

Forgotten Wrecks of the First World War

Pinnacle 704 (FL7) Site Report



LED BY IWM

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FORGOTTEN WRECKS
OF THE FIRST WORLD WAR

Steam Pinnacle 704 (FL7)
Site Report



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ii Copyright Statement

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1 Project Background

Forgotten Wrecks of the First World War is a Heritage Lottery Funded project dedicated to raising the profile of a currently under-represented aspect of the First World War. While attention is often focused on the Western Front and major naval battles like Jutland, historic remains from the war lie, largely forgotten, in and around our seas, rivers and estuaries.

With over 1,000 wartime wrecks and dozens of coastal sites along England's south coast alone, the conflict has left a rich heritage legacy and many associated stories of bravery and sacrifice. The underwater memorials represent the vestiges of a vital, yet little known, struggle that took place on a daily basis, just off our shores. The study and promotion of these archaeological sites presents a unique opportunity to better interpret them and improve physical and virtual access.

The project focuses on underwater and coastal sites from the Isle of Thanet in Kent, to beyond the Isles of Scilly, and over half way into the English Channel. The sites include merchant and naval ships, passenger, troop and hospital ships, U-boats, ports, wharfs, buildings and foreshore hulks. These sites, under water and on the foreshore, have been degrading and deteriorating due to natural and human processes for approximately 100 years and, as a result, are extremely fragile. In many cases, this project represents a final opportunity to record what remains on the seabed and foreshore before it is lost forever.

The project aims to characterise the nature and extent of the maritime First World War archaeological resource surviving on the south coast's seabed and around the coast. This will enable an understanding of the record of maritime activity created during the conflict and provide a window onto some of the surviving sites. While it will not be possible to visit and record every site dating to the First World War along the south coast of England, a representative sample of sites have been selected for more detailed study, analysis and interpretation.

With particular regard to coastal, rather than fully submerged archaeological remains, it has been noted in wider commentaries on England's coastal heritage (Murphy, 2014: 94) that there are relatively few surviving sites because of subsequent reuse and/or destruction during or following the Second World War. As a result, from the perspective of identifying coastal research priorities an emphasis has been placed (Murphy, 2014: 119) on the need to differentiate First World War sites from those of the Second World War. With all of this in mind, the following report addresses one of the coastal sites dating to the First World War.

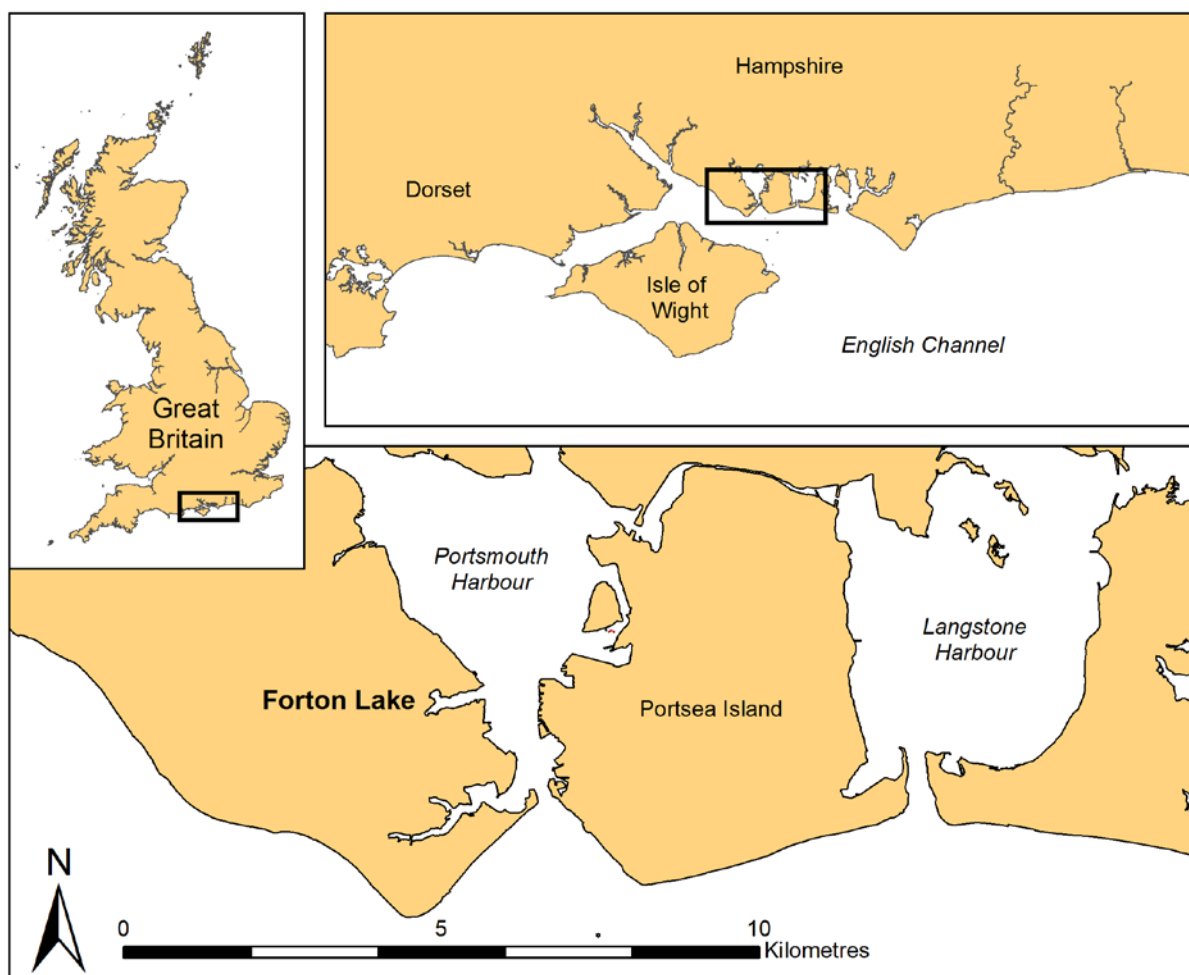
This report collates information collected during the project, relating to one of the south coast's First World War intertidal sites, the hulked remains of the steam Pinnacle 704, located at Forton Lake, Gosport (Figure 1 & Figure 2).

The report outlines the result of research, the creation and subsequent analysis of the 3D model and how this has helped inform on and improve our understanding of the site and the hulks in the local vicinity. The report constitutes one of the project outputs and will be lodged with the Archaeological Data Service, ensuring free public access beyond the life of the project.

2 Background and Context

Forton Lake is a tidal inlet on the western shore of Portsmouth Harbour (Figure 1). From an archaeological perspective, Forton Lake is notable for the large collection of twenty-eight hulked vessels that are located around its foreshore, numbered FL1-11, 15-31. These have been subject to periodic phases of survey work, most notably during an extended community-based project between 2006 and 2008 run by the Nautical Archaeology Society and the Hampshire and Wight Trust for Maritime Archaeology (now Maritime Archaeology Trust). The findings of that project have been disseminated through a dedicated monograph published jointly between the NAS and HWTMA (Beattie-Edwards and Satchell, 2011).

The remains of FL7 are located on the southern side of Forton Lake, at the western end of the main surviving concentration of hulked vessels (Figure 2). It comprises the rusting, degraded and partially buried remnants of a First World War steam Pinnacle (No. 704) that was originally ordered in 1915, delivered in 1917, and eventually laid up after many years of service, in 1948. Pinnacle 704 is the only vessel within the Forton Lake assemblage confirmed as being of First World War date. Initial work was conducted in September 2015 and included MAT staff and a group of volunteers.



Map Datum: OSGB36
Mean High Water data courtesy of the Marine Management Organisation.

FIGURE 1: LOCATION OF FORTON LAKE ON THE WEST SIDE OF PORTSMOUTH HARBOUR.



FIGURE 2: LOCATION OF FL7 WITHIN FORTON LAKE, AT THE WESTERN END OF THE MAIN COLLECTION OF HULKED VESSELS ON THE SOUTHERN SHORE OF FORTON LAKE. THE AERIAL PHOTO DATES FROM JUNE 2013.

2.1 SITE HISTORY

An overview of the history of Forton Lake itself is provided by Maddocks (2011) in relation to the NAS/HWTMA survey work undertaken there. In the context of the hulk assemblage a key period of activity can be identified from the early 20th century onwards with the establishment of a number of boatyards along the southern shore of Forton Lake (Maddocks, 2011: 9). These were especially busy between the two World Wars and in the decades following the Second World War when a large number of decommissioned and unwanted vessels were disposed of, bought, sold and scrapped within Forton Lake, especially through the boatyard of Fred Watts.

Work undertaken for the Forton Lake project (Beattie-Edwards, 2011b: 10) included historical research into the archives of material related to Fred Watts' yard, as part of the wider work to understand the nature and origins of the hulk assemblage. Further oral history research was able to augment the historical records through the memories of those who had lived and worked around Forton Lake when many of the vessels were deposited. In many cases, these combined sources were able to provide identifications for many of the ship and boat remains upon which archaeological survey had been undertaken.

The background biography for Pinnacle 704 was established through such a combination of historical research, in conjunction with oral history. Pinnacle 704 was identified through correlation of its surviving features, most notably the distinctive Yarrow water tube boiler, with those present in archive photos from the 1970s and 1980s (Figure 3 & Figure 7). The more complete nature of the vessel in those images allowed comparison with other extant examples and provided an identification of vessel type as a steam pinnacle (Donohue *et al.*, 2011: 48). Further information was then added by Jack Smale, who identified the vessel as Pinnacle 704, which was beached at Fred Watts' Yard in the 1950s and that the remains of the vessel were 'finally cleared by the local authorities' at a later date.



FIGURE 3: PINNACLE 704 IN THE 1970s, FROM THE JACK SMALE COLLECTION (IMAGE: COURTESY OF PHILIP SIMONS).



FIGURE 4: PINNACE 704 PHOTOGRAPHED AT AN UNKNOWN DATE. ASSUMED TO BE AFTER FIGURE 3 BECAUSE OF THE ABSENCE OF THE STARBOARD RUBBING STRAKE, AND CLEARLY PRIOR TO THE TRUNCATION OF THE BOW, VISIBLE IN FIGURE 5 (IMAGE: COURTESY OF PHILIP SIMONS).



FIGURE 5: PINNACE 704 IN THE 1980s, THOUGHT TO BE 1987, WHEN THE BOW OF THE VESSEL AND GUN MOUNT HAS BEEN TRUNCATED, BUT WHERE LARGE PARTS OF THE MAIN SUPERSTRUCTURE ARE STILL IN PLACE. THE BOILER IS NOW CLEARLY VISIBLE WITHIN THE FORWARD PART OF THE VESSEL (IMAGE: COURTESY OF PHILIP SIMONS).



FIGURE 6: PINNACE 704 PHOTOGRAPHED IN 2006 DURING THE FORTON LAKE PROJECT. THE MAJORITY OF THE SUPERSTRUCTURE AND HULL IS NOW LOST AND THE BOILER IS THE MOST PROMINENT FEATURE OF THE SITE (IMAGE: FORTON LAKE PROJECT ARCHIVE).



FIGURE 7: PINNACE 704 PHOTOGRAPHED IN 2015. THE OVERALL DISPOSITION OF THE SITE IS VERY SIMILAR TO ITS SITUATION IN 2006.

2.1.1 Pinnacle 704

A basic outline of the career of Pinnacle 704 was supplied to the Forton Lake Project by the Naval Historical Branch (Donohue *et al.*, 2011: 48). The vessel was part of a batch order placed in 1915 and built in steel by Camper & Nicholson, the machinery was provided by Allen & Son of Bedford. The original dimensions of the vessel are likely to have been 50' (15.24m) overall, 9'9" (3m) breadth and a mean draught of 3'1½" (0.95m) (Donohue *et al.*, 2011: 48-9).

Pinnacle 704 was delivered on 16th August 1917 and assigned to the Royal Clarence Yard in Gosport on 27th August 1919, where its presence was recorded in 1924, 1925, 1934, 1936, 1938 and 1947, before being disposed of on 31st May 1948 (Donohue *et al.*, 2011: 49)

Pinnacle 704 therefore represents the remains of a vessel that was ordered, constructed and active during the First World War, and which then continued in service through the inter-war period and the Second World War. The vessel's service history at present is not extensively known, although its operation appears to have remained local to Portsmouth Harbour, through the Royal Clarence Yard at Gosport. Following decommissioning it seems to have followed a path of acquisition by Fred Watts' yard, before being abandoned. With regard to the latter, it is notable that the vessel does not appear in the list of vessels for sale at Watts' yard between 1951 and 1959 (see Beattie-Edwards and Satchell, 2011: Appendix A). Similarly, salvage/breaking up of the vessel following its arrival in Forton Lake was possibly limited, judging by the extent of superstructure surviving in photos from the 1970s and 1980s (Figure 3-5). The main destruction of vessel structure seems to have occurred from the 1980s onwards and is presumably not related to the commercial salvage of the vessel. Investigation of the site formation processes, natural and human, which the vessel has been subjected to therefore provides a useful avenue of research for the present project.

2.2 WIDER GEOGRAPHICAL CONTEXT

Forton Lake is situated on the western side of Portsmouth Harbour to the north of Gosport (Figure 1 and 2). Although called a 'lake' it is actually a tidal inlet which opens, at its eastern end into Portsmouth Harbour. Forton Lake is 860m in length (west/east) from its truncated head at St Vincent College to the footbridge at its eastern end, and c.200m across (north/south). The inlet formerly extended much further inland to the west and north-west, prior to land reclamation in the 20th century, and encompassed a mill and associated mill pond at Forton (Beattie-Edwards, 2011a: 2-4). At the eastern end of Forton Lake, its entrance to Portsmouth Harbour is flanked by the former sites of the Royal Clarence victualling yard to the south, and Priddy's Hard to the north.

The remains of Pinnacle 704 are located high up the foreshore, reflecting the beaching of the vessel with the bow close to or at, the high water mark. As a result, the site is fully exposed during every tidal cycle, including neap tides, affording a long working window on the site of many hours. The southern end of the remains lie on relatively hard foreshore, which trends to deeper mud around the surviving stern area, but even there, conditions are not particularly challenging.

2.3 RESEARCH QUESTIONS

As noted in Site History, Pinnacle 704 was assigned the ID of FL7 during the Forton Lake Archaeology Project that took place between 2006 and 2009. The remains were surveyed in plan view by a team of volunteers in 2007 (Figure 8), with associated historical research that enabled the identification of the remains as Pinnacle 704. The results of this work were published in the final project monograph (Donohue *et al.*, 2011) and serve to establish the primary record of the formally surveyed extent of the remains circa 2007, along with the essential biographical information relating to the vessel. The work undertaken as part of the Forgotten Wrecks project builds on the previous surveys.

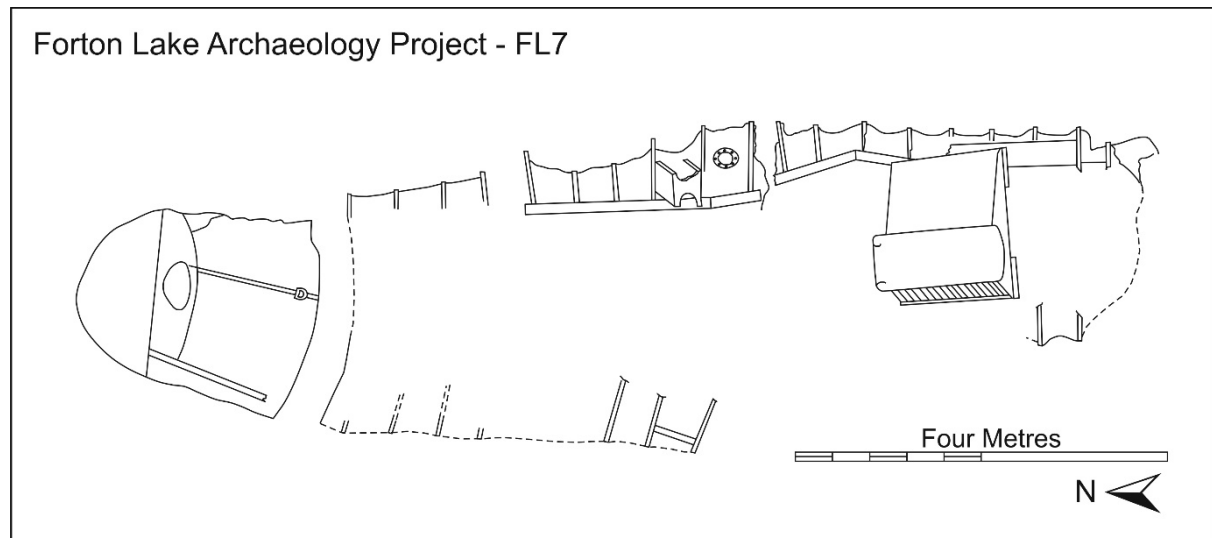


FIGURE 8: PLAN OF FL7 RECORDED IN 2006 DURING THE FORTON LAKE ARCHAEOLOGY PROJECT, THE STERN OF THE VESSEL IS TO THE LEFT, THE BOILER TO THE RIGHT (IMAGE: FORTON LAKE PROJECT ARCHIVE).

As there have been notable technological advances in archaeological surveying that have taken place since 2006 it was possible to apply these to the site for baseline survey and the development of a 3D model. Additionally, there was scope for further enhancement of the vessel's service history, biography and site-formation processes following its disposal from Royal Clarence Yard in 1948.

The following primary research questions were developed for the site as a means to guide the work done through the Forgotten Wrecks Project:

- Photogrammetric recording of remains to provide a baseline for subsequent survey work, and to allow an assessment of the effectiveness of this approach for rapid on-site recording, followed by post-fieldwork analysis.
- Historical research of a more detailed service biography for the vessel, its disposal, and processing through Forton Lake.
- Investigation of available aerial photographs, and other archive sources to try to understand site formation process pre-1970 and to rationalise site degradation with the existing photographic archive after that.
- Detailed 3D analysis of photogrammetric model to review future methods of monitoring the site and potential applicability to other hulks in the area.

3 Fieldwork Methodology

Forgotten Wrecks Project site visits and fieldwork aimed to:

- Provide opportunities for volunteers to access and take an active role in the recording and research of a range of different types of maritime First World War site.
- Record extant remains for heritage records.
- Record extant remains for public dissemination, enabling 'virtual' access for those not able to achieve physical access.

Fieldwork undertaken at FL7 in 2015 included:

- Initial site visit
- Characterisation of remains through detailed inspection
- Site survey – sketch and measured survey, photographic
- Drone survey for photogrammetric recording
- Creation of 3D model

In 2017 the data was fully analysed. The 3D model was analysed using Rhino 5.0 software. The model was cut into a series of profiles that were cross referenced with the original survey data to verify the models accuracy.

For further information about methodology, please refer to the MAT's *Forgotten Wrecks of the First World War: Project Methodology Report*.

4 Site Results

The 2017 analysis of the survey results confirm that the site is stable with very little degradation of the structure and little change in the overall sediment levels. The state of the site remains largely the same over the 10 years between the two surveys with the majority of features still extant. The 2007 survey stated that the vessel remains are 11.60m long and 3.52m at its widest point. The measurements taken from the model in 2015 show a slight decrease to 10.8m which could infer the detached stern section may have degraded.

The width of the site was recorded at 3.6m, a slight increase from 2007, which is likely to be caused by the slight twist of the stern section which is having an ongoing effect on the northern area of the vessel which is slowly collapsing out due to degradation.

The remains are corroded, especially towards the bow which means the vessel is shorter than its original recorded length. The lower section of the hull is visible, as is the port side but only in the forward sections. The vessel is constructed of metal plates riveted to a metal frame. The frames are 5cm wide and are spaced 40cm apart. Seven meters forward from the stern on the port side is a circular riveted opening still present in 2017, which has a diameter of 18cm which is believed to be the remains of a bilge pump outflow.

The most complete section of the vessel is the stern section, which remains up to the sheer, which is partially detached. Towards the bow of the hulk the engine boiler is present, as the most prominent feature on the site it can be used for future monitoring. The boiler comprises of a central steam drum at the head of the boiler with two diagonal steam chambers off to the side. Part of the casing is missing from the starboard side chamber revealing the water pipes inside. To the back of the boiler there is a small rectangular opening, which could be the firebox.

4.1 DBA & HISTORICAL RESEARCH

The previous work on the remains of Pinnacle 704 undertaken through the Forton Lake Archaeology Project meant that several important areas of study already had significant quantities of data available. The Desk-Based Assessment (DBA) and historical research phase of investigation proved to be extremely helpful in establishing the overall disposition of structural remains at the site, as well as providing some indication of the likely changes to those remains over time. As noted in Section 2.1, the historical photos of the vessel show that it was substantially intact in the 1970s (Figure 3 & Figure 4), but that the bow area had been truncated by the mid/late 1980s (Figure 5). A major reduction in the overall extent of the surviving structure then took place by the time of the Forton Lake Project from 2006 onwards.

It appears that Pinnacle 704 was not subjected to significant salvage activity by Fred Watt's yard, given the latter yard closed in 1959 and the vessel's hull and superstructure was still largely intact in the 1970s. The vessel was also not offered for sale by the yard in any of the available listings researched by the Forton Lake Project for 1951-1959, when the yard was operational. Any salvage undertaken during this time seems therefore to have been limited to relatively superficial material, deck fittings, etc., rather than wholesale disassembly of the hull.

The existing archive of material for Pinnacle 704 within the Forton Lake Project archive also included a number of historical aerial photographs, including one dating to 1953, when the vessel might be expected to be in its present location. Reference between that image and the currently known location of Pinnacle 704 reveals that it was not occupying its final resting place in April 1953. A vessel is visible in the correct location, but at c.9.5m in length is too small to be Pinnacle 704.

4.2 MEASURED SURVEY

A team of four undertook detailed inspection and survey at the site. Measurements acquired were used to scale the photogrammetry model of the site, while notes on the site condition built upon previous work and enabled assessment of any changes to monitor any deterioration.

The 2015 survey demonstrates very slight changes across the site. Measurements of the length and beam of the remains are fairly constant and there are no major changes to key site features. The site is relatively stable, with good protection from the tidal cycle.

With the development of rapid digital survey techniques, it is still important to undertake direct measured survey to create a baseline dataset and to allow scaling of the 3D data. However, 3D recording does mean that significant amounts of data can be gathered from sites such as FL7, which can reduce the amount of time it would take to achieve similar coverage using traditional 2D recording techniques.

4.3 PHOTOGRAMMETRY

Photogrammetry is now a well-established and widely adopted rapid recording technique. It brings significant benefits for rapid recording of intertidal sites, as demonstrated on FL7. A key benefit is that time constraints imposed by the tidal cycle can be overcome allowing a site to be accurately recorded within a 2 hour window by a small team. A further benefit is that often fragile remains can be surveyed remotely without the need to access them directly risking damage.

1hr and 25 minutes of survey was undertaken using a drone, during this time 821 photographs were taken in a series of concentric circles around the site, along with detailed shots of specific areas. From the base data collected it is clear that the vessel structure has remained relatively stable from the 2006 survey to the 2015 survey with a nominal difference. A site with little movement of material makes it ideal for trialling a 3D monitoring techniques. The small levels of erosion which are a constant but cannot be readily seen with traditional methods can be seen with photogrammetric monitoring and reveal subtle changes.

A 3D model of FL7 was created using photographs taken in 2015 with further processing taking place in 2016-2017. This model, along with basic interpretation and has been published through the MATs SketchFab pages as a means to further dissemination of the site¹.

The model was then further refined and scaled to be analysed through CAD software to produce a number of other outputs. Through the application of this rapid field recording method an ortho-rectified overhead view of the site was generated (Figure 9 – Ortho- mosaic of site).

¹ The 3D model of the remains of Pinnacle 704 can be viewed at <https://sketchfab.com/models/d0412bbd009946dfb7c81ebc4914428f>

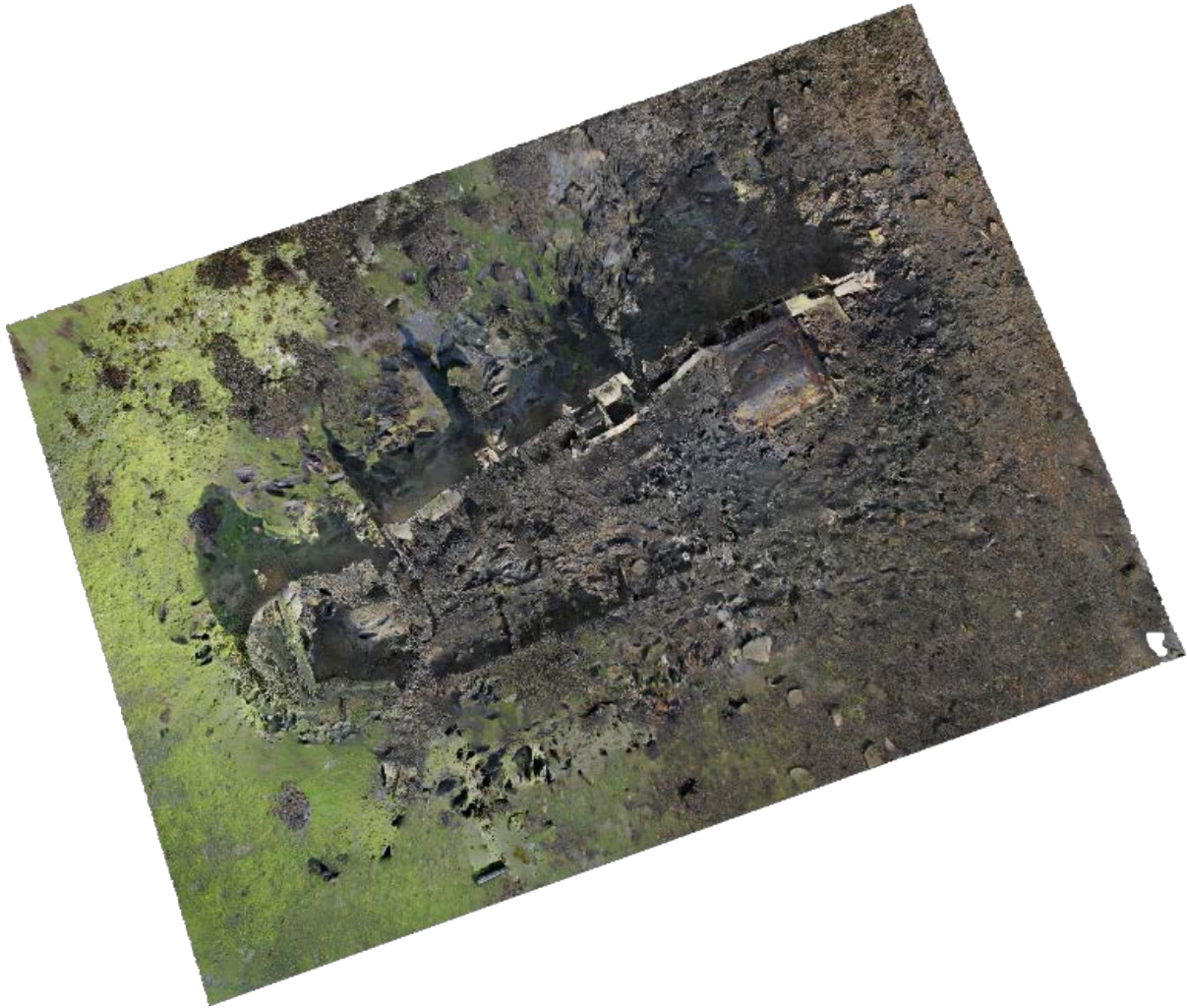


FIGURE 9: ORTHO- MOSAIC OF THE FL7 SITE.

The ortho mosaic was placed as a bitmap at a 1:1 scale in CAD software. The use of an ortho rectified image allows accurate measurements to be collected in addition to the creation of a conventional site plan that can be compared to the 2006 survey (See Figures 10 and 11). By comparing the two plans, it is clear there has been some loss of sediment on the site with new areas of structure revealed, however the 2017 plan shows the initial 2006 plan to be a highly accurate record of the site.

The 3D model created in 2015 and analysed in 2017 has provided a baseline data set that has been used to quantify site formation processes, the extent of the remains and the general the rate of erosion at the site. The model can be used for future work to consistently monitor the deterioration of the site, and inform management of this site and others in the collection of hulks in Forton Lake.

Figure 12 demonstrates how the 3D model can be used to visualise sections through the site. By taking a series of measurements across the midsection, it is possible to roughly establish the extent to which the vessel is listing - showing a clear twist from 10 degrees at the estuarine extents to 5 degrees around the midsection and then 25 degrees and its furthest southern extents. The twist is likely caused by the stern sections constant interaction with the tidal cycles, creating stress on the structure. The section forward where the boiler is pinned by its weight, acts as an anchor point to the action caused by the tidal movement resulting in the stern becoming further detached over time.

Images taken in 2006 and 2015 show that sediment has been lost around the mid-section which is close to the high water mark. The tidal cycle creates slight scour where water flows freely through the

structure. In areas where the water has become trapped it is possible to see deposition of sediment within the internal structure.

The sediment levels in the 2006 survey cannot be fully quantified, but have been interpreted from the extensive photograph archive. However, with the use of the cross sections taken through the model generated in 2017 it is possible to estimate the levels, this data can be used to compare with future surveys allowing the movement of sediment and how this effects the erosion and collapse of the structure to be understood.

FL7

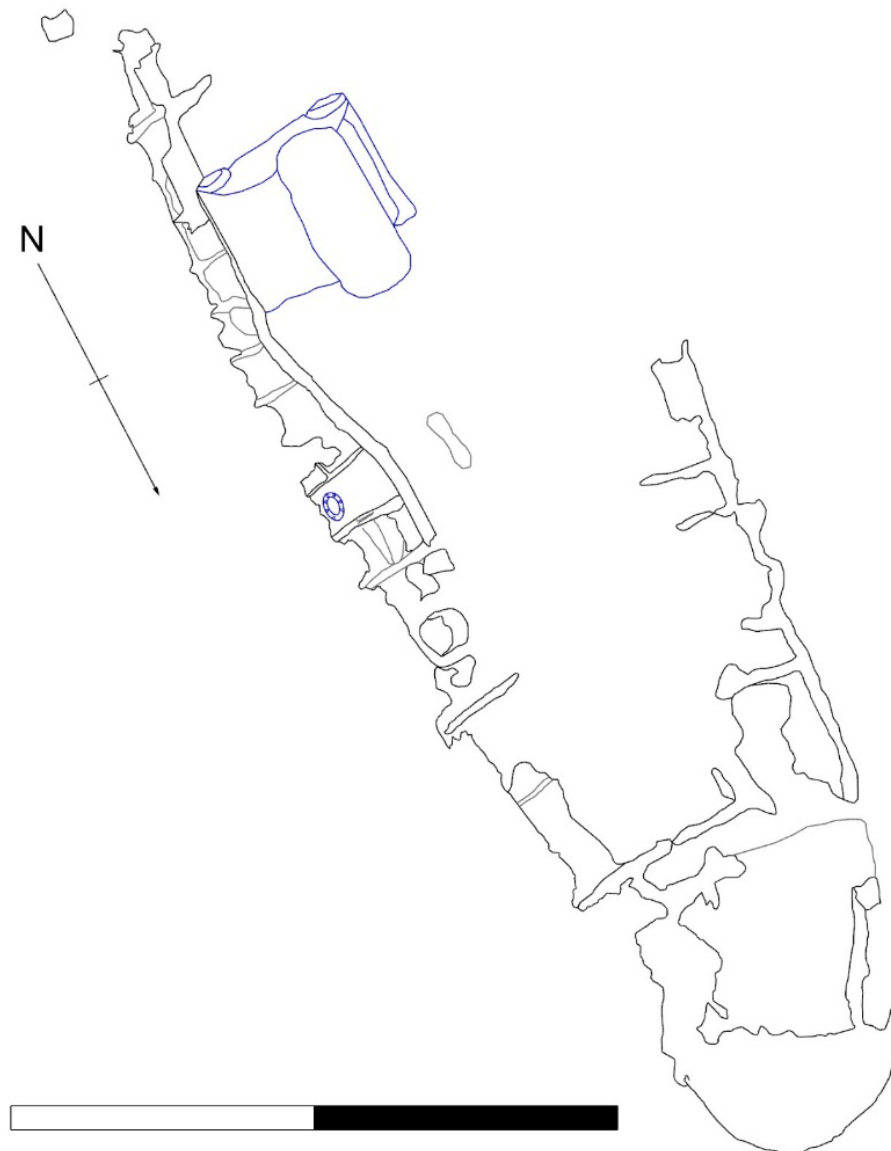


FIGURE 10: FL7- 2017 SITE PLAN.

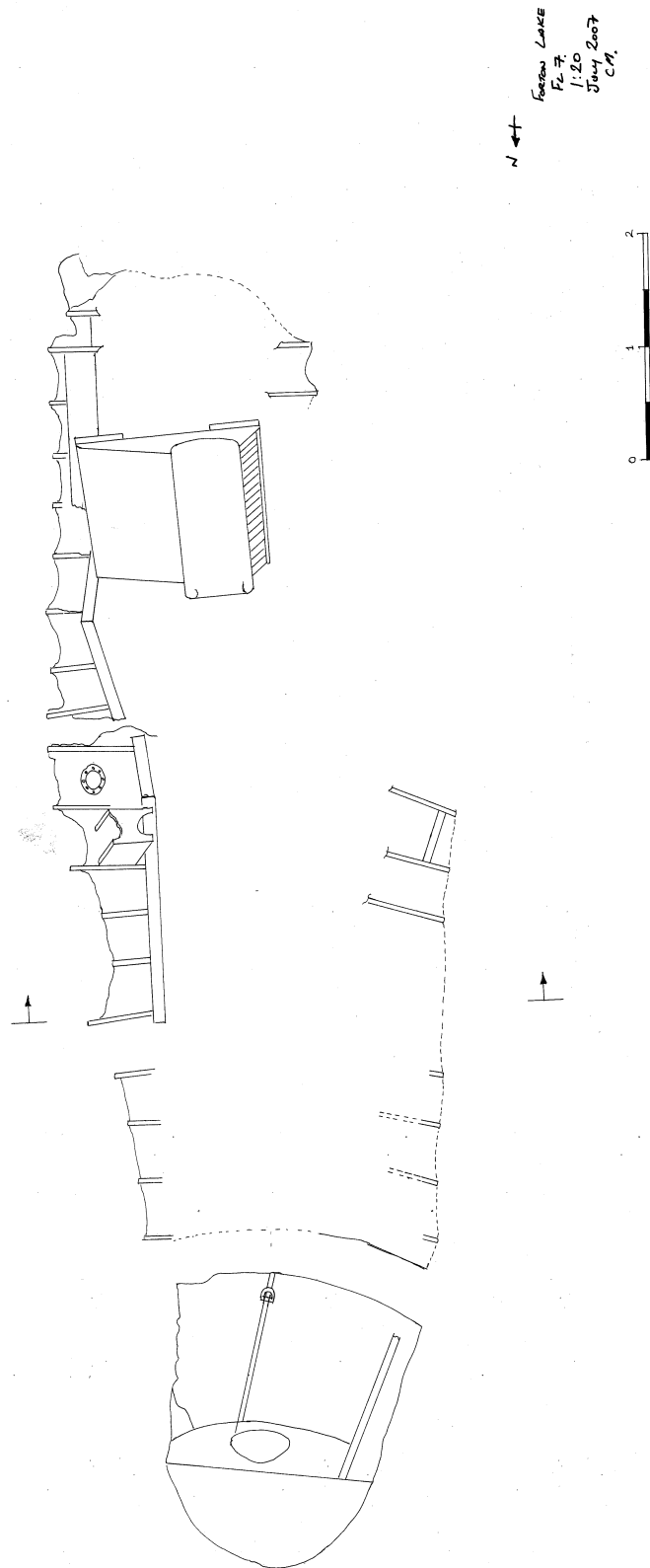


FIGURE 11: 2006 SURVEY PLAN - FORTON LAKE PROJECT.

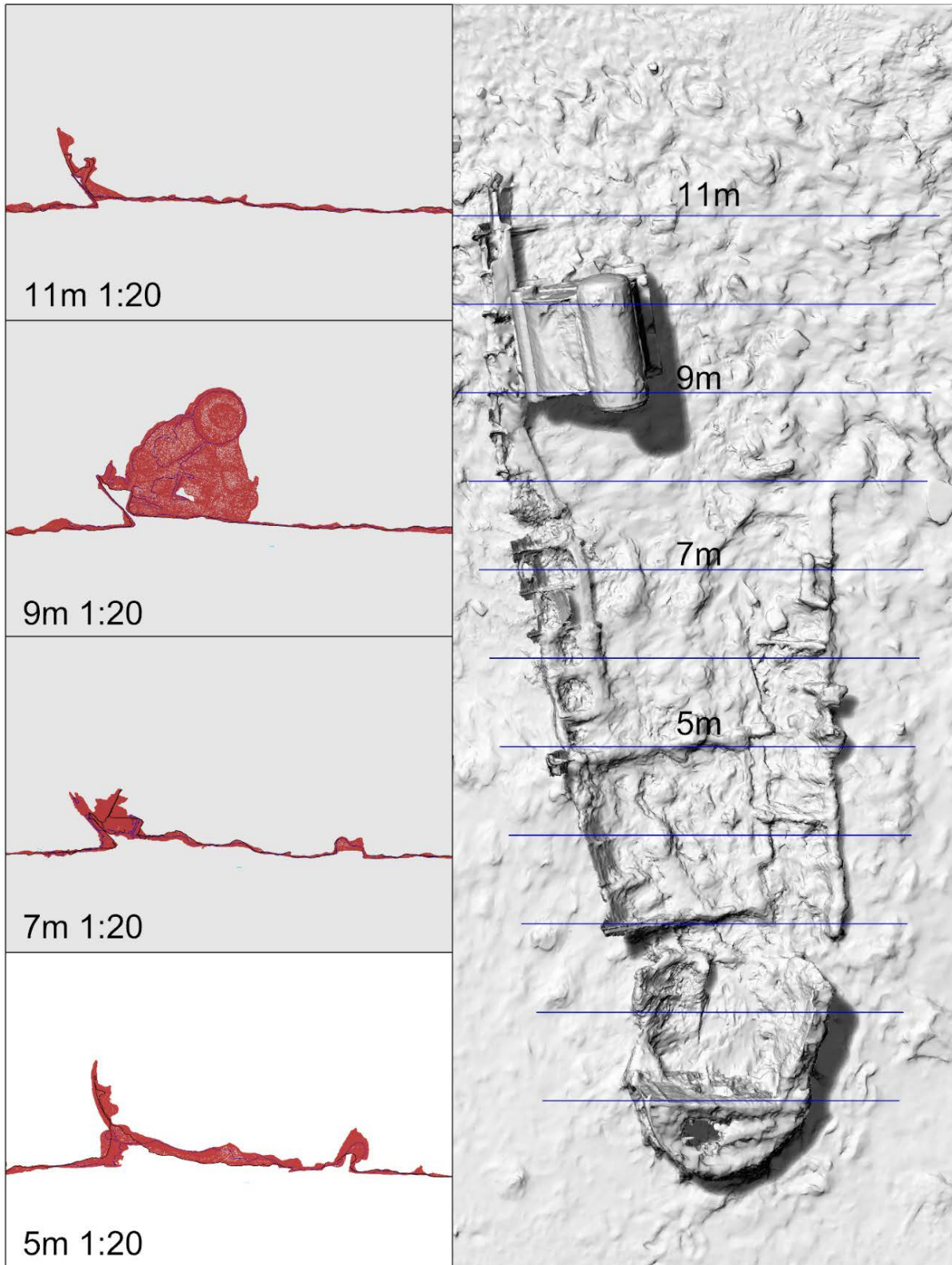


FIGURE 12: CROSS SECTIONS AT REGULAR INTERVALS THROUGH FL7.

5 Discussion and Conclusions

The 2015 field work and subsequent analysis in 2017 has developed understanding of Pinnacle 704 in relation to many of the research questions identified following the initial desk based assessment (See Section 2.3). The survey has demonstrated the relative stability of the site, confirmed the accuracy of the 2006 survey and generated a high resolution baseline data set for future work.

5.1 SITE RECORDING AND MONITORING

Photogrammetry and resulting modelling has been used as both a product for public dissemination and an enhanced research tool. The use of photogrammetry provides a saving in time and an increase in the diversity and quality of available outputs. Analysis of the 3D model demonstrates potential for long-term monitoring. Surveys at regular intervals would allow the model to be used as a digital datum to track changes to the site structure and surrounding sediments. Pinnacle 704 could be used as an example for measuring the degradation of other comparable hulks.

Large numbers of vessels were 'hulked', being deposited at the end of their working lives around the outbreak of the Second World War or later. Many sites still include upstanding remains which are recognisable as ships. Any data collected on how these ships degrade once deposited can greatly increase understanding of how vessels deteriorates on the foreshore, allowing us to apply the data to other vessel assemblages. Approaches used to record and monitor FL7 as part of the Forton hulks assemblage could be applied to the study of other vessels and hulk assemblages across the UK.

5.2 HISTORICAL RESEARCH AND ARCHAEOLOGICAL SIGNIFICANCE

Further historical research has provided more information on the service history of the vessel prior to 1950. Now that the heavy salvage event previously identified has been discounted, a clear gap in the record can be seen and demonstrated on the site when comparing the images taken in the 1980's (Figure 5) to the images taken in 2006 (Figure 6) and the subsequent survey in 2015 (Figure 7). The results show the site to be very stable other than in this, as yet unknown, activity between 1980's and 2006. Further questions remain in relation to impacts on the site during this period, these could be answered through interrogation of historic aerial photographs which may also enable the date for the vessel being deposited in its current location to be more accurately determined.

The site of FL7 has a clear significance in the archaeological record, at present it is unknown how many other examples of this type of vessel survive in the world. In 2009 sixteen pinnace's were registered on the UK's National Historic Ships Register dating from the *Collie* which was built around 1890 by Thornycroft as a sailing pinnace for the Royal Navy, to the pinnace *Diligence* built in 1946 by J Samuel White of Cowes on the Isle of Wight. Based on the numbers of this vessel type registered with the National Historic Ships Register Pinnacle 704 is not considered rare.

Pinnacle 704 and many of the First World War hulks are in a unique position in terms of changes in shipbuilding. The First World War period witnesses large leaps in technology particularly regarding military craft, however, traditional wooden merchant vessels, barges etc are still working during the 1900's, later to be deposited at the end of their working lives in the estuaries and coastal areas of the UK. This unique period in history has therefore left a selection of vessels of wooden, iron and composite construction.

The pinnace represents a vessel type that has been commonly found hulked in the estuaries of the UK, with examples residing afloat as houseboats or in maritime museums. It is a vessel type that spans a long period in British history with a consistent purpose and were easily adapted once

decommissioned. The pinnacle is a constant in the Royal Navy from the early 1800's (sail pinnaces) to the end of the Second World War. There is a further potential avenue of research to compare how pinnaces were constructed, repurposed and eventually laid up following the development of this type of craft from sail through steam to diesel engines.

As a positively identified steam pinnacle (Number 704) ordered in 1915 and launched in 1917 the data gathered from FL7 can now be used to compare to other pinnacle remains. Although little detail is known of the precise role of the pinnacle based at Royal Clarence Yard during the First World War, it remains an important hulk with particular significance to this area of Portsmouth Harbour.

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