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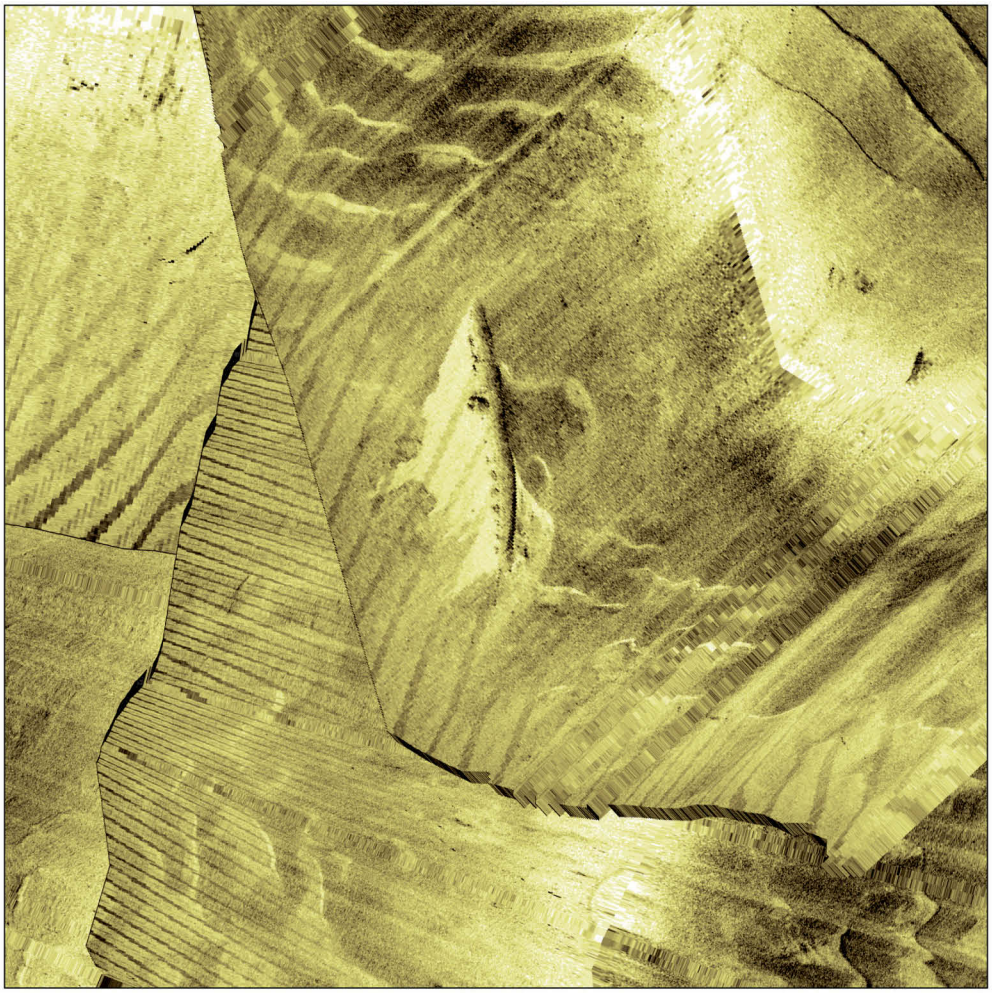
Archaeological Services in Relation to Marine Designation

UC-6, Thames Estuary

Archaeological Report



Ref: 83803.23
January 2015

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ARCHAEOLOGICAL SERVICES IN RELATION TO MARINE DESIGNATION

UC-6, Thames Estuary

ARCHAEOLOGICAL REPORT

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January 2015

Ref: 83803.23

Quality Assurance

Project/Report Code	83803.23	**Accession Code**	n/a	**Client Ref.**	EH 6552
Planning Application Ref.	n/a	**Ordnance Survey (OS) national grid reference (NGR)**	WGS 84 Lat: 51° 30.6998' N Long: 01° 34.6692' E		

Version	Status*	Prepared by	Checked and Approved By	Approver's Signature	Date
v01	I	*Peta Knott*			
File:	W:\Projects\PWA\Projects\83803\10 Reports*UC-6*-21				
v.02	E	*Peta Knott*	*Toby Gane*		10/11/2014
File:	W:\Projects\PWA\Projects\83803\10 Reports*UC-6*-21				
v.03	E	*Peta Knott and Patrick Dresch*	*Toby Gane*		06/01/2015
File:	W:\Projects\PWA\Projects\83803\10 Reports*UC-6*-21				
v4	F	*Peta Knott and Patrick Dresch*	*Toby Gane*		06/03/2015
File:	W:\Projects\PWA\Projects\83803\10 Reports*UC-6*-21				

* I = Internal Draft; E = External Draft; F = Final

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Summary

Wessex Archaeology (WA) was commissioned by English Heritage (EH) to undertake an Undesignated Site Assessment of the wreck site reported as being the German minelayer *UC-21* or possibly *UC-6* located in the Thames Estuary, off the North Foreland, Kent. The work was completed as part of the Heritage at Risk (HAR) Contract for Archaeological Services in Relation to Marine Designation.

The assessment of the site was undertaken as part of a two stage investigation. Stage one consisted of a geophysical survey and stage two consisted of a diver survey of the site, which also involved the local British Sub Aqua Club (BSAC) 326: Canterbury Divers.

A geophysical survey was completed of two potential sites for the U-boat minelayer: the UKHO 14054 wreck location (believed by the UKHO to be possibly *UC-21*) and a submarine dived by Canterbury Divers further to the north, (referred to in UKHO report 14086 as the cargo ship *Grazia*). A sidescan survey was completed for both sites and a magnetometer survey was completed for the northern site. At the northern location wreck **7000** has now been identified as a submarine, probably *UC-6*. Wreck **7001** was identified at the southern location (UKHO 14054) and appears more likely to be the remains of a ship, possibly those of the *Grazia*.

This was followed up by diver investigations in the area of wreck 7000 where divers reported seeing the U-boat sitting on the seabed leaning approximately 35 degrees to starboard. The submarine was briefly located by WA divers but a diving incident and DSV break down prevented further diving but additional information was provided by Canterbury Divers.

Geophysical data and archival records were used to identify that the submarine is most likely to be *UC-6* rather than *UC-21*.

The site has been assessed against the non-statutory criteria for scheduling and further diving investigation is required before a recommendation can be made. Beyond the initial damage that caused the sinking, the boat was observed as being in good condition. It is possible that the propeller is still present under the sand wave which could provide conclusive identification.

Risk is assessed as low with natural corrosion expected as the main risk.

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Acknowledgements

This investigation was commissioned by English Heritage, and the assistance provided by Terence Newman and other members of staff is gratefully acknowledged.

Wessex Archaeology would also like to thank the following people and organisations (alphabetical order):

- Brian Allen, skipper, and crew of *Dockman*;
- Dr. Baberg and Mr Bredow, Deutsches U-Boot Museum;
- Canterbury Divers BSAC 326;
- Michael Lowrey;
- Jens Neuberger;
- Terence Newman, English Heritage;
- Dwight Messimer

Stage 1 geophysical data were acquired by Patrick Dresch and Michael Murray, data were processed by Patrick Dresch, quality control was carried out by Dr Stephanie Arnott and illustrations were produced by Karen Nicholls.

The Wessex Archaeology dive team worked with divers from BSAC 326: Canterbury Divers to carry out the Stage 2 diving operations. The Wessex Archaeology team consisted of Peta Knott, Paolo Croce, Toby Gane, Michael Murray and Graham Scott, with the assistance of Terence Newman from English Heritage. The Canterbury Divers consisted of: Gerry Dowd, Derek Greenan, Rob Harrison, Debbie Philips, Kay Skinner and Simon Woollcott.

Peta Knott supervised the Stage 2 fieldwork. Graham Scott and Paolo Croce supervised the Wessex Archaeology diving operations. Canterbury Divers (BSAC 326) diving operations were led by Simon Woollcott and Rob Harrison.

The report was compiled by Peta Knott with archaeological contributions by Graham Scott and geophysical components written by Patrick Dresch. Ken Lymer prepared the illustrations. Toby Gane and Graham Scott carried out QA. The project was managed for Wessex Archaeology by Toby Gane.

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ARCHAEOLOGICAL REPORT

1 INTRODUCTION

1.1 Assessment Background

1.1.1 Wessex Archaeology (WA) was commissioned by English Heritage (EH) to undertake a geophysical survey and associated archaeological assessment of the reported wreck site of the German minelayer, U-boat *UC-21* or possibly *UC-6* (the Site; Figure 1;). The work was undertaken as part of the NHPP Heritage at Risk - Designated Wrecks at Risk contract for archaeological services (EH 6552). The UDS application number is 476490.

1.1.2 The work was conducted in accordance with a written brief and agreed scope of work (EH 2013). This was modified on site with the agreement of the client representative Terence Newman.

1.1.3 The fieldwork was part of a staged investigation of two wreck sites in the Thames Estuary, in June 2014. Wreck site 1 (WA ID_**7000**), corresponding with UKHO record 14086 for the cargo vessel *Grazia* (possibly), was believed to be the site of a U-boat reported by local club Canterbury Divers and also published in Young and Armstrong (2006). Wreck site 2 (WA ID_**7001**), corresponding with UKHO record 14054, was the location of the *UC-21* (possibly) according to UKHO and was 0.6 nautical miles south of site 1.

1.1.4 The text of this report should be understood strictly as read and contains no implied meanings or judgements. Reporting of third party actions, statements and intentions is based upon the information available to WA at the time of drafting. Use of the phrase “It is reported that…” means that WA has received a report from a third party that appears to be credible but which cannot be confirmed as fact from the available evidence.

2 ASSESSMENT AIMS AND OBJECTIVES

2.1.1 The overall aim of the project was an undesignated site assessment. This was broken down into the following primary and secondary objectives (EH 2014):

Primary Objectives

- Contact the Receiver of Wreck to gain a list of droits relating to the site;
- Obtain documentary evidence of the two possible U-boat minelayers
- Undertake geophysical survey (side-scan & magnetometer only) to assess the presence/absence of heritage assets with the reported locations for the *UC-6* or *UC-21* and to establish extent, stability and character.
- To assess the current condition of the possible U-boat wreck and identify any surrounding material of possible archaeological potential in order to inform possible further studies;
- To provide data and/or imagery directly relating to the wrecks and any associated material on the seabed.
- To assist in further diver related work in the area.

- Undertake a diver survey of the exposed remains. Confirm position, extent, stability and character (plotted by tracked diver survey) of the site;
- Locate and accurately position (plotted by tracked diver survey and probing as appropriate) any additional archaeological material;
- Produce a structured record of field observations; preferably including a photographic record of the site and a basic site plan. Key artefacts are to be subject to detailed examination and recording (position by tracked diver survey, taped measurements, photographs and video and written database entries);

Secondary Objectives

- Supplement the recording of the core of the site by recording profiles across the main axis of the site;
- Establish links with local divers, dive groups and skippers to enable future site management options.

2.1.2 Following discussions with the onsite EH representative it was agreed that diver survey should first focus on Priority 1 Site (hereafter Site 1) as the SSS had produced data that was interpreted as a possible U-boat and then, time permitting, examine the Priority 2 Site (hereafter Site 2), the UKHO's location for the U-boat.

2.1.3 Prior to fieldwork, it was agreed that the secondary objective to establish links with local divers and to involve them in Stage 2 diving operations was to be treated as a priority objective. These were specifically listed as the Canterbury Divers BSAC 326 branch.

2.1.4 The level of site investigation required by English Heritage was defined using WA's proprietary Level of Recording system. A Level 3a approach was requested (diagnostic). All archaeological material located was recorded using still photography and video, together with selected measurements. Positions were to be recorded using either a USBL system or a GPS buoy and/or by distance and bearing to a shot position.

3 METHODOLOGY

3.1 General

3.1.1 All fieldwork procedures and standards complied with the relevant guidance produced by the Institute for Archaeologists (IfA).

3.2 Stage 1 Geophysical Survey

3.2.1 The geophysics survey targeted two wreck sites in the study area. The target locations are listed in Error! Reference source not found. and illustrated in **Figure 1**. The target positions of the wreck sites used for the survey were ranked by priority based on desk based research prior to diving operations. Site 1 is based on a location provided by Canterbury Divers, who reported diving on a submarine near the United Kingdom Hydrographic Office (UKHO) position for the *Grazia* (UKHO 14086). Site 2 corresponds to the UKHO recorded position for the wreck of the *UC-21* (UKHO 14054).

3.2.2 Both Site 1 and Site 2s were located approximately 18km north-east of Margate in the outer Thames Estuary. These sites are approximately 1km apart with Site 1 to the north and Site 2 to the south.

3.2.3 The geophysical survey was carried out on 18 June 2014 aboard the Thames Towage vessel *Dockman*, skippered by Brian Allen. The survey was focused on determining

presence or absence of wrecks at Site 1 and Site 2 and consisted of prospection lines followed by further coverage focused on the location of the wreck once found.

Site	Latitude (WGS 84)	Longitude (WGS 84)	Easting (UTM 30N)	Northing (UTM 30N)
UC-6 / *UC-21* Priority1	51°30.725' N	1°34.660' E	401300	5707732
UC-6 / *UC-21* Priority 2	51°30.102' N	1°34.694' E	401317	5706577

Table 1: Geophysical priority search areas

3.2.4 The British Geological Survey (BGS) of the southern North Sea recorded the seabed in the vicinity of the sites as consisting of gravelly sand, and rare or absent sand waves although it is not far from the area of the Goodwin Sands to the south (Cameron *et al.*, 1992).

Geophysical Data – Technical Specifications

3.2.5 The survey involved the acquisition of sidescan sonar and marine magnetometer data.

3.2.6 A Klein 3900 high frequency (500/900 kHz) digital sidescan sonar was deployed off the port side using a crane to increase the distance from the survey vessel. Initial prospection lines were run at a 900kHZ frequency using a 100m range. Once a more accurate location for the target was found, the range was reduced to 50m. Lines were selected from a planned line spacing of 20m once the wreck location was identified, ensuring data were acquired in both directions on primarily north-south lines and cross lines running east-west. Data were recorded as .xtf files using Sonar Pro.

3.2.7 The magnetic data were acquired using a Geometrics G-882 caesium vapour marine magnetometer and Geometrics MagLog software. The equipment was deployed in tandem with the sidescan sonar off the port side of the vessel and manual layback was applied to the data during processing. Due to technical problems magnetic data was not obtained over Site 2.

3.2.8 Primary positioning was provided by Hemisphere Crescent VS100 GPS unit and navigation was performed using Hypack software. This allowed target positions to be entered and survey lines planned around them. For this survey all positions were recorded and expressed as WGS84 UTM31N. Laybacks were applied manually in Coda geosurvey and MagPick during processing.

3.2.9 The strong tides of the Thames Estuary and the relatively flat bottom of the survey vessel affected the ability to transverse the search areas in straight lines. While the layback of the towfish and the aforementioned issues were taken into account during processing, it hampered the accuracy of the geo-located image.

3.2.10 The data were assessed for quality and their suitability for archaeological purposes. Both the sidescan sonar data and the magnetometer data were rated as 'Good' in reference to the following criteria in Error! Reference source not found..

Data Quality	Description
Good	Data which are clear and unaffected by weather conditions or sea state. The dataset is suitable for the interpretation of standing and partially buried metal

	wrecks and their character and associated debris field. These data also provide the highest chance of identifying wooden wrecks and debris.
Average	Data which are affected by weather conditions and sea state to a slight or moderate degree. The dataset is suitable for the identification and partial interpretation of standing and partially buried metal wrecks, and the larger elements of their debris fields. Wooden wrecks may be visible in the data, but their identification as such is likely to be difficult.
Variable	This category contains datasets with the quality of individual lines ranging from good to average to below average. The dataset is suitable for the identification of standing and some partially buried metal wrecks. Detailed interpretation of the wrecks and debris field is likely to be problematic. Wooden wrecks are unlikely to be identified.

Table 2: Criteria for assigning data quality rating

Geophysical Data – Processing

Sidescan Sonar

3.2.11 The sidescan sonar data were processed by WA using Coda Geosurvey software. This allowed the data to be replayed with various gain settings in order to optimise the quality of the images. The data were initially scanned to give an understanding of the geological nature of the area and were then interpreted for any objects of possible anthropogenic origin. This involves creating a database of anomalies within Coda by tagging individual features of possible archaeological potential, recording their positions and dimensions, and acquiring an image of each anomaly for future reference.

3.2.12 A mosaic of the sidescan sonar data is produced during this process to assess the quality of the sonar towfish positioning. The survey lines are smoothed, and the navigation corrected with individual fixed laybacks as recorded in the survey logs. This allows the position of anomalies to be checked between different survey lines and for the layback values to be further refined if necessary.

3.2.13 The form, size and/or extent of an anomaly is a guide to its potential as an anthropogenic feature and therefore of archaeological interest. A single small but prominent anomaly may be part of a much more extensive feature that is largely buried. Similarly, a scatter of minor anomalies may define the edges of a buried but intact feature, or it may be all that remains as a result of past impacts from, for example, dredging or fishing.

Magnetometry

3.2.14 The magnetometer data were processed by WA using Geometrics MagPick software in order to identify any discrete magnetic contacts which could represent buried metallic debris or structures such as wrecks.

3.2.15 The software enables both visualisation of individual lines of data and gridding of data to produce a magnetic anomaly map. The data were first smoothed to try and eliminate the observed spiking. A trend was then fitted to the resulting data, and the trend values subtracted from the smoothed values. This was carried out in an attempt to remove natural variations in the data (such as diurnal variation in magnetic field strength and changes in geology). The processed data were then gridded to produce a map of magnetic anomalies, and individual anomalies tagged and images taken in a similar process to that undertaken for the sidescan sonar data.

3.2.16 A1 (anthropogenic origin of archaeological interest) and A2 (uncertain origin of possible archaeological interest) sidescan sonar anomalies identified during this survey are shown in **Figure 1**

3.2.17 The magnetometer equipment ceased to function and therefore it was not possible to complete a survey of the southern search point.

Geophysical Data – Anomaly Grouping and Discrimination

3.2.18 The previous section describes the initial interpretation of all available geophysical data sets. This inevitably leads to the possibility of any one object being the cause of numerous anomalies in different data sets and apparently overstating the number of archaeological features around the wreck sites.

3.2.19 To address this fact, the anomalies were grouped together, allowing one ID number to be assigned to a single object for which there may be, for example, a magnetic response and multiple sidescan sonar anomalies.

3.2.20 Once all the geophysical anomalies have been grouped, a discrimination flag is added to the record in order to discriminate against those which are not thought to be of an archaeological concern. These flags are ascribed as follows:

Non-Archaeological	U1	Not of anthropogenic origin
	U2	Known non-archaeological feature
	U3	Non-archaeological hazard
Archaeological	A1	Anthropogenic origin of archaeological interest
	A2	Uncertain origin of possible archaeological interest
	A3	Historic record of possible archaeological interest with no corresponding geophysical anomaly

Table 3: Criteria for discriminating archaeological importance of features

3.2.21 All the features that have been identified from around the wreck sites are presented in **Appendix I** and discussed in this report.

3.2.22 The grouping and discrimination of information at this stage is based on all available information and is not definitive. It allows for all features thought to be of archaeological interest to be highlighted, while retaining all the information produced during the course of the geophysical interpretation for further evaluation should more information become available.

3.3 Stage 2 Diving Survey

3.3.1 The diving technique selected was free-swimming buddy-pair SCUBA with through-water communications and twinset diving cylinders, plus a bailout. Depth did not necessitate the use of gas mixtures other than air and all diving was carried out within no-decompression limits.

3.3.2 The diving operation complied with the Diving at Work Regulations 1997 and the HSE Scientific and Archaeological Diving Projects Approved Code of Practice. The diving operation was undertaken in daylight hours only.

3.3.3 Strong tidal currents run through the Thames Estuary due to the confluence of multiple divergent sources. Slack water is never achieved although, during a period of 1-2 hours

around low water, reduced currents of under 1 knot can be expected. During this short window, it is possible to enact safe diving operations.

3.3.4 MV *Dockman*, a 14m MCA coded work boat, was used as the diving support vessel and loading and unloading took place at Ramsgate Royal Marina which is approximately 1.5 hours transit from the dive site. The vessel operators provided logistical support in the form of making alterations to the vessel for safer diving operations and the use of a RHIB as a tender to the main vessel.

3.3.5 The survey methods employed on site consisted of general and close visual inspection with integrated on-site recording, acoustic tracking and video survey. The video system consisted of a Sony RX100 camera and a housed mask-mounted GoPro Hero 3 HD video camera.

3.3.6 The survey concentrated on the Site 1 wreck (WA **7000**), the northern search point.

3.3.7 Positions for all environmental and archaeological features and dive events recorded during the survey and navigational tracking information for the divers were generated using a Sonardyne Scout USBL acoustic positioning system (internal instruments) and a Hemisphere R101 dGPS system, linked to the DIVA database. An omni-directional transponder beacon was attached to one of the buddy-pair divers. The Scout system was selected because it is optimised for shallow water conditions. The position of the diver generated by Scout was displayed against GIS layers of the bathymetric and SSS data and the anomaly positions, enabling the dive supervisor to provide navigational corrections and ensuring that anomaly positions were fully searched. Diver orientation and navigation were also assisted by use of compasses and ground lines.

3.3.8 Diver and surface descriptions of archaeological features, operational actions and environmental features were recorded using a proprietary MS Access database called 'DIVA', linked to ArcView 9.3 GIS. DIVA uses a system of 'observation points' to record survey data. The DIVA system was also used to generate daily operational logs, which were sent to EH.

Existing Data

3.3.9 Data received from EH with the brief included Cotswold Archaeology's draft report on U-boats (Cotswold Archaeology, forthcoming); Ships and Boats 1914-1938 (Wessex Archaeology 2011); East Coast War Channels report (Firth 2014) and the NRHE monument report for *UC-6* (901536). NRHE reports 1569775 and 904788 for *UC-21* were also obtained along with UKHO records and HM Receiver of Wreck (RoW) records have been requested but not yet received.

3.3.10 Data from Stage 1 was available for the Stage 2 fieldwork.

3.3.11 There are several records relating to this wreck in the NRHE. There is a loss record for *UC-6* (Monument number 901536) and two records relating to *UC-21*: the wreck event (Monument number 1569775) and the reported wreck location (Monument number 904788).

3.3.12 The U-boat minelayer site had been previously dived by a member of Canterbury Divers who provided the northern search point for the wreck and this coincided with UKHO obstruction record 14086 which had been previously identified as the wreck of the 120m Italian cargo ship SS *Grazia* sunk in November 1939 by a mine strike.

3.3.13 Deutsches U-boot Museum provided plans of UC I-type, which is the design of *UC-6*, and UC II-type, the design of *UC-21*.

3.3.14 The National Archives were also consulted for details and plans of the two U-boat types and details of German mine laying operations.

3.3.15 Historical photographs of UC I and UC II types were consulted from online sources and dive guides provided further useful information.

3.3.16 Numerous secondary sources were consulted for their information about First World War (FWW) U-boats and their mine laying operations.

4 RESULTS

The results reported are for both stages incorporating the geophysical and diving surveys are as follows:

4.1 Summary of Progress Against Objectives

Primary Objectives	Progress
Contact the Receiver of Wreck to gain a list of droits relating to the site.	Awaiting response. The Receiver of Wreck was contacted post fieldwork. However no droits have been received at the time of writing.
Undertake a diver survey of the site	Not achieved. The U-boat was located by divers but an on-site incident curtailed any detailed archaeological investigations by divers. However, visual records and information have been gathered from local dive club Canterbury Divers.
Locate any additional material	Partly achieved. Minimal time was spent on the wreck site and therefore no time was devoted to additional material in the diving investigations. However, detailed SSS images of the wreck on the southern search point have been gathered. See **Figures 2 and 3.**
Produce a structured record of field observations	Partly achieved, using the DIVA recording system and video photography from external sources. See archive, images and appendices.
Review the site against the non-statutory criteria for scheduling under the Ancient Monuments and Archaeological Areas Act 1979.	Achieved. See section 7.
Secondary Objectives	**Progress**
Assess the likely depth of deposit	Partly achieved. Using SSS data and historic U-boat plans, the likely depth of deposit has been calculated.
Record profiles across the site	Not achieved. Minimal time spent on wreck site made this task impossible to achieve in the allocated time.

Liaise with BSAC 326 and offer them participation in Stage 2.	Achieved. See below generally.

Table 4: Progress Against Objectives

4.2 Seabed Features Assessment

4.2.1 A total of three anomalies were observed across the two survey areas (Table **5**). A wreck was observed at the Site 1, while at Site 2 both a wreck and a seafloor disturbance were observed.

Archaeological Discrimination	Number of Anomalies	Interpretation
A1	2	Anthropogenic origin of archaeological interest
A2	1	Uncertain origin of possible archaeological interest
A3	0	Historic record of possible archaeological interest with no corresponding geophysical anomaly
Total	**3**	

Table 5: Discrimination of the anomalies identified within the survey area

4.2.2 The individual features identified in the geophysical survey are discussed below, and listed in **Appendix I** and illustrated in **Figures 2** and **3**.

Classification	Number of Anomalies
Wreck	2
Seafloor Disturbance	1
Total	3

Table 6: Classification of the anomalies identified within the survey area

4.2.3 Wreck **7000** was observed approximately 50m south of the Site 1 target position (**Figure 2**). It appears to be a submarine orientated approximately north to south and resting mostly on its keel although possibly listing to the west. The wreck measures approximately 24.2m long, is 7.6m at its widest including the conning tower, has a hull diameter of approximately 2.5 m and reaches a height of 3.9m above the seabed. It has an associated magnetic response of 1522nT.

4.2.4 **7000** lies in an area of sandy seabed, is possibly partially buried at its northern end and may have an associated scour at its southern end. A feature consistent with a conning tower is visible near the centre, approximately 10m from the north end, and is also visible in the sidescan sonar shadow. Round, regularly spaced features can be identified along the length of the hull approximately in line with the conning tower. These features are more easily identifiable on the wreck's southern end but may also be present north of the conning tower. It is not possible to determine what these features are from the data. They may be hatches but this would require diver investigation to confirm.

4.2.5 This wreck is very likely to be a submarine. However, its identity cannot be confirmed without further investigation, including diver survey. The observed length is less than both

the 34m of the *UC-6* and the 49.35m of the *UC-21*. This may be due to a combination of burial and damage suffered when it sank.

4.2.6 Wreck **7001** coincides with the UKHO position for *UC-21* at the Site 2 location although it does not appear to be a submarine (**Figure 3**). **7001** measures 44.2m long, 7.1m wide and 2.8m high. This is a broken up wreck with visible internal structure, including at least 12 parallel linear anomalies spaced at 1m intervals which may be ribs. The wreck lies in an approximately south-west to north-east orientation in an area of sandy seabed, and may be partially buried.

4.2.7 Although the dimensions do not preclude it from being the *UC-21* the remains appear more likely to be those of a ship than a submarine. It is possible that it could be the wreck of the *SS Grazia*, however further inspection would be required to confirm that it is a ship rather than a submarine and diver survey would be needed to try and establish the actual identity of the vessel.

4.2.8 **7002** was observed approximately 58m north-east of **7001** and has been interpreted as a seabed disturbance measuring 5.5m long, 0.9m wide and 0.2m high. This may be the result a partially buried object with possible nearby scour, perhaps debris associated with wreck **7001**.

4.3 Data Audit

4.3.1 A limited audit of existing primary and secondary sources has been undertaken in order to inform BULSI (Build; Use; Loss; Survival; Investigation) characterisation (see **section 5.4**) and interpretation generally. Technical specifications of the U-boats *UC-6* and *UC-21* and their operations are quite well known through primary and secondary sources up until the loss of these vessels, where there is either multiple reasons for the loss (*UC-6*) or minimal information (*UC-21*). It is necessary to examine the available documentary evidence from the perspective of BULSI, as this is directly relevant to the identification and interpretation of archaeological material.

4.3.2 The NRHE records for monuments no 901536, 904788 and 1569775 were accessed through Pastscape in June 2014. 901536 is the record of loss of *UC-6* while 1569775 is the record of loss for *UC-21* and 904788 gives an account of the *UC-21* wrecking event. These three records are cross referenced within Pastscape as it has been acknowledged that there is confusion about the location and nature of the wrecking of these two U-Boats.

4.3.3 The UKHO has two records that are relevant to this investigation. UKHO 14054 is attributed to *UC-21* although it is acknowledged as only a possible identification of the obstruction recorded at that location. The UKHO records that the wreck of *UC-21* boat was located south of Knock Deep in 17m of water, a 20m long obstruction that was netted with a low magnetic signature. It was acknowledged that this could possibly be *UC-6*. UKHO 14086 is the reported location of what might possibly be the SS *Grazia*, a 120m Italian steamer built in 1923 that sank after striking a mine in 1939. However in 1984 the UKHO records that the obstruction is too small to be the *Grazia*. Both these UKHO records positively state that there is a wreck at those locations; however, the identity of the wrecks are only tentatively given.

4.3.4 Canterbury Divers had previously dived a U-boat minelayer in the area off Knock Deep and one of their members, Gerry Dowd, reported that a mine was protruding from one of the hatches. The coordinates for this U-boat wreck coincide with the Site 1 location and UKHO record 14086.

4.3.5 Primary sources from both the British and German sides contain operational information for *UC-6* and *UC-21* as well as technical details for their U-boat design, *UC-6* was UC I-type and *UC-21* was UC II-type.

4.3.6 British Admiralty archives have written histories of the movements of both *UC-6* and *UC-21* including their date, method and approximate location of loss (ADM 137/3918). There is also an Admiralty publication to aid in the identification of German U-boats (ADM 186/407). While this book was produced after *UC-6* and *UC-21* were lost it does include detailed structural and technical descriptions, images and plans of U-boats of the same designs as these vessels. Translations of German histories detailing their mine laying operations 1915-1918 were located in the National Archives at Kew and provided useful information about the Flanders Flotilla. Unfortunately, the German publication stopped at January 1917 and the remaining months' information was researched by Historical Section of the British Navy (ADM186/629).

4.3.7 Photographs of type UC I and UC II were viewed from the Bundesarchiv online catalogue for reference to key characteristics of the two submarine designs (http://www.bundesarchiv.de/index.html.de).

4.3.8 While German written archives have not been directly accessed for this research, credible summaries of this information have been accessed through the publication *Verschollen* (Messimer 2002) and Deutsches U-boot Museum. The Deutsches U-Boat Museum provided copies of their archive relating to *UC-6* and *UC-21* which consisted of: plans of U-Boat Types UC I and UC II, an assortment of records relating to *UC-6* and *UC-21*, excerpt of a document about the construction of submarines in German shipyards, a casualty list and photos of *UC-6* and *UC-21*. While most of the text was in German, Jens Neuberger, a native German speaking WA staff member, provided translations of relevant archives.

4.3.9 *Verschollen: World War One U-boat Losses* (Messimer 2002) is a well researched book that gives detailed individual accounts of all U-boats lost in the FWW including *UC-6* and *UC-21*. The author had access to American microfilms of the German Navy archives and completed his own translations which were used in conjunction with other reputable secondary sources. References to primary and secondary sources are given for each vessel.

4.3.10 *The U-Boat* (Rossler 2001) is widely acknowledged as the foremost publication on the technical history of U-boats. Construction specifications of the UC I-type (*UC-6*) and UC II-type (*UC-21*) are given in this book along with boat plans.

4.3.11 Details of all vessels sunk by *UC-6* are given in *Silent Warriors* (Young and Armstrong 2006) as well as technical specifications of the U-boat and a description of the wreck remains. Despite having an eye witness account of the wreck, the authors seem unclear to its exact location giving three separate sets of coordinates.

4.4 Site Position

4.4.1 The site investigated is in the Thames Estuary, 5 nautical miles south east of Knock Deep and 9 nautical miles north east of North Foreland. The U-boat is lying with its bow to the south-south-west and stern towards north-north-east. The position given below is the southern point of the wreck site WA ID **7000**.

Lat	51° 30.6998' N	**Easting**	401310

Long	01° 34.6692' E	**Northing**	5707685
WGS84 Lat/Long		WGS84 UTM 31N	

Table 7: Site co-ordinates

4.5 Operational Summary

4.5.1 As the SSS images from Stage 1 clearly demonstrated that Site 1 to the north was a submarine (WA ID **7000**) and Site 2 0.6 nautical miles to the south was more likely to be a shipwreck (WA ID **7001**), the diving operations were focussed on the northern site.

4.5.2 In order to structure the survey and facilitate diver navigation, distinctive features of the two U-boat types were compiled (**Table 8**). This information, along with illustrations, was turned into reference sheets for surface crew and divers. Laminated sheets of key features were prepared for study on the surface with a summary table that could be attached to a slate for underwater reference (**Appendix IV**). It was decided that WA divers were to focus on the bow features and Canterbury Divers to locate the propellers if possible. Visibility was predicted to be 1-2m so the primary search technique was therefore visual search.

Characteristics	***UC-6***	***UC-21***
Length	34m	52.7m
Beam	3.15m	5.2m
Depth	3m	3.5m
Displacement	183 tons	493-511 tons
Hull type	Steel single hull	Steel double hull
Bow	Rounded bow that blends into superstructure in a streamlined manner	High bow with net cutter on top and conspicuous dip where gun is located before the conning tower. Many earlier ones had rounded 'whale' bow but some have had a 'ship' bow put on
Superstructure	Top edge of superstructure forms near straight edge from bow to stern	Horizontal along the bow then slopes down as it approaches the conning tower. Aft of the conning tower it runs parallel to the waterline for a section and then slopes down into the water
Hatches	Two hatches: one in the conning tower and one aft leading to crew quarters	Three hatches: one in the conning tower, one in between the conning tower and mine room and one aft of the conning tower leading to engine room
Ballast tanks	No external tanks	Seven external ballast tanks
Conning tower	Circular in section and 1.3m (4.25') diameter	Circular in section and 1.4m (4.5') diameter and 1.8m (6') high
Periscopes	One	Three

Propeller	A three bladed bronze propeller 1.8m (3'3") diameter with pitch 0.43m (1'5")	Two of manganese bronze, approx 1.9m (4'3") diameter with pitch 0.9m (3')
Anchor	Mushroom anchor of 136kg (300 lbs (3 cwt))	Mushroom anchor in bow weighing 272kg (600lbs)
Mines	Twelve	Eighteen
Guns	A machine gun	One machine gun and one 22 pounder
Torpedoes	None	Five
Torpedo tubes	None	Three 0.5m (19.7") torpedo tubes. 2 external tubes one internal tube
Loss	Mined by net barrage or bombed by seaplane	Disappeared

Table 8: Comparison of features of *UC-6* and *UC-21*

4.5.3 Key features of the wreck were to be documented by measured and still photographic recording using a housed Sony RX100 camera and a housed mask-mounted GoPro Hero 3 HD video camera. However SD card error made the footage of Dive 3 and 4 unreadable and the in-water incident prevented any footage of use or consequence from being obtained. Video footage from Canterbury Divers was extensive but due to the close framing, sediment scatter by torchlight and lack of archaeological training, this footage is of limited use.

4.5.4 Diving operations were scheduled to coincide with neap tides. A total of 4 dives were undertaken near the site of 7000, with a total in-water time of 37 minutes (**Appendix II**). The first dive was aborted before the divers left the surface due to strong currents and the second dive was aborted due to diver mask issues.

4.5.5 For the third dive, a shot was deployed near the Site 1 search point. Unfortunately by the time the divers descended the shot it had been pulled several meters south by the current. Therefore, the WA divers were directed to swim north and then east to locate the U-boat in the area indicated by the geo-referenced SSS image. By the time the divers had reached the end of their 50m reel, the U-boat had still not been located. Previous advice from the geophysicist had suggested the wreck maybe further south and therefore the divers were directed to begin a southerly circle search for the wreck. After completing approximately a quadrant search the divers were recalled to the surface without finding the U-boat. Two members of Canterbury Divers also searched a similar area without finding the U-boat.

4.5.6 Further processing of the SSS data, taking into account the layback, repositioned the geo-referenced SSS image to a location 45m south of the Site 1 point.

4.5.7 An echo sounder survey to the south of Site 1 confirmed this new location and informed the shot placement for the fourth dive. Once again, the current hampered diving activities by pushing the DSV away from the shot. Divers were therefore required to swim along a line from the DSV to the shot before descending into water where less surface current was experienced. Once on the seabed, the two WA divers were quickly able to locate the U-boat which was approximately 5m west of the shot. Diver 1 reported this successful identification and three Canterbury Divers entered the water to assist with the investigation. Diver 1 reported that he was on the stern of the U-boat as he had observed

a vertical section of wreck resembling a rudder (however this was later proved to be the bow). The divers were continuing the search north towards the conning tower when an incident took place that required WA diving operations to cease.

4.5.8 The three members of Canterbury Divers were unaware of the incident and continued on with their dive spending approximately 35 minutes examining and filming the U-boat. Some of this footage has been made available to WA for research.

4.5.9 The extent of the area searched is indicated in **Figure 4** which incorporates the points generated by the USBL system for the diver being tracked with the average underwater visibility at 1-2m.

4.5.10 Due to the diving incident investigation and a subsequent technical issue with the DSV, all subsequent diving was cancelled.

4.5.11 Despite Wessex Archaeology divers spending limited time on the submarine site, archaeological data concerning the wreck has been gathered from the geophysical survey, comparison with U-boat plans and information shared by several members of Canterbury Divers who had dived on the wreck during these investigations and also on a previous occasion. In particular, Rob Harrison, who took extensive footage of the submarine, carefully went through his video with Wessex staff and described the features of the submarine that were shown on the screen.

4.6 Seabed and Ecology

4.6.1 The U-boat is recorded as sitting on a gravelly sand seafloor with a sand wave covering the stern of the vessel.

4.6.2 An ecological assessment was not an objective of the fieldwork however observations were made and recorded by the divers. The U-boat is thickly covered in a marine turf including plumose anemones, soft corals and sponges. Several lobsters were observed in hatches and holes.

4.7 Archaeological Data

4.7.1 The submarine is positioned with the bow facing south-south-west and the stern north-north-east. 24.2m of the wreck is visible with approximately 13m of bow extant (i.e. forward of the conning tower). Four of the mine tubes appear to be present and there is the possibility that the remaining two were destroyed during the wrecking process. The conning tower is visible but the outer casing is not present. The stern appears to be buried in a sand wave and there is the possibility that the propeller may be preserved in the seabed.

5 DISCUSSION

5.1 Type and Size of Site

5.1.1 Using geophysical data and observations from WA divers and members of Canterbury Divers it is possible to say that wreck site **7000** is a small discrete site with no visible wreck debris surrounding the mostly intact U-boat hull. The wreck measures approximately 24.2m long, is 7.6m at its widest including the conning tower, has a hull diameter of approximately 2.5 m and reaches a height of 3.9m.

5.1.2 Due to the wreck's strong magnetic signature, it is not possible to discern whether there is any extraneous metal debris either buried or protruding from the sandy seabed however SSS and diver investigations did not identify any such wreck remains.

5.1.3 The SSS image clearly shows that this wreck is a submarine and this has been confirmed by divers from Wessex Archaeology and Canterbury Divers.

5.1.4 Historical information about the location of submarines during the FWW and comparison of the SSS image to plans of type UC I and UC II suggest that this is a FWW German mine laying submarine and due to the extant dimensions, it is most likely *UC-6*.

5.2 Identification

5.2.1 The SSS image shows that wreck **7000** is a submarine and not a 120m long steamer as is reported by the UKHO in this location. While it is not possible at this point to definitively conclude that the wreck is a particular U-boat, the evidence suggests that it is most likely to be *UC-6* rather than *UC-21*.

5.2.2 24.2m of the U-boat is visible on the seabed with the possibility that a sand wave has buried part of the northern (stern) section of the wreck. It also has not yet been established whether the bow is intact or whether some has been fragmented due to damage sustained during sinking or later collapse. There is a modern diver's report that the first two minelayer hatches were blown off during the wrecking process (Messimer pers. comm., 11.07.2014). It is also most likely that only the internal pressure hull section of the conning tower remains, based on SSS images, diver reports and video footage. Another distinctive feature of the wreck remains are the mine chute openings. The SSS image clearly shows that four mine chute hatches are visible on the deck of the U-boat with the possibility that the other two might be present. Finally, there is a small protrusion aft of the conning tower that may correspond with the aft access hatch, a feature on both U-boat types.

5.2.3 Measurements of the wreck remains taken from the SSS image compared to those from plans of the design types of *UC-6* (UC I-type) and *UC-21* (UC II-type) (**Figures 5 and 6**) show the similarities between the wreck remains and the smaller *UC-6* vessel. The remains of the U-boat on the seabed are only 24.2m of the entire vessel. The *UC-6* had a length overall of 34m while *UC-21* was 52m. From the front of the internal conning tower to the front of the visible mine hatch area on the wreck measures approximately 12m. If, as it has been suggested, the front two hatches are no longer extant, this would almost exactly match the same dimensions of *UC-6* which is 14.2m as opposed to *UC-21*'s 16.5m. The measurement from the front of the internal conning tower to the aft end of the mine hatches is 5.6m on the wreck remains, 5.7m on the UC I-type plans and 7.1m on the UC II-type plans. A final measurement that suggests the wreck is *UC-6* is the distance between the aft side of the internal conning tower and the aft access hatch. On the wreck this distance is approximately 2.5m, on the UC I-type plan it is 3.4m and on the UC II-type plan it is 9.2m.

5.2.4 The geophysical survey data demonstrated that UKHO 14054 is not a submarine, and is mostly likely to be the SS *Grazia* while UKHO 14086 most definitely resembles a submarine on the side scan sonar. The coordinates also correlate with those given by Canterbury Divers as the location of the U-boat on which they have previously dived. Young and Armstrong also back up this identification (2006: 243). This site is 0.6 nautical miles north of the UKHO's recorded position for the U-boat.

5.2.5 Historical information about the last known locations of the *UC-6* and *UC-21* also support the identification of this wreck as the *UC-6*. There are several variations on the last known position of the *UC-6* but all state that it was wrecked off Kentish Knock which is within the area of the wreck WA ID **7000**. Admiralty records state that it was sunk on 28 September

1917 while other sources state 27 September 1917 (ADM 137/3918). Some sources state that *UC-6* fell foul of mine nets, while others claim a sea plane bombed the U-boat.

5.2.6 As yet, it has not been established how the wreck off Kentish Knock came to be identified as *UC-21* (UKHO 14054). The Admiralty records that the *UC-21* was sunk by mine nets at the location given but it does not give details of how this conclusion was reached (ADM 137/3918). It is known that no contemporary divers investigated the wreck and no positive identification was made by eyewitnesses.

5.2.7 It is unlikely that the *UC-21* was ever in the area of Kentish Knock as the operating area of the vessel was the west coast of France. On the vessel's last mission it was scheduled to lay mines off Belle Ile on the west coast of France before going to the Bay of Biscay (Spindler 1932: 314-5). UC II-type vessels usually had a two-week operational endurance. *UC-21* departed Zeebrugge on 13th September and by 27th September it was coming to the end of its patrol. The maximum fuel capacity for this vessel theoretically allowed for 9,430 nautical miles on the surface at the standard cruising speed of 7 knots (Messimer pers comm., 11.07.2014). Zeebrugge to the Bay of Biscay is approximately 700 nautical miles so a return trip with a slight detour to the Thames Estuary would be within the capability of this vessel. However, military personnel are predisposed to abide by their orders and changing the area of operation from the Bay of Biscay to over 300 nautical miles away to the Thames Estuary would be considered unlikely and no variation of orders has been located. There is a chance that the U-boat may have been chased there by surface ships or to avoid other anti-submarine tactics. However, this was one of the most heavily mined and fortified areas so it would not have made sense to be there.

5.2.8 Recent research suggests that the last known position of the *UC-21* was on 16th September 1917 when it sank the American sailing vessel *Ann J. Trainer* off Brest (Michael Lowery pers. comm., 14.7.2014 and http://uboat.net/wwi/ships_hit/322.html). The crew were saved before the cargo vessel was scuttled and it is surmised that they provided the positive identification for the *UC-21*. However, recently updated records may put the loss of HMS *St Dunstan*, a dredger *en route* for Pembroke, down to a mine laid by *UC-21* off Chesil Beach (http://www.uboat.net/wwi/boats/successes/uc21.html). Although it is possible the mine may have been laid by *UC-21* on the route out, it may equally have been laid on its return leg, and this casts some uncertainty on *UC-21*'s final resting place.

5.2.9 On balance, *UC-21*'s known area of operation was over 300 nautical miles away and Kentish Knock would have been a small detour for the vessel and the only historical reference to it being lost in this area comes from British Admiralty archives. Therefore it is considered unlikely that the *UC-21* was in the vicinity of Kentish Knock when it sank.

5.3 Overall Characterisation

5.3.1 The overall character of the exposed material on the seabed can be summarised as follows, using the Build/Use/Loss/Survival/Investigation (BULSI) method of 'shipwreck biography'. Details of both *UC-6* and *UC-21* are given below.

Build	*UC-6* is a UC I-type U-boat. It was one of 10 built by the private yard AG Vulcan as a new type of short range coastal minelayer that could be built in 5 or 6 months and transported by rail from the shipyards in Hamburg to the coastal port in Flanders (Rossler 2001: 44). The *UC-6* was 34m length overall, a draught of 3m with an overall height of 6.3m and a beam of 3.15m to comply with the gauge of

	the railway which transported them in pieces to the coast (Young 2006: 234 and Rossler 2001: 40). It had a single hull and a single bronze propeller and was powered by a 90hp Daimler diesel engine with a Siemens-Schuckert 175 hp electric motor. Its armament was 12 UC/120 mines in six vertically oriented chutes in the bow of the vessel with a machine gun and rifles for surface use (Rossler 2001: 44). The *UC-6* was commissioned on 24 June 1915 and assigned to the Flanders Flotilla on 31st July 1915 (Young 2006: 234). In its approximately two year history, this U-boat completed 89 minelaying patrols of two or three days' duration. Its minelaying operations were successful in sinking 54 ships, damaging eight, sinking one warship and damaging another. Young lists all 54 vessels that were sunk by *UC-6* and they are listed and mapped on the uboat.net website (2006: 34-40 and http://www.uboat.net/wwi/boats/successes/*UC-6*.html). All vessels that fell foul of *UC-6*'s mines were wrecked off the east coast of England stretching from Great Yarmouth in the north to Folkestone in the south and with two vessels wrecked off Dunkirk. U-boats were the ideal minelayers as they could accomplish their mission without the knowledge of the enemy until their vessels came into contact with these mines. The Russian submarine *Krab* was the first purpose built mine laying submarine. The *Krab* was ordered in 1908 but not commissioned until 1915 by which time Germany had caught up and launched two of its own minelaying U-boats (Kemp 1999: 91). The German UC I-type was the first successful U-boat minelayer. UC-1-15 were small vessels with twelve UC/120-type contact mines in six free flooding chutes in the forward section of the pressure hull. The mines were released from the U-boat and a soluble plug kept the mine attached to its sinker for half an hour, giving the U-boat time to vacate the area, before rising to the surface. Unfortunately the solubility of the plugs was variable and so seven minelayers were sunk by their own mines: *UC-2*, *UC-12*, *UC-32*, *UC-41*, *UC-42*, *UC-68*, *UC-76* (Messimer 2002). *UC-21* was a UC II-type vessel, an improved and larger version of the earlier minelayer type. Built by Blohm and Voss in Hamburg, it was ordered on 29 August 1915 and commissioned on 12 September 1916 (http://www.uboat.net/wwi/boats/index.html?boat=UC+21). The UC II type had two propellers for greater reliability and a double hull for improved stability. The increased size meant that it was no longer possible to transport the vessels by train but this also lifted the beam restriction for railway gauge size. Saddle tanks were fitted to allow for the greater surface transit times and these vessels also had increased surface speed and range. *UC-21* was 52m length overall, 3.5m draught and 5.2m beam (ADM 186/407:28-29). The U-boat was powered by two 6-cylinder diesel engines of 500 hp and had two Siemens-Schuckert electric motors of 460 hp. The vessel was armed with 18 UC/200 mines in six chutes forward of the conning tower along with two external,

	forward torpedo tubes and one internal stern torpedo tube with 5 torpedoes (Rossler 2001: 50-53). For surface use, there was a 22 pounder gun in a well forward of the conning tower and a machine gun.
Use	The small UC I-type U-boats were mainly deployed in the North Sea, Thames Estuary and English Channel which were within the 1,650 nautical mile capability from their bases in Zeebrugge and Ostende (Kemp 1999: 92). This meant that they could quickly achieve their goal of laying mines with superior accuracy without spending long periods at sea. *UC-6* was assigned to the Flanders Flotilla on 31 July 1915. From that day until the U-boat disappeared, 89 patrols of two or three days were completed out of Zeebrugge. The mines laid by *UC-6* were responsible for sinking at least 54 known vessels and damaging 7. These are listed below as taken from Young and Armstrong (2000:241-243).

Area	Vessel	Flag	Tons	Date	Location
North Sea	*Worsley*	GBR	309	14/08/1915	Mined off Aldeburgh
North Sea	*Japan*	GBR	205	16/08/1915	Mined off the Shipwash Light vessel
English Channel	*Disa*	SWE	788	25/08/1915	Mined 5-6 miles N by E of Shipwash Light Vessel
North Sea	*Dane*	GBR	265	28/08/1915	Mined off Aldeburgh
North Sea	*Sir William Stephenson*	GBR	1540	17/06/1917	Mined at the entrance to Yarmouth
English Channel	*Africa*	GBR	1038	16/09/1915	Mined 2.5 miles off Deal
English Channel	*Lydian*	GBR	244	18/09/1915	Mined off South Foreland
English Channel	*San Zeferino*	GBR	6430	18/08/1915	Mined and damaged 2 miles NNW of South Goodwin L/V.
North Sea	*Horden*	GBR	1434	20/09/1915	Mined ½ mile E of Aldeburgh Napes Buoy
North Sea	*Groningen*	GBR	988	23/09/1915	Mined 1.5miles N by E of Sunk Head Buoy
English Channel	*Great Heart*	GBR	78	24/09/1915	Mined E of South Goodwin L/V
English Channel	*Nigeria*	GBR	3187	27/09/1915	Mined and damaged near S Goodwin L/V
North Sea	*Aleppo*	GBR	3870	18/10/1915	Mined and damaged 1/5 miles E of Sunk Head buoy
North Sea	*Salerno*	NQR	2431	18/10/1915	Mined 2 miles ESE of Sunk Head buoy
North Sea	*Monitoria*	GBR	1904	21/10/1915	Mined at mouth of River Thames
English Channel	*Aries*	GBR	268	31/10/1915	Mined off Leathercoat
English Channel	*Eidsira*	NOR	1092	31/10/1915	Mined 2 miles SW of South Foreland
English Channel	*Othello II*	GBR	206	31/10/1915	Mined off Leathercoat
English Channel	*Toward*	GBR	1245	31/10/1915	Mined off South Foreland
North Sea	*Friargate*	GBR	264	03/11/1915	Mined 4 miles E of Oxfordness
English Channel	*Moorside*	GBR	311	12/11/1915	Mined off Boulogne

	English Channel	*Nigel*	GBR	1392	12/11/1915	12 miles NNW of Les Hanois lighthouse
	English Channel	*Traquair*	GBR	1067	12/01/1916	Mined 1 mile SW of Admiralty Pier, Dover
	English Channel	*Leicestere*	GBR	1002	12/02/1916	Mined 2.5 miles SE by E of Folkestone Pier
	English Channel	*Carlton*	GBR	267	21/02/1916	Mined off Folkestone
	North Sea	*Trignac*	FRA	2375	24/02/1916	Mined 7 miles W of Outer Dowsing L/V
	English Channel	*Empress of Fort William*	GBR	2181	27/02/1916	Mined 2 miles S of Dover Pier
	English Channel	*Maloja*	GBR	12431	27/02/1916	Mined 2 miles SW of Dover Pier
	English Channel	*Anjelus*	GBR	304	28/02/1916	Mined off Dover
	English Channel	*Weigelia*	GBR	262	28/02/1916	Mined off Dover
	English Channel	*Flicker*	GBR	192	04/03/1916	Mined off Dover
	English Channel	*Corona*	GBR	212	23/03/1916	Mined near Ramsgate
	English Channel	*Sea Serpent*	GBR	902	23/02/1916	Mined off Folkestone Pier
	English Channel	*Christianss und*	DAN	1017	24/03/1916	Mined 3 miles SW of Folkestone
	English Channel	*Saint Cecilia*	GBR	4411	26/04/1916	Mined 4 miles off Folkestone
	North Seal	*Lavinia Westoll*	GBR	3131	28/03/1916	Mined 33 miles SW by S of Spurn L/V
	English Channel	*Halcyon*	GBR	1319	07/04/1916	Mined 3.5 miles SW by S of Folkestone Pier
	English Channel	*Shenandoa h*	GBR	3886	14/04/1916	Mined 1.5milesW of Folkestone Gate
	English Channel	*Estafette*	FRA	267	21/04/1916	Mined Dunkerque Roads
	English Channel	*Saint Corentin*	FRA	216	29/04/1916	Mined 900m off Dunkerque harbour
	North Sea	*Batavier V*	NLD	1562	16/05/1916	Mined 0.5miles E of North Buoy, Inner Gabbard
	North Sea	*Volharding*	BEL	1000	25/05/1916	Sunk by explosives N of Noord Hinder Light vessel
	North Sea	*Excellenz Mehner*	NOR	646	01/06/1916	Mined 5 miles SSW of Winterton
	North Sea	*Kaphreda*	GBR	245	08/06/1916	Mined near Gorton Light vessel
	English Channel	*Saint Jaques*	FRA	72	19/06/1916	Mined off Le Havre
	North Sea	*Otis Tarda*	NLD	759	25106/1916	Mined
	North Sea	*Burma*	GBR	724	23/06/1916	Mined 15 miles E of Shipwash light.
	North Sea	*Waalstroom*	NLD	1441	27/06/1916	Mined 4 miles NW of Shipwash light V.
	North Sea	*Hirose*	GBR	275	29/06/1916	Mined off Aldeburgh Napes
	North Sea	*Gannet*	GBR	1127	07/07/1916	Mined 5 miles ENE of Shipwash light vessel
	North Sea	*Kara*	GBR	2338	10/07/1916	Mined near Pakefield Gat Buoy
	North Sea	*Mascotte*	GBR	1097	03/09/1916	Mined 6-5 miles SE of Southwold
	English Channel	*Girl Eva*	GBR	76	30/09/1916	Mined near Elbow Buoy
	North Sea	*Lonada*	GBR	1286	29/12/1916	Mined 5 miles N by E 0.5 E Shipwash Light vessel
	North Sea	*Ludlow*	GBR	810	29/12/1916	Mined off Shipwash light vessel

English Channel	*Ashtabula*	GBR	7025	22/02/1917	Mined and damaged near Elbow Buoy
North Sea	*Forward III*	GBR	89	31/03/1917	Mined S of Shipwash light vessel
English Channel	*Lumia*	GBR	5856	19/04/1917	Mined and damaged about 3 miles N of Elbow Buoy
English Channel	*Waterville*	GBR	1968	12/05/1917	Mined and damaged near Elbow Buoy
North Sea	*Roald Amundsen*	NOR	4390	16/06/1917	Mined and damaged 3 miles W of Tongue light vessel
North Sea	*Dorte Jensen*	DAN	2086	18/06/1917	Mined near Tongue Sand light vessel.

As the war progressed, the United Kingdom improved their anti-U-boat warfare measures which included counter minelaying and net barrages, particularly across the Dover Straits which is where *UC-6* may have encountered a net barrage (Kemp 1999: 92). Despite this, the Germans built another 70 U-boat minelayers of the larger UC II-type and UC III-type.

The *UC-21* sank 99 ships and damaged 6. These are listed and mapped on the uboat.net site http://www.uboat.net/wwi/boats/successes/UC-21.html. The majority of vessels wrecked by *UC-21*'s mines were off the west coast of France from Brest in the north to Bordeaux in the south with one wrecked off the north coast of Spain and two off the south coast of England.

Loss

There are several primary records reporting the possible reasons for the sinking of *UC-6* and *UC-21* but none are conclusive. There is much stronger evidence for the *UC-6* being lost at this location.

One option for its wrecking at this location was that it became entangled in the mine nets laid by the Royal Navy on 27th September 1917. Hydrophone operators reported hearing U-boat engines in the area and then witnessed an explosion. The alternative for the demise of *UC-6* is that it succumbed to the bombs of a seaplane patrol. Once again, there were witnesses to seeing the *UC-6* and the seaplane in the same area.

It is assumed that the full complement of 16 submariners died when *UC-6* sank. The names of the crew as given by U-Boot Archiv are listed below and the wreck site should be considered their last resting place of mariners for commemorative purposes.

Name	Grade
Reichenbach, Gottfried	Kommandant Oberleutn.z.S
Binz	Ob.Masch.Mt.
Brase	Hzr
Bruckner	Ob.Masch.Mt.
Detloff	Ob.Mts.
Gorke	Ob.Masch.Mt.d.Res.
Jepsen	Ob.Btn.Mt.
Kraft	Ob.Hzr
Kunkel	Masch.Anwarter.
Lange	?
Lehmann	Masch.Mt
Nabrotzki	Mts..
Nachtigal	Masch. Ob.Anwarter.
Schubert	Mts.
Schwarz	Mts.

	Wunderlich | Stm. However for the *UC-21*, there is no conclusive evidence that this U-boat was in the Kentish Knock area. The last known position for the *UC-21* was departing Zeebrugge on 13th September 1917. There is inconclusive evidence that it laid mines off the west coast of France. There are many theories for how this U-boat became wrecked and many theories for where this took place. The *UC-21* could have been wrecked by one of its own mines, which happened to several German minelayers. It could have run into a British or French mine. There may have been an internal mechanical failure or it could have lost buoyancy in the stern as was quite common with German U-boats. It also may have become entangled in the numerous nets or detonated a mine placed across the Thames Estuary, Dover Straits and English Channel. Any of these events could have taken place after 13th September 1917. There is no known conclusive evidence why the British Admiralty declared that it was wrecked in nets on 27th September 1917.
Survival	There are British Admiralty records that state that sections of U-boat were extracted from the mine nets off Kentish Knock 21st January 1918. There is no evidence that the British or Allied forces attempted to identify or salvage this U-boat during the war as had been done with other similar vessels. The first record of this wreck on the seabed is from 1949 when it was cleared with Oropesa sweep and examined with an echo sounder (UKHO 14086). At this point, the obstruction was identified as being the cargo steamer SS *Grazia*. The site was once again examined in 1983 when it was stated that the majority of wreck remains must be buried and that it was too small to be the SS *Grazia*. Further examination of the wreck in 1995 identified that it had a strong magnetic signature. In 2005, local divers from Canterbury Divers examined the wreck and identified it as a minelayer submarine. There is no evidence of salvage, diver tampering or destruction by marine industry. The wreck structure is quite heavily covered in marine turf including plumose anemones, sponges and other short statured marine life. It is unclear how much of the super structure is extant but diver reports indicate that the majority of the pressure hull is intact including the central structure of the conning tower. Evidence suggests that the stern section of the U-boat is buried which may have protected the propeller/s from salvage, however conclusive identification of the U-boat could be achieved by access to the propeller/s.
Investigation	There is no record of contemporary salvage activities or avocational or professional investigations taking place on this site

	prior to the current investigation. There is one report that members of the local club Canterbury Divers visited the site on a single occasion. The Canterbury Divers club has shown interest in investigating the site in the future. The recent investigation by WA was by no means comprehensive. Technical issues and a diving incident limited the diving that took place on site and therefore further investigation is required of the U-boat site to ensure that an entire survey of the area is completed and sufficient remains are recorded.

Table 9: Characterisation Using BULSI

5.4 Circumstances of Loss

5.4.1 Primary sources record that the wreck took place on either 27th or 28th September 1917.

5.4.2 *UC-6* was part of the Flanders Flotilla and was wrecked in the Dover Patrol campaign (Cotswold Archaeology 2013: 34). The precise details of the loss of the *UC-6* are not consistent. British Admiralty records, German records, Larn and Young report that the U-boat was sunk by No. 8676 Curtiss H-12 seaplane. German records, and Larn and Young, report that this took place on 27th September 1917 while the Admiralty records report this happened the following day during a skirmish in the North Hinder area (ADM 137/3918; Young and Armstrong 2006: 240). However this is refuted by Grant (2002: 67) and the alternative view is that the U-boat ran into nets that had been laid off Kentish Knock by the Royal Navy earlier that day (Bendert 2001: 69; Grant 2002:67; Kemp 1997: 36; Young and Armstrong 2006: 241). Nearby patrols reported an explosion in the area of the nets. The coordinates of this explosion/net location are given by Young and Armstrong (2006: 241) and they are 0.8 nautical miles south west of the U-boat's location and only 0.4 nautical miles west of the UKHO *UC-21* position WA ID **7001**. On 21st January 1918, British investigations revealed that parts of a U-boat including an anchor were tangled in the mine nets off Kentish Knock (Bendert 2001: 69) possibly corresponding with *UC-6*.

5.4.3 Details of the loss of *UC-21* however, are minimal. The last recorded position of *UC-21* was when it departed Zeebrugge on 13th September 1917 to lay mines off the west coast of France (Records of the German Navy) before heading to the Bay of Biscay. The French Ministère de la Marine suggests that the *UC-21* may have laid mines in its designated area on the west coast but it is also possible that other vessels laid those mines (Deutsches U-Boot Museum archive). There are no conclusive details of the *UC-21*'s final fate in German, French or British records. The Admiralty has broad coordinates of the loss of the vessel which have been substantiated by the UKHO, however, these are unlikely to be correct (ADM 137/3918). The Admiralty recorded that it was lost in mine nets on 27th September 1917 (ADM 137/3918) and this is also given as an option of loss by Kemp along with being sunk by one of its own mines or internal mechanical failure (Kemp 1997: 35). There is also the possibility that *UC-21* may have succumbed to the malfunction common to some U-boats which was to suddenly lose buoyancy by the stern (Messimer 2002: 12-13). There is very little conclusive evidence that *UC-21* was lost off Kentish Knock, and it is more likely to have been lost off the west coast of France.

6 RISK ASSESSMENT

6.1.1 Using available information, the Site has been risk assessed for the purposes of site management using the EH Risk Management Handbook (EH 2008). The results are set out in **Appendix III**.

6.1.2 Risk is assessed as **medium risk**. The principal vulnerability identified is the risk of a resumption of finds recoveries without adequate archaeological controls, however this may be viewed as relatively minor.

7 ASSESSMENT AGAINST THE NON-STATUTORY CRITERIA FOR SCHEDULING

7.1 Assessment Scale

7.1.1 For each criterion, one of the following grades has been selected. This has been done in order to help assess the relative importance of the criteria as they apply to the site. The 'scoring' system is as follows:

- Uncertain – insufficient evidence to comment;
- Variable – the importance of the wreck may change, subject to the context in which it is viewed;
- Not Valuable – this category does not give the site any special importance;
- Moderately Valuable – this category makes the site more important than the average wreck site;
- Highly Valuable – this category gives the site a high degree of importance. A site that is designated is likely to have at least two criteria graded as highly valuable;
- Extremely Valuable – this category makes the site exceptionally important. The site could be designated on the grounds of this category alone.

7.2 Non-Statutory Criteria Assessment

7.2.1 The *UC-6* site has been assessed against the *Ancient Monuments and Archaeological Areas Act* 1979 using the assessment scale outlined above. Should further evidence be found relating to the site, this assessment should be updated appropriately.

Period

7.2.2 *UC-6* was commissioned in June 1915 as part of the Flanders Flotilla and was wrecked in September 1917. *UC-6* is one of 41 German WWI U-boats that were wrecked within English territorial waters.

7.2.3 The First World War saw the rapid development of the submarine which was increasingly used minelaying. UC I-type was the first successful example of a U-boat minelayer which was further developed in the UC II-type. UCI was also highly innovative as it was constructed in sections in Hamburg and then transported by rail to Flanders on the coast for final assembly. *UC-6* is an example of this technological change in submarine design and implementation. Vessels from the FWW displaying new developments in technology such as minelayers, are to be considered especially significant (Wessex Archaeology 2011: 51) and *UC-6* is an early war example of this.

7.2.4 Sites of FWW heritage should be considered of special interest as a tangible part of British and international history and the commemorations of events that took place one hundred years ago. The wreck site that has been identified as *UC-6* is an example of this tangible heritage.

7.2.5 As limited investigation took place on this site it can only be considered **Moderately Valuable** at this point. Further investigation into this wreck, including definitive identification of *UC-6* may increase significance within this criteria.

Rarity

7.2.6 Of the 41 U-boats sunk in British waters, five UC I-type vessels were lost (*UC-2*, *UC-5*, *UC-6*, *UC-9*, and *UC-11*), and of these, only three have had physical remains associated with them. *UC-6* is the only one in relatively intact condition (Cotswold 2013 and Young and Armstrong 2006). *UC-2* is a debris field off Lowestoft (Young and Armstrong 2006: 177) while *UC-5* was captured in 1915, displayed and later broken up (Young and Armstrong 2006: 213). *UC-9* disappeared off Long Sands, possibly destroyed by a British mine, or one of its own, and has not been relocated (Young and Armstrong 2006: 190). *UC-11* was also destroyed by its own mine and was subsequently further dispersed by explosives by the Royal Navy who sent divers to retrieve intelligence. For this reason the site is only a debris field and while it has been physically located, it has yet to be positively identified as *UC-11* (Cotswold, 2014: 38 and Young and Armstrong 2006: 204).

7.2.7 Fifteen UC I type U-boats were built in 1914-15 in two separate yards. The majority of this type were built in Hamburg (*UC-1* - *UC-10*) while the remaining five were built in Bremen. *UC-6* was one of these 15 and was built in Hamburg (Cotswold 2014).

7.2.8 As *UC-6* is the only remaining example of the original form of FWW German minelayers, it is considered **Highly Valuable**.

Documentation

7.2.9 There were no survivors from the *UC-6* which has contributed to the uncertainly of the wreck's location and therefore there are no first hand accounts of the U-boat's last hours. Also, there was no definitive identification of the wreck through contemporary sources.

7.2.10 The National Archives at Kew hold records relating to *UC-6* including U-boat descriptions, plans and arrangements (ADM 186/407) and original history sheets of UC type U-boats (ADM 137/3918).

7.2.11 There are also records of the German Navy held at the National Archives in Washington, United States on microfilm. Record Group 242, Roll 62, PG61903 and Roll 45, PG61920, related to UCII-type.

7.2.12 Numerous secondary sources also document information about *UC-6* and *UC-21*. Authors such as Grant, Kemp, Messimer and Young discuss these U-boats in their publications and as do German authors Bendert and Spindler who also provide a broader perspective on the conflict at the time and the role of U-boats within it.

7.2.13 Due to the lack of eye witness accounts and the reasonable amount of primary and secondary sources relating to this U-boat, it is considered **Moderately Valuable** in the documentation criteria.

Group Value

7.2.14 There are 90 identified submarines wrecked in British territorial waters with another 19 possible submarines and 36 other submarine losses (Cotswold 2013: 8). Of the 109 confirmed and possible wrecks, 81 are German and 42 of these are from WWI (Cotswold 2013: 20-23). There are 19 FWW U-boat minelayers wrecked in British waters. *UC-6* is part of a group of submarine wrecks representing the conflict in British waters during the

FWW. These are tangible evidence of the submarine and minelaying strategies employed by both sides in the Dover Strait/Thames Estuary area.

7.2.15 *UC-6* also forms part of a group with several other wrecks which were victims of its mines in the Dover and Thames Estuary area. Seven of the wrecks caused by mines laid by *UC-6* have become popular dive sites and have significance to the local diving community. Four vessels were sunk by *UC-6's* mines on 31 October 1915: HMS *Aries*, *Eidsiva*, HMT *Othello II* and *Toward. Traquair* was sunk on 12 January 1916, *Empress of Fort William* on 27 February 1916 and *Saint Cecilia* 26 March 1916 (Canterbury Divers website). All these wrecks are visited by divers and with the inclusion of the U-boat that launched the deadly mines, form a physical historical experience and memorial to events of the FWW.

7.2.16 The wider landscape of FWW remains in territorial waters in the south east of England constitutes a nationally/internationally significant maritime landscape historically characterised by and centred around the activities of the Dover Patrol, the Folkestone-Gris Nez and Dover barrages and the physical remains of U-boats. Even if an individual U-boat wreck might not be worthy of designation in their own right, the circumstances of their loss and the association with the other U-boats in and around the Dover Strait, and to a lesser degree the Thames Estuary, help define a historically unique place that played a crucially significant role during the First World War.

7.2.17 *UC-6* is **Highly Valuable** as it forms a significant part of several groups including the broader tangible heritage of the FWW and the more defined evidence of the Flanders Flotilla and its minelaying activities. It is a representative example of a FWW vessel, the best example of the particular design UC I-type in English territorial waters. It is also part of the larger group of enemy vessels sunk in action during the FWW and demonstrated the need for contemporary British improvements in anti-submarine warfare and may indeed be a victim of those improvements. It is the best example of the first design of minelayer submarines and adds to the diversity of enemy vessels now lying in territorial waters.

Survival / Condition

7.2.18 This is the most intact example of an early war German minelayer submarine. While it is missing the superstructure it still retains all the identifying characteristics of its type and is rare in possibly still having its propeller.

7.2.19 Therefore, the *UC-6* is **Highly Valuable** is its survival and condition.

Potential

7.2.20 This wreck site has a fair amount of archaeological potential and would benefit from further investigation. A complete survey could certainly prove that the submarine was indeed *UC-6*. This might be achieved by excavating the stern section of the vessel and locating the markings on the propeller for a definitive identification of the wreck. Detailed examination of the hull structure, when compared to the known plans would also help confirm the identity of the wreck.

7.2.21 Initial information suggests that the hatches are still closed and therefore it is most likely that human remains are contained within. As a War Grave, it should not be disturbed.

7.2.22 The archaeological potential for this submarine is **Moderately Valuable** however this could increase in significance when the wreck is identified as *UC-6* as it is the only intact remaining example of is type.

7.3 Summary

The *UC-6* wreck site demonstrates high value in the categories of Rarity, Group Value and Condition, moderate value in Period, Documentation, and Potential. Therefore, according to the non-statutory criteria assessment and the recommendation that sites demonstrating high value in two criteria or more (English Heritage 2012), the *UC-6* wreck site represents a strong candidate for scheduling under the *Ancient Monuments and Archaeological Areas Act* 1979.

8 RECOMMENDATIONS

8.1.1 Due to factors beyond the control of Wessex Archaeology, a comprehensive diving investigation of the wreck was not possible. Therefore it has not been possible to definitively prove that this is the wreck of the *UC-6* although it is highly likely to prove to be so. The following recommendations are made to realise the potential of this wreck.

Diving Investigation

8.1.2 It is recommended that further diving investigation is planned in the future to confirm the hypothesis that the submarine is *UC-6*.

8.1.3 Consideration should be given to commissioning excavation of the sand wave currently covering the stern of the submarine. It is highly possible that the propeller may still be in situ and would provide definitive confirmation of the U-boat's identity. With increased attention being drawn to the *UC-6* site as a result of the HAR investigations, the examination of the stern area should be undertaken with some urgency. Propellers are known to be targets for salvors, which is why there are very few submarines still retaining their propellers.

Diver Liaison

8.1.4 It is recommended that all future work carried out at the site should be done in conjunction with the local divers from Canterbury wherever possible. Members of this club dived the submarine prior to the Wessex investigations and they had already developed a sense of custodianship towards the wreck. It is considered highly likely that Canterbury divers would be excellent wreck custodians for this site, both monitoring the wreck's condition for environmental or human intervention and to further the survey work on the site

8.1.5 Canterbury Divers participated actively in the Stage 2 fieldwork. They have been provided with the confirmed location of the U-boat to aid in their planned further investigation of the site (email, Simon Woollcott 01.07.2014). A very strong level of satisfaction with this participation has been expressed by the club members and they appreciated being invited to join archaeological investigations into a wreck in their local area (email, Simon Woollett 23.06.2014).

Update Records

8.1.6 It is recommended that the UKHO and NRHE records be updated to reflect the change in knowledge regarding wrecks **7000** and **7001**.

9 ARCHIVE

9.1.1 The project archive consists of a hard copy file and computer records and is currently stored at WA under project code 83803. The project will be transferred to an accredited repository to be agreed.

9.1.2 Shapefiles generated for the project comply with Marine Environment Data and Information Network (MEDIN) standards for metadata.

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http://uboat.net/wwi/ships_hit/322.html

11 APPENDICES

Appendix I: List of archaeological features located

WA ID	Description	Easting*	Northing*	Latitude	Longitude
7000	U-boat	401310	5707685	51° 30.6998' N	01° 34.6692' E
7001	Wreck	401313	5706576	51° 30.1017' N	01° 34.6904' E

Appendix II: Dive Log

Dive	Date	Start Time	Duration*	Max Depth (m)	Divers	Task
01	20/06/2014	13:34	Aborted	0m	Croce, Murray	Aborted
02a	21/06/2014	13:26	Aborted	0m	Croce, Newman	Aborted
02b	21/06/2014	13:54	26	22m	Croce, Gane	Search for U-boat
03	22/06/2014	16:34	11	22m	Murray,	Locate U-boat

					Newman	

*** Bottom time in minutes (time from diver left surface to diver left bottom; actual working time will be shorter**

UTM zone 31N

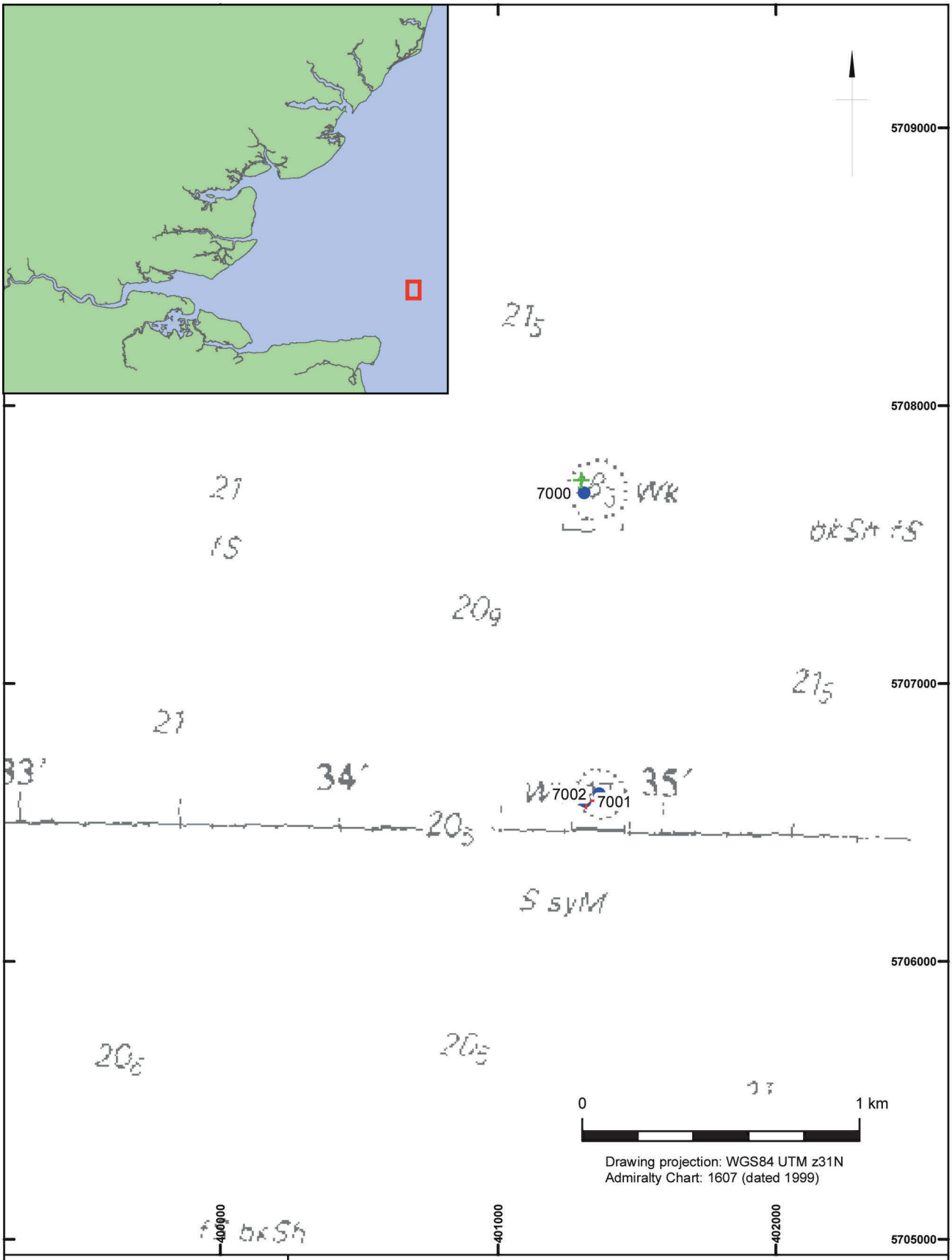
Appendix III: Site Risk Assessment

Wreck/Site Name	***UC-6*, Thames Estuary**		
HRHE / UKHO No.	EH Region	Restricted Area	Principal Land Use
NRHE 907656	South of England	N/A	Coastland 1: Marine
Latitude (WGS84)	51° 30.6998' N		
Longitude (WGS84)	01° 34.6692' E		
Class Listing	Period	Status	
Unknown (Possible Wreck)	WWI	Non-designated site	
Licensee	Nominated Archaeologist	Principal Ownership Category	
N/A	N/A	N/A	
Seabed Owner	Navigational Administrative Responsibility		
Crown Estate	Dover MRCC		
Environmental Designations			
G. None			
Seabed Sediment	Energy		
Sand with sand waves	High		
Survival			
Medium			
Overall Condition	Condition Trend	Principal Vulnerability	
C: generally satisfactory with up to 25% damage to site.	C: Stable, no active deterioration of remaining artefacts detectable.	NKT: no known threat	
Amenity Value: visibility			
A: substantial remains that are easily interpretable.			
Amenity Value: physical accessibility	Amenity Value: intellectual accessibility		
A: No restrictions to access.	C: no interpretation nearby		
Management Action	D		
Management Prescription	H; K		
Notes:			
Risk is assessed as:	**Low to Medium**		
Data Source	CON	Date & Initials	Wessex Archaeology, December 2014

Appendix IV: Diver Slate

COMPARISON OF U-BOATS

U-BOAT	UC-6	UC-21
		
Length: _____ Beam: _____ Depth: _____	Length: 34m Beam: 3.15m Depth: 3m	Length: 52.7m Beam: 5.2m Depth:
Bow: _____ _____ _____ Superstructure: _____ _____ _____	Bow: rounded bow Superstructure: parallel to waterline from bow to stern	Bow: high bow with net cutter Superstructure: high bow section dips before conning tower and slopes to stern
Hatches:_____ Periscopes: _____ Anchor: _____ _____	Hatches: 2 Periscopes: 1 Anchor: mushroom anchor of 300 lbs	Hatches: 3 Periscopes: 2 Anchor: mushroom anchor of 600 lbs
Propeller:_____ _____ _____	Propeller: one 3 bladed bronze dia. 3ft 3in	Propeller: two manganese dia. 4ft 3in
Mines: _____ Guns: _____ _____ _____ Torpedoes: _____ _____	Mines: 12 Guns: 1-4 pr or 1 machine gun Torpedoes: none	Mines: 18 Guns: one 22 pr and 1 machine gun Torpedoes: 5-7 with 3 tubes
Loss damage: _____ _____ _____ _____	Loss damage: mined by net barrage or bombed by seaplanes	Loss damage: disappeared



- Geophysical Anomalies
- Priority 1 Target
- Priority 2 Target

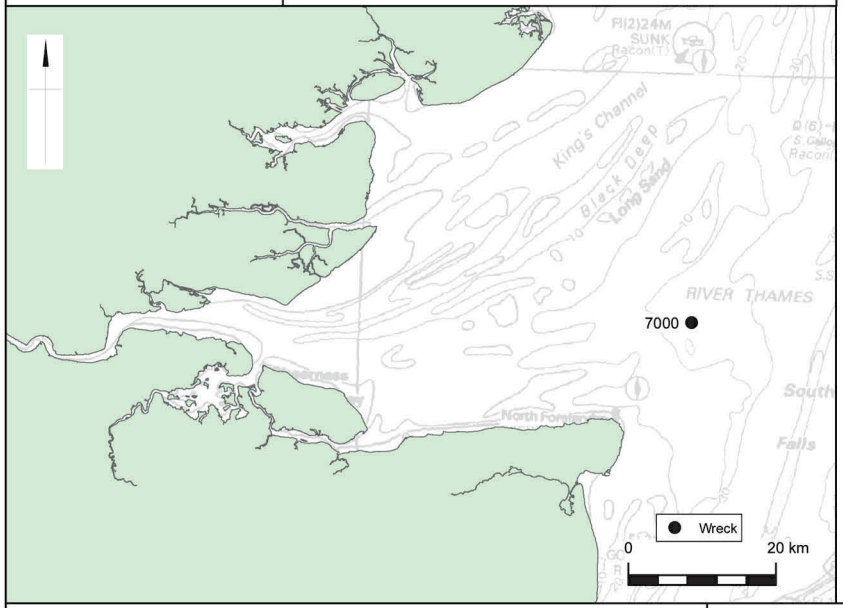
Date:	15/07/14	Revision Number:	0
Scale:	1:20,000 at A4	Illustrator:	KL
Path:	W:\Projects\PWA\Projects\83803\7 Drawing Office\UC6\2014_12_11		

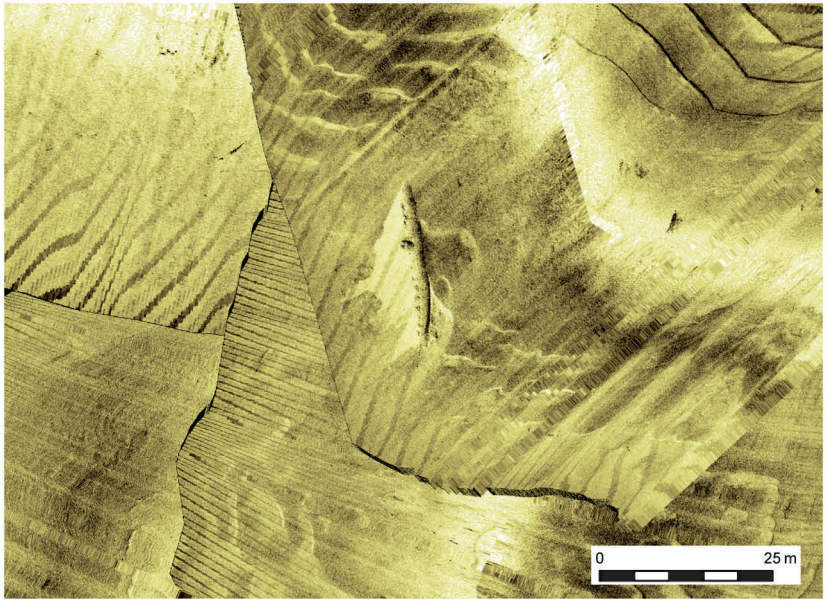
Location of Wrecks 7000 and 7001

Figure 1

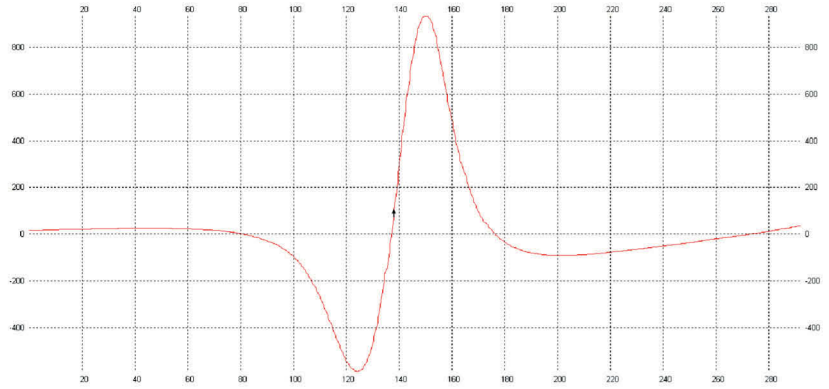
WA ID 7000 - Unknown Wreck

Location		401310 E, 5707685 N (UTM31N) 51° 30.6998' N 01° 34.6692' E (WGS84)	**Area:** Priority 1
Geophysical Survey Dimensions and Notes		Dimensions: 24.2m x 7.6m x 3.9m 7000 has been interpreted as the probable wreck of a submarine. There are possible hatches visible on its top side and what appears to be a conning tower visible in shadow. A high magnetic amplitude of 1522nT is associated with the wreck, further suggesting that it is of steel construction. The wreck is orientated approximately south-north and possibly partially buried at northern end. Located in an area of sandy seabed. There are records of two submarines which may correspond to this wreck. The UKHO records the UC-21 (UKHO 14054) as lying approximately 1km to the south of 7000, and the NHRE reports the loss of the UC-6 in the area.	
Build	**Date Built**	Unknown	
	Type	Submarine	
	Construction	Unknown but very large magnetic response suggests a steel hull.	
	Shipyard	Unknown	
	Dimensions	Unknown	
Loss	**Cause**	Unknown	
Extents of Survival		The hull of the vessel appears to be mostly intact in the data. Further investigation is required to confirm the extent of the wreck's survival.	





Sidescan sonar image of wreck 7000



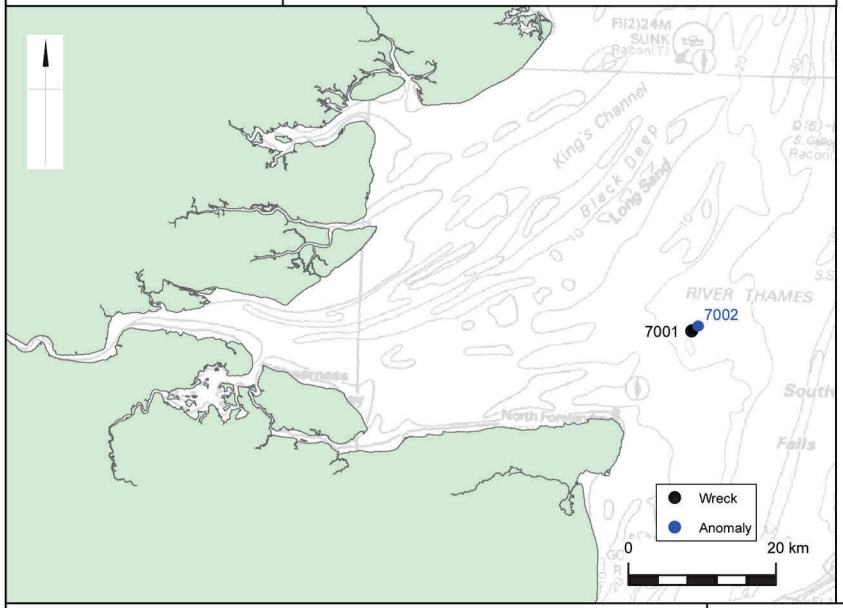
Magnetic Amplitude (1522nT)

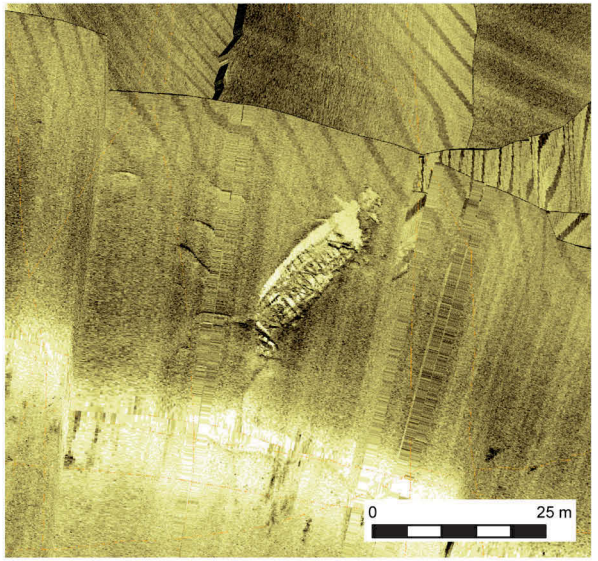
Drawing projection: WGS84 UTM z31N
Admiralty Chart: 2182 (dated 2000)

Date:	15/07/14	Revision Number:	0
Scale:	1:750,000 at A3	Illustrator:	KL
Path:	W:\Projects\PWA\Projects\83803\7 Drawing Office\UC6\2014_12_11		

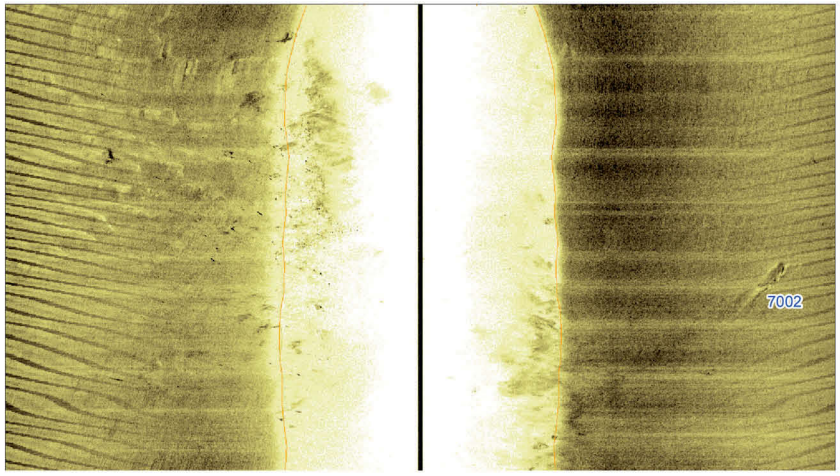
WA ID 7001 - Unknown Wreck

Location		401313 E, 5706576 N (UTM31N) 51° 30.1017' N 01° 34.6904' E (WGS84)	**Area:** Priority 2
Geophysical Survey Dimensions and Notes		Dimensions: 44.2m x 7.1m x 2.8m 7001 has been interpreted as a partially broken up wreck with visible internal structure. The wreck is orientated approximately south-west to north-east, and may be partially buried at southern end. Located in an area of sandy seabed. It is possible that this is the wreck of submarine and coincides with the UKHO record for the UC-21 (14054), however the data indicates this that it is more likely to be the wreck of a ship and may be related to the Grazia (UKHO 14086) recorded approximately 1km to the north by the UKHO.	
Build	**Date Built**	Unknown	
	Type	Unknown	
	Construction	Unknown	
	Shipyard	Unknown	
	Dimensions	Unknown	
Loss	**Cause**	Unknown	
Extents of Survival		Largely broken up and possibly partially buried.	





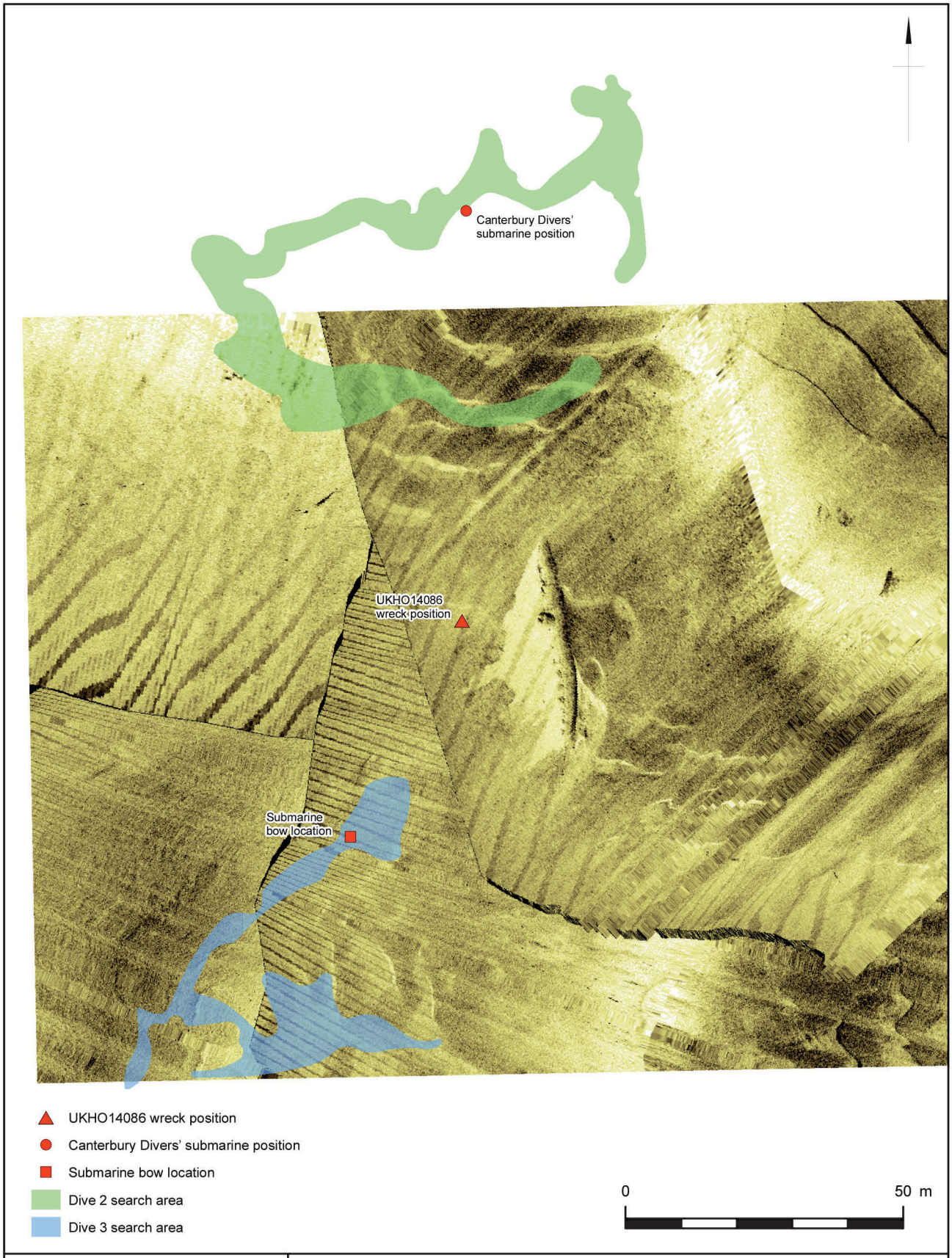
Sidescan Sonar Mosaic



Anomaly 7002, sidescan sonar image (5.5m x 0.9m x 0.2m)

Drawing projection: WGS84 UTM z31N
Admiralty Chart: 2182 (dated 2000)

Date:	15/07/14	Revision Number:	0
Scale:	1:750,000 at A3	Illustrator:	KL
Path:	W:\Projects\PWA\Projects\83803\7 Drawing Office\UC6\2014_12_11		



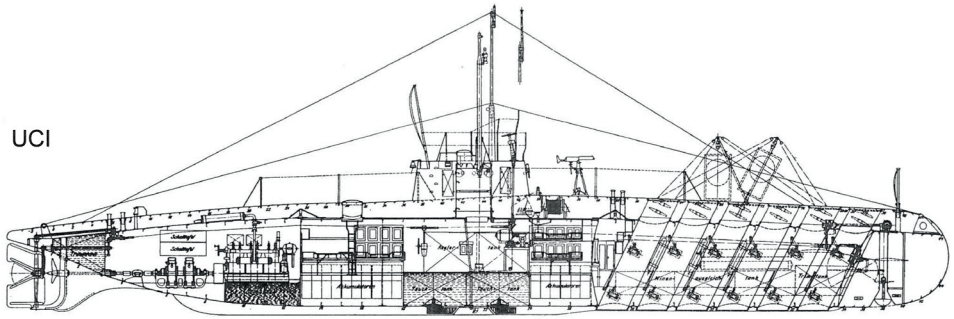
Drawing projection: WGS84 UTM z31N

Date:	11/12/2014	Revision Number:	0
Scale:	1:1000 at A4	Illustrator:	KJF
Path:	W:\Projects\PWA\Projects\83803\7 Drawing Office\UC6\2014_12_11		

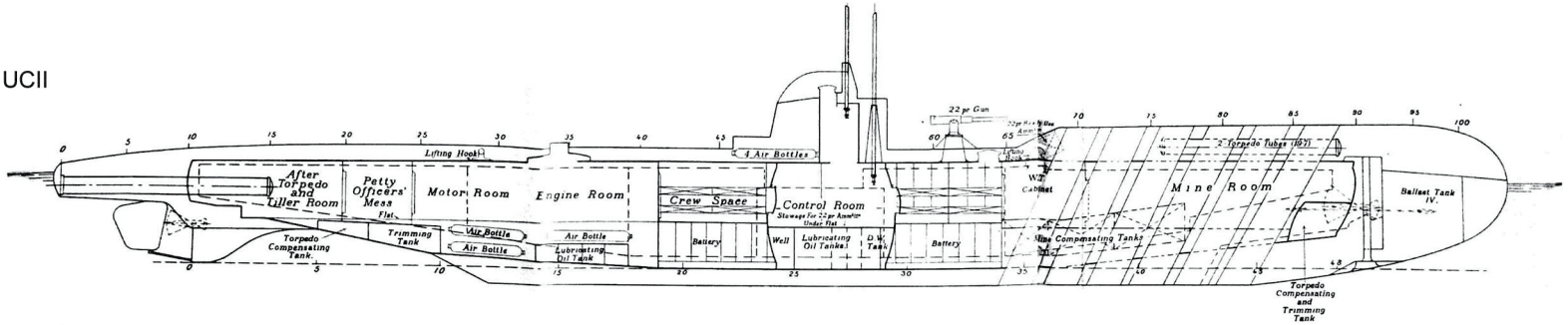
Diver Search Areas with Geo-located Side Scan Sonar Image

Figure 4

UCI



UCII

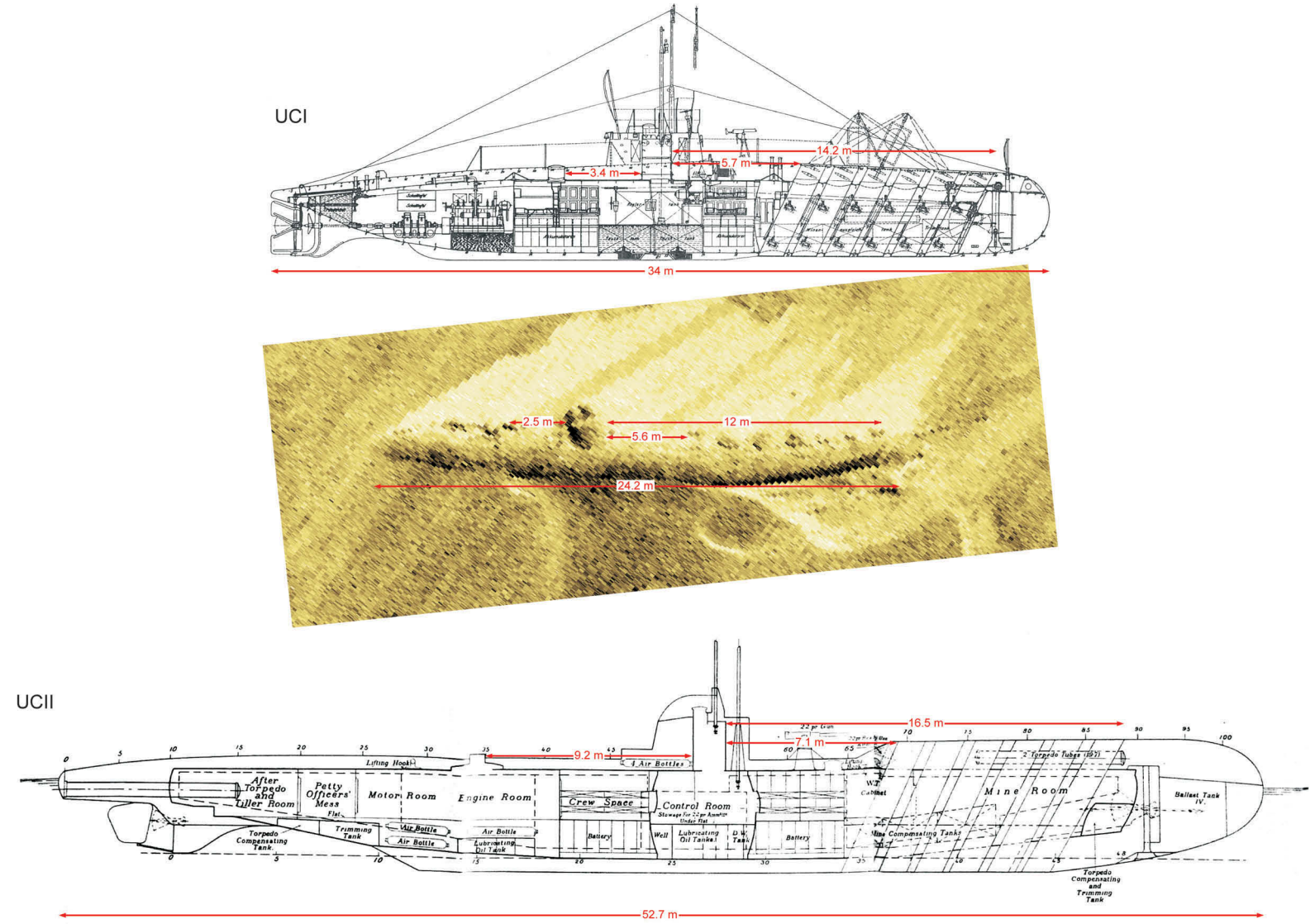


0 10 m

Date:	11/12/2014	Revision Number:	0
Scale:	1:200 @A3	Illustrator:	KJF
Path:	W:\Projects\PWA\Projects\83803\7 Drawing Office\UC6\2014_12_11		

comparison of Type UCI and UCII plans. UCI plan courtesy Deutsches U-boot museum and UCII plan courtesy National Archives Kew

Figure 5



0 10 m

Date:	12/12/2014	Revision Number:	0
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Comparison measurements of SSS image and UC-6 and UC-21 plans

Figure 6

Plate 1: Captured German minelayer of UC5.
By Bain News Service, Library of Congress Prints and Photographs Division Washington, D.C, Public Domain

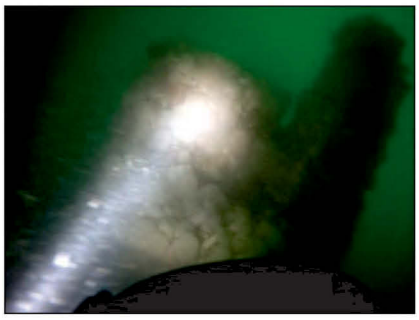

Plate 2: UC6 periscope. Photograph by Rob Harrison, Canterbury Divers

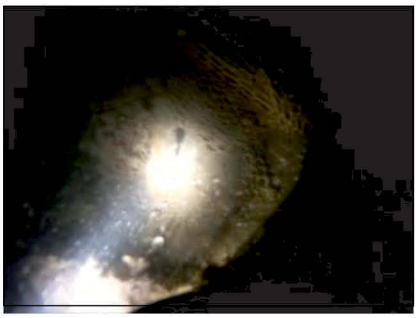

Plate 3: Fishing nets on U-boat Photograph by Rob Harrison, Canterbury Divers

Date:	11/12/2014	Revision Number:	0
Scale:	N/A	Illustrator:	KJF
Path:	W:\Projects\PWA\Projects\83803\7 Drawing Office\UC6\2014_12_11		

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