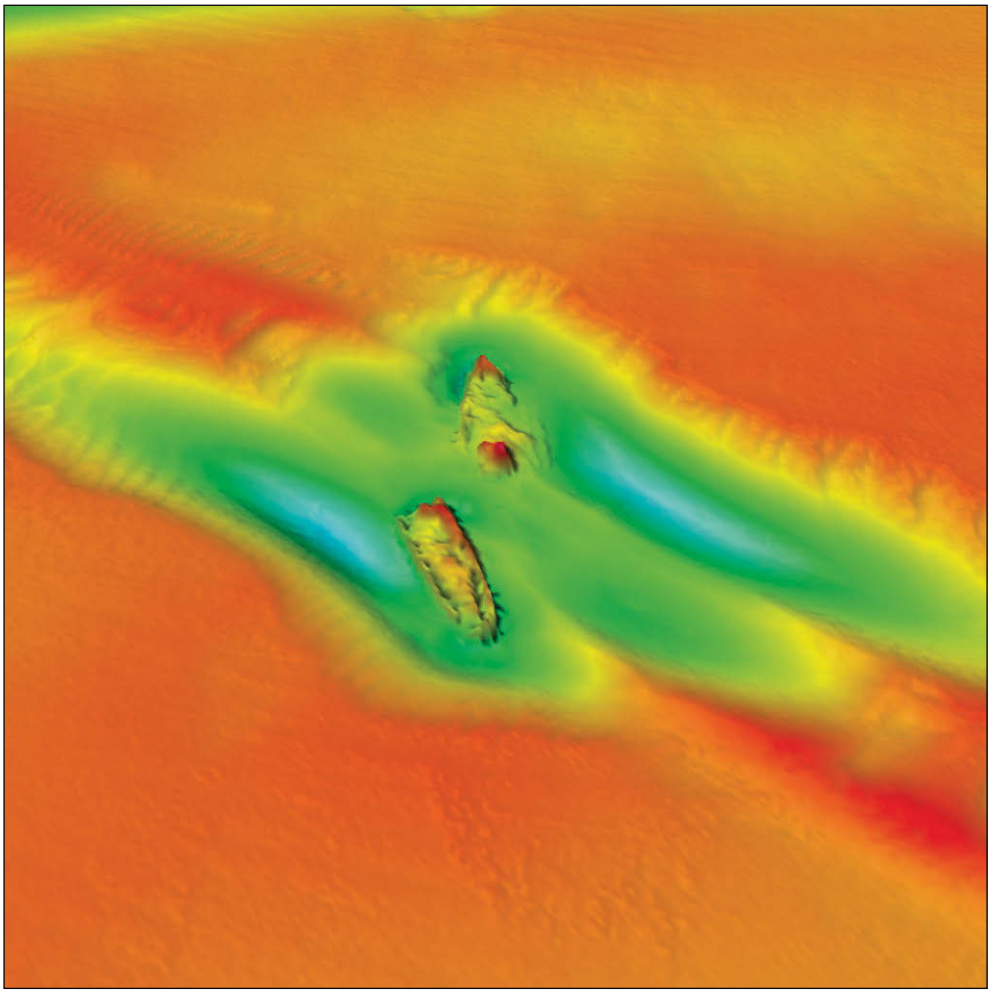
making sense of heritage

Aggregate Area 507

Archaeological Review of Geophysical Data



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geoservices

Aggregate Area 507

Archaeological Review of Geophysical Data

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DISCLAIMER

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Summary

Wessex Archaeology was contracted by Fugro EMU Ltd. on behalf of CEMEX UK Marine Ltd. to carry out an archaeological assessment of geophysical data acquired from aggregate licence Area 507. The dataset comprised sidescan sonar, multibeam bathymetry and sub-bottom profiler data, and the assessment was to be undertaken as a baseline review for the dredging licence renewal application associated with the licence area. The study area comrpised the six licence areas of Area 507 and an associated 500m buffer zone.

A number of palaeogeographic features of archaeological potential were identified within Area 507 and the buffer zone. These were generally palaeochannel features, both buried and unfilled, potentially associated with the Thames – Medway river system that existed in the region during periods of relatively low sea level between the Cromerian and the Early Holocene. A number of possible overbank deposits associated with these channels were also identified, although a number of these were intermittent poorly defined, and may contain seabed sediment.

Palaeogeographic features of this type and age have the potential to contain both derived and in-situ objects of archaeological interest (e.g. lithic artefacts) and preserved material of palaeoenvironmental potential (e.g. organic material such as peat). As such, it is recommended that, should any objects or samples of archaeological interest be recovered during dredging operations, they should be reported using the established Marine Aggregate Industry *Protocol for Reporting of Finds of Archaeological Interest*.

A number of seabed features of high archaeological potential, particularly 12 distinct wrecks plus four large pieces of debris, were identified within Area 507 and the buffer zone. Due to the significant potential impact of dredging upon these features, it is recommended that 50m archeaological exclusion zones be placed around the 10 of these locations that are situated within the licence area boundaries. This also includes a wreck situated completely within the buffer zone, the 50m exclusion zone of which partially extends within a licence area.

The remainder of the identified anomalies are identified as of uncertain origin and of possible archaeological interest. No exclusion zones are recommended but their positions should be noted, particularly those within licence areas. Should any objects of archaeological interest be recovered during dredging operations, they should be reported using the established Marine Aggregate Industry *Protocol for Reporting of Finds of Archaeological Interest*.

Additionally, four previosuly recorded wrecks situated within the licence area were not identified within the geophysical data. Each of the wreck records was based on a ship loss record, and none of the wrecks have been identified in this or any previous survey. Also, as the four records relate to substantial WW1 wrecks, it is considered that there would be evidence in the geophysical data. Because fo this, no archaeological exclusion zones are recommended, although these positions should be noted and any artefacts from these areas should be reported through the Marine Aggregate Industry *Protocol for the Reporting of Finds of Archaeological Interest.* If any finds are found in the future associated with these positions then further investigations may be required.

Aggregate Area 507

Archaeological Review of Geophysical Data

Acknowledgements

This assessment was commissioned by Fugro EMU Ltd. on behalf of CEMEX UK Marine Ltd, and Wessex Archaeology would like to acknowledge the assistance of Sam Drawbridge of Fugro EMU Ltd. during the course of this project.

The geophysical assessment was undertaken by David Howell, and the report written and prepared by David Howell with assistance from Laura Andrews. Geophysical Quality Control was provided by Dr Louise Tizzard. Kitty Foster prepared the illustrations, and the project was managed for Wessex Archaeology by Dr Louise Tizzard.

Aggregate Area 507

Archaeological Review of Geophysical Data

1 INTRODUCTION

1.1 Background

1.1.1 Wessex Archaeology (WA) was contracted by Fugro EMU Ltd. (FEMU) on behalf of CEMEX UK Marine Ltd. (CEMEX) to carry out an archaeological assessment of geophysical data acquired from aggregate licence Area 507. The dataset comprised sidescan sonar (SSS), multibeam bathymetry (MBES) and sub-bottom profiler (SBP) data, and the assessment was to be undertaken as a baseline review for the dredging licence renewal application associated with the licence area.

1.1.2 Area 507 is located within the southern North Sea, approximately 22km east of Felixstowe, Suffolk. The licence area is split into six sub-areas (507/1 – 507/6), three of which lie in close proximity to each other, and the geophysical survey was divided into four separate study areas as illustrated in **Figure 1**.

1.1.3 These study areas include the licence area extents plus a 500m buffer zone. For the purposes of this assessment these study areas are interpreted and reported separately, and are named as follows: Area 507/1/3/4, Area 507/2, Area 507/5 and Area 507/6.

1.1.4 This report forms part of continued site assessments associated with the Area 507 dredging licence renewal application in advance of aggregate dredging within the licence area.

1.2 Aims and objectives

1.2.1 The aim of the assessment was to undertake an archaeological interpretation of the provided geophysical data, and assess the possible impact of proposed dredging activities on any potential archaeological features located within the licence area. This was done through the following objectives:

- Assess the geophysical data acquired and provided by FEMU to identify whether any material of archaeological potential is present on the seabed within the study area;
- Identify any evidence for palaeolandscape features of archaeological potential within the study area;
- Compare the results with past investigations directly associated with the licence area, known archaeological sites or records, and previous work undertaken in the wider region;
- Propose mitigation for any identified material or archaeological potential likely to be directly impacted by future dredging.

2 METHODOLOGY

2.1 Data Sources

2.1.1 A number of data sources were consulted during this assessment, including:

- Geophysical survey datasets (SSS, SBP and MBES) from within the study area, as acquired and provided by FEMU, and the associated survey report (FEMU 2015);
- UKHO records of wrecks and obstructions within and surrounding the study area;
- Previous geophysical and desk-based assessment work undertaken by WA within Area 507 (WA 2012), and from surrounding development areas (WA 2015a, 2015b);
- Previous regional studies undertaken within the Outer Thames Estuary, such as the Outer Thames Estuary Regional Environmental Characterisation (REC) (Emu 2009) and the Thames Estuary Dredging Association (TEDA) Marine Aggregate Regional Environmental Assessment (MAREA) (WA 2010a), alongside background British Geological Survey (BGS) geological information (Cameron *et al.* 1992).

2.2 Geophysical Data – Technical Specifications

2.2.1 The assessed geophysical data were acquired by FEMU during May 2015 on board the survey vessel RV *Discovery*, and provided to WA by FEMU. The data set comprised SSS, MBES and SBP data.

2.2.2 Main lines were acquired at a spacing of between 125m and 140m with cross lines acquired at a spacing of 1km. Line orientation differed between the four study areas, and a total of approximately 531 line km of data were acquired.

2.2.3 The SSS were acquired using an Edgetech 4200 towfish operated at both 100kHz and 400kHz and a range of 150m per channel. Positioning of the towfish was provided using a USBL system. The data were digitally recorded and provided to WA as *.xtf* files.

2.2.4 The SBP data were acquired using both an Applied Acoustics surface-towed boomer with an eight element single channel trailing hydrophone, and a four element GeoAcoustics 3.5kHz pinger transducer. The data were digitally recorded using Coda Octopus acquisition software, and provided to WA as a series of processed and interpreted Coda Seismic+ *.seizip* project files.

2.2.5 The MBES data were acquired using a Kongsberg EM2040 dual head multibeam echo sounder, with motion corrections provided by a POS MV Motion Reference Unit and water column sound velocity data provided by a Valeport Mini Sound Velocity Probe. The data were digitally recorded using QINSy acquisition software, and provided to WA as gridded 1m *.asc* files.

2.2.6 Primary positioning for the survey was provided by a Fugro Starpack system with Starfix G2, HP and XP corrections. Secondary positioning was provided by an Applanix POS MV system with EGNOS corrections. All positions were recorded and expressed as WGS84 UTM Zone 31N coordinates.

2.3 Geophysical Data – Data Quality

2.3.1 All of the provided geophysical data sets were assessed for quality and suitability for archaeological interpretation, and were rated using the following criteria:

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 1: Criteria for Assigning Data Quality Rating

2.3.2 The SSS data were rated as 'Variable' using the above criteria. The data were acquired at a range of 150m per channel which is generally considered to be too low resolution for effective archaeological interpretation, especially with respect to smaller pieces of debris. Although larger, upstanding debris and wrecks will be identified, smaller pieces of debris may not be interpreted and discrimination of features at this range is limited.

2.3.3 Additionally, the degree of overlap between adjacent survey lines was relatively low. This resulted in a number of anomalies only been present on one survey line, as they were positioned either at the extreme extents of the survey range or directly beneath the fish on adjacent lines.

2.3.4 Some lines of data were also found to be heavily affected by weather conditions, which detrimentally affected the data to a significant degree in some areas. Due to the combination of these factors, it cannot be guaranteed that all small features of archaeological potential present within the study area will have been identified.

2.3.5 The SBP data were rated as 'Average' using the above criteria. Generally the data were of good quality with reflectors clearly visible, although some areas were affected by weather conditions, particularly swell, which increased the difficulty of interpretation. However, this was not considered to detrimentally affect the data to a significant degree.

2.3.6 Although two different SBP data sets were acquired during the survey, the interpretation provided by FEMU had been undertaken using the boomer data. As such, this was the data set used for this assessment.

2.3.7 The MBES data were rated as 'Good' using the above criteria, with both large and small scale features clearly visible on the seabed. Some weather effects were identified within the data, but these did not detrimentally affect the interpretation to a significant degree.

2.4 Geophysical Data – Processing

2.4.1 The SSS data were processed by WA using Coda Geosurvey software. This allows 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 study 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.

2.4.2 A mosaic of the SSS data is produced during this process to assess the quality of the sonar towfish positioning. This process allows the position of anomalies to be checked

between different survey lines and for the layback values to be further refined if necessary. In the case of this data set some discrepancies in positioning were identified but, since the data were acquired using USBL positioning, these were not altered further during processing, however, the position of individual anomalies were rectified during the anomaly grouping and discrimination process described below.

2.4.3 The form, size and/or extent of an anomaly is a guide to its potential to be 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.

2.4.4 The SBP data were processed by WA using Coda Seismic+ software. This software allows the data to be visualised with user selected filters and gain settings in order to optimise the appearance of the data for interpretation. The software then allows an interpretation to be applied to the data by identifying and selecting sedimentary boundaries and shallow geological features that might be of archaeological interest.

2.4.5 The SBP data were interpreted with a two-way travel time (TWTT) along the z-axis. In order to convert from TWTT to depth, the velocity of the seismic waves was estimated to be 1,600ms^{-1}. This is a standard estimate for shallow, unconsolidated sediments.

2.4.6 The SBP data were not fully interpreted by WA, but instead a previous interpretation undertaken by FEMU was provided along with the data as part of the Coda Seismic+ *.seizip* project file and used as a basis for the archaeological assessment. This was altered where necessary to reflect the different objectives between the two interpretations, i.e. one identifying deposits of similar type for resource assessment (FEMU) and one identifying features of similar age for archaeological assessment (WA).

2.4.7 The MBES data were analysed to identify any seabed structures that could be shipwrecks or other anthropogenic debris, and to provide a vertical reference for the SBP data. The data were gridded at 1m and analysed using IVS Fledermaus software, which enables 3-D visualisation of the acquired data and geo-picking of seabed anomalies.

2.5 Geophysical Data – Anomaly Grouping and Discrimination

2.5.1 The previous section describes the initial interpretation of all available geophysical data sets which were conducted independently of each other. 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 in the study area.

2.5.2 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 UKHO record, a MBES anomaly and multiple SSS anomalies.

2.5.3 Once all the geophysical anomalies and desk-based information 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. For anomalies located on the seabed, 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 2: Criteria Discriminating Relevance of Seabed Features to Proposed Scheme

2.5.4 Similarly, the discrimination flags applied to shallow geological features of possible archaeological potential are ascribed as follows:

Non-Archaeological	U2	Feature of non-archaeological interest
Archaeological	P1	Feature of probable archaeological interest, either because of its palaeogeography or likelihood for producing palaeoenvironmental material
	P2	Feature of possible archaeological interest

Table 3: Criteria Discriminating Relevance of Palaeogeographic Features to Proposed Scheme

2.5.5 All the sites that have been identified are presented in **Appendix I** and **Appendix II**, and discussed in this report. Recommendations have been made for mitigation measures should the sites be impacted by the proposed development scheme.

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

2.5.7 Any sites which are located outside of the defined study area, either previously recorded in known databases (e.g. UKHO) or identified during this geophysical assessment, are deemed beyond the scope of the current assessment and are subsequently not included in this report.

3 PALAEOGEOGRAPHIC ASSESSMENT

3.1 Geological and Prehistoric Baseline

3.1.1 Area 507 is located off the east coast of Suffolk, within the southern North Sea basin (**Figure 1**). A shallow marine basin has existed in the approximate location of the North Sea since the Early Tertiary period (although the exact location and extent has altered over time), which is reflected in the geology of the region (Cameron *et al*., 1992).

3.1.2 The background geology of the study area is dominated by the London Clay Formation, which is generally Lower Eocene (*c.* 54 – 51Ma) in age although also includes the older, Upper Paleocene (*c.* 54.5 – 54Ma) Harwich Member (Cameron *et al*., 1992). This is a thick, regional deposit of stiff dark or bluish grey clayey silts, silty clays and clays which is

present across much of the southern North Sea. Dewatering of the London Clay Formation over time has created numerous small scale extensional faults which are generally obvious within seismic data and are very characteristic of this unit. The upper surface of the London Clay Formation is erosional, and the unit is unconformably overlain by Pleistocene and Early Holocene sediments.

3.1.3 The Pleistocene history of the southern North Sea is dominated by repeated glacial/interglacial cycles and the effects of the associated rises and falls in relative sea level, which has resulted in large areas of the southern North Sea being periodically exposed as a terrestrial environment (**Figure 2**). This is also represented in the geological record, with distinct terrestrial landscape features being present along with deposits of marine sediment.

3.1.4 Within the greater Thames Estuary, these Pleistocene terrestrial sediments typically occur as widespread river terrace sand and gravels, along with associated bank and overbank deposits. The southern North Sea off the coast of East Anglia is only thought to have been covered by ice during the Anglian Period (*c.* 480,000 – 423,000 Before Present (BP)), and it is interpreted to have been free from ice during subsequent glacial advances. The exact southern extent of the Anglian glaciation is currently debated, although a series of enclosed bathymetric deeps previously identified within multibeam echo sounder data (most notably two large features located between the Shipwash and Inner Gabbard sand banks) have been interpreted as being glacial in origin. This suggests at least a lobe of ice may have extended further south than the established main ice sheet limit (Emu 2009), although this is currently unproven.

3.1.5 Due to this lack of direct influence from glacial ice after the Anglian the Pleistocene sediments within the Outer Thames Estuary area of the southern North Sea are relatively well preserved, and as such the locations and histories of a number of these fluvial systems over time has been interpreted.

3.1.6 Previous bathymetric surveys of the Outer Thames Estuary region has shown a large channel system extending from the entrance of Harwich Harbour, the characteristics of which suggest it is a river system incised during a glacial period and associated sea level lowstand (EMU 2009: 37). This feature, still visible on multibeam bathymetry data as an underfilled channel, has been found to represent a large fluvial braidplain; a river system containing multiple channels and tributaries extending in a relatively linear fashion eastwards from the coast until it reaches a break in slope east of the Greater Gabbard sand bank (Emu 2009). This system has also been previously found to pass through part of the current study area (WA 2012) (**Figure 3**).

3.1.7 This channel system has been interpreted as originally dating from the Cromerian (*c.* 760,000 – 478,000 BP), pre-dating the Anglian glaciation, as it appears to be incised by the interpreted Anglian enclosed deeps (Emu 2009; Dix and Sturt 2011). It is also interpreted to be the original route of the Thames-Medway river system, which was gradually pushed further south to its present location, initially during the Anglian glaciation due to the advancing ice front (Emu 2009).

3.1.8 The earliest evidence for hominin activity in the UK dates to *c.* 970,000 years BP from Happisburgh, Norfolk (Parfitt et al. 2010), and therefore there is the potential for evidence of Palaeolithic activity to exist within Late Pleistocene deposits. Even where there is no evidence of anthropogenic activity, there may be palaeoenvironmental material which can elucidate aspects of the former landscape and environment.

3.1.9 The channel system previously identified running through the study area has been dated to *c.* 720ka BP (EMU 2009: 37), which makes it roughly approximate in age with early hominid activity identified at Pakefield in Norfolk (Parfitt *et al.* 2005). Geophysical and geotechnical survey undertaken at Pakefield demonstrated that the sediments containing the Palaeolithic material could be demonstrated to extend beyond the current shoreline (WA 2006). During periods of sea level change, it is likely that the system was reactivated resulting in cyclical deposition of associated gravel terrace and flood plain deposits laid down in relation to relative sea level, and the same is likely to be true of other similar fluvial systems present within the wider region (WA 2010a).

3.1.10 After warming of the climate and retreat of the ice sheet at the end of the Pleistocene, a terrestrial environment likely still existed within the region around the study area into the Early Holocene. It is possible that the now submerged environment of which the study area was a part was occupied up until the final marine transgression between 8,900 and 5,000 BP.

3.1.11 A sequence of Holocene deposits overlies the Pleistocene sediments, which can be divided into two sections. The first is essentially a continuation of the underlying Pleistocene terrestrial sediments, and can include channel deposits and associated overbank sediments deposited pre-transgression. The second comprises marine sediments (sands, gravels and muds (BGS 1990)) deposited post-transgression.

3.1.12 Within the broader Thames Estuary region, the seabed topography is dominated by numerous sandbanks, which accumulated as a result of the Holocene deposits being swept by tidal currents into ridges parallel with the shoreline. The study area is approximately situated between two of these sandbanks – Shipwash to the west and Inner Gabbard to the east. These late Quaternary deposits were laid down during the present Holocene interglacial, and as such represent the most recent geological history of the study area.

3.1.13 The study area is located within the Central Zone of seabed sediments and morphology as described by Emu (2009), which contains sediments ranging in thickness from a thin veneer of sediment deposited on a relatively flat platform, to large, apparently stable, shore-parallel sand banks. This zone is described as having minimal modern sediment input (Emu 2009); indicating the veneer of seabed sediment could include reworked underlying Pleistocene terrace deposits (BGS 1990, WA 2010a).

3.2 Palaeogeographic Assessment results

3.2.1 A number of palaeogeographic features of archaeological potential were identified within the study area. The identified features are discussed below and further described in **Appendix I**, and their distribution is within the study area is illustrated in **Figure 3**.

3.2.2 As the study area is divided into four completely separate sections, the features identified within each of these sections shall be described separately.

Area 507/1/3/4

3.2.3 Area 507/1/3/4 is the largest of the four study areas and contains the most identified palaeogeographic features. The background geology of the area is dominated by the London Clay Formation, identified within the SBP data by its distinctive faulted internal reflectors. As this formation is Eocene in age, it pre-dates the earliest known Hominid occupation of the UK and as such is not deemed to be of archaeological potential.

3.2.4 A number of younger landscape features have been identified cutting into and deposited on top of the London Clay Formation. The largest of these is a distinct channel feature identified within the southwest corner of the study area (**7500**, **Figure 3**).

3.2.5 This feature trends approximately east-west and is characterised by a well-defined basal reflector and a single phase of acoustically unstructured/blank fill. It is cut partially into the London Clay Formation, and partially into a deposit older than the base of the channel (**7501**) which is present just below the seabed to the east of **7500** (**Figure 4**).

3.2.6 Feature **7500** has been interpreted as a buried palaeochannel, and is likely part of the old Thames - Medway river system extending east from Harwich (Emu 2009) and previously identified within the study area during earlier survey work (WA 2012), and it approximately matches the earlier interpreted location of this channel (**Figure 3**). Feature **7501**, by comparison, has a much poorer defined basal reflector and a fill containing poorly defined internal reflectors. This has been interpreted as possible overbank/channel complex deposits directly associated with channel **7500**.

3.2.7 Two other, smaller, buried palaeochannels (**7511** and **7515**) have been identified trending north – south across the study area. These are similar in form to **7500**, with a well-defined basal reflector and single phase of fill, but are shallower and much narrower. The locations of these features suggest they may have originally been tributaries of channel **7500**, but any confluence that may exist is located outside of the study area.

3.2.8 Feature **7519**, also interpreted as a channel, is located on the southern edge of the study area and is possibly a small section of the northern edge of the main east-west channel, of which **7500** is a part.

3.2.9 As past palaeolandscape features, these palaeochannels are considered to be of high archaeological potential. Since it is likely that they relate to the Thames – Medway river system, they have the potential to contain both *in-situ* and derived archaeological artefacts, alongside material of palaeoenvironmental importance, spanning a period of time from the Cromerian to the Early Holocene.

3.2.10 Additionally, the overbank/channel complex deposits directly associated with channel **7500** (**7501**, plus similar immediately surrounding features **7503**, **7504** and **7505**) are also interpreted as high archaeological potential for the same reasons.

3.2.11 Two small cut and fill feature (**7502** and **7507**) have also been identified within the study area. These are similar in appearance to the larger palaeochannels, but have only been identified on a limited number of survey lines. As such, they have the potential to contain similar deposits and material but, due to their limited lateral extent, are only considered to be of medium archaeological potential.

3.2.12 Finally, a number of thin, extensive, intermittent and poorly defined shallow deposits have been identified across the study area (see **Appendix I** for full list and **Figure 3** for extents). These deposits are characterised by a very poorly defined, often absent, basal reflector and a single phase of acoustically unstructured fill.

3.2.13 These deposits are interpreted as possibly the remains of overbank sediments related to the identified palaeochannels. However, their shallow, uncertain nature means their extents are difficult to define with a high degree of confidence, and they may also contain partially reworked modern seabed material.

3.2.14 These deposits do have the potential to contain archaeological artefacts and palaeoenvironmental material but, due to their apparent poorer preservation relative to feature **7501**, they are characterised as of medium archaeological potential.

Area 507/2

3.2.15 As with Area 507/1/3/4, the background geology of Area 507/2 is dominated by the London Clay Formation, which is considered too old to be of archaeological potential. The major shallow geological feature identified within Area 507/2 is a distinct, east – west trending cut and fill feature (**7526**, **Figure 3**).

3.2.16 This feature appears similar to the large channel identified within Area 507/1/3/4, but with some differences. The basal reflector is generally not as well-defined, and, especially towards the centre of the feature, the edges have not been identified at all. This suggests it may be a larger geological deposit rather than a fluvial/palaeolandscape feature.

3.2.17 BGS data indicates the presence of Pliocene outcrops closer to shore than the study area, although one large such outcrop extends further from the coastline to the northern end of Shipwash sand bank. Similarly, Palaeocene outcrops are present from the coastline to the south of Shipwash (Cameron *et al.* 1992).

3.2.18 It is possible that **7526** represents an outlier of one of these deposits, possibly the Pliocene Red or Coralline Crag Formations. If so, the feature would pre-date the earliest known Hominid occupation of the UK and as such be too old to be of archaeological potential. However, it does have some features in common with a fluvial channel and it is possible that, even if it does contain Pliocene deposits, the softer sediments relative to the surrounding London Clay will have created a preferable erosive path for later channel features. Due to this uncertainty, it is interpreted as medium archaeological potential.

3.2.19 Along the west of Area 507/2, two small channel features (**7523** and **7525**) have been identified cutting into London Clay and feature **7526** respectively. Previous work in the area (Emu 2009, **Figure 3**) indicate that these are both part of a northern extension of channel **7511** identified within Area 507/1/3/4. As such, they are interpreted as being related to the wider Thames – Medway channel system and are of high archaeological potential.

3.2.20 A small area of possible overbank deposits, **7524**, was identified to the north of **7523**, and is possibly directly related to the channels in the area. This feature is interpreted as of medium archaeological potential.

Area 507/5

3.2.21 No surviving deposits of archaeological potential were identified within Area 507/5. However, MBES data indicates an underfilled channel, along with a possible small tributary, cutting east – west across the centre of the study area (**7527**, **Figure 3**).

3.2.22 Previous work has indicated this is likely to be related to the same Thames – Medway river system as the previously identified channels within Area 507/1/3/4 and Area 507/2, although here there do not seem to be any surviving fill sediments within the feature. Some sediments were identified along sections of the southern edge of the feature, but these were found by MBES data to represent bands of mobile seabed sediment.

3.2.23 Although the feature relates to the Thames – Medway river system, the apparent lack of associated sediments reduces the archaeological potential. However, it is still possible

that a small layer and/or pockets of fluvial or related sediments do survive, and as such the feature is interpreted as being of medium archaeological potential.

Area 507/6

3.2.24 As with the other study areas, Area 507/6 is dominated by the London Clay Formation which is considered too old to be of archaeological potential. However, a distinct, sinuous, north – south trending channel feature has been identified cutting into the London Clay within Area 507/6 (**7529**, **Figure 3**).

3.2.25 As with the previously identified channels, feature **7529** is characterised by a relatively distinct basal reflector and a single phase of acoustically unstructured fill. It is tentatively associated with a previously identified channel in this area (Emu 2009, **Figure 3**), although a channel of the size of **7529** has not previously been identified in this area.

3.2.26 A second, similar, smaller channel (**7530**) has been identified trending approximately east – west across the southern area of Area 507/6. Both of these features appear to flow into a third, underfilled channel (**7528**) in the southernmost corner of the study area. Although described as a separate feature, this **7528** is likely to be part of the same channel system and previous work indicates it is likely to be the northern edge of the main Thames – Medway river channel.

3.2.27 Of these features, channels **7529** and **7530** are interpreted as being of high archaeological potential, and could contain both in-situ and derived archaeological artefacts and material of palaeoenvironmental interest. Feature **7528**, although originally part of the same channel system, is interpreted as being of medium archaeological potential due to the apparent lack of preserved fill sediments within it.

3.2.28 Also situated within Area 507/6, between channels **7529** and **7530** and to the east of **7529** are two areas of possible shallow deposits (**7531** and **7532**). These are characterised by a very poorly defined, often absent, basal reflector and a single phase of acoustically unstructured fill. The deposits are also intermittent (especially **7532**), and their extents could not be definitively determined. They have been interpreted as possible overbank deposits associated with the identified channels, although they may contain some reworked seabed sediment. Due to this, and their uncertain extents, they have been classified as of medium archaeological potential.

4 SEABED FEATURES ASSESSMENT

4.1 Archaeological Baseline

4.1.1 Since the study area was submerged by marine transgression in the Early Holocene, the archaeological potential of the area from this period onwards is purely maritime in nature. In particular, this relates to the use of the east coast trade routes and military activity within the North Sea, primarily during WWI and WWII. A number of UKHO wreck records are present in and around the study area, all of which are post 1815 in date (WA 2012).

4.1.2 This period is undoubtedly one of the most dramatic in terms of development in shipbuilding. It was during this period that metal became prevalent in ship construction, starting as composite vessels where metal replaced some of the wooden parts. Then this was followed by complete metal structures. Following this was the change from sail to firstly steam power then later diesel engines as these new technologies provided the means of propulsion that powered the vessels of the industrial revolution. This change to

metal shipbuilding also increased the chances of a wrecks survivial after loss, as a metallic hull is more resistant to degradation than one made of wood.

4.1.3 During the early stages of this period, up to 1887 the sea trade in the UK grew by an average of 4.2% per year (WA 2010b). The majority of the goods being traded around the UK were associated with the industrial output and included bulk cargos of fuel and raw materials. The East coast was especially prevalent within the coal trade as the towns and cities of the North East supplied London with its coal. The study area lies within the parameters of these trade routes (WA 2003).

4.1.4 This increase in trade also saw the increase in the number of voyages made. Between 1876 and 1913 the UK ports recorded a 12% increase in the number of vessels.

4.1.5 The modern period is also characterised by the two World Wars of the 20th century, which saw a sudden rise in military activity for two relatively short periods. As the region encompassing the study area borders the Thames estuary to the south and because the east coast trade for London had to pass through it, it attracted intensive enemy action throughout both wars. This took the form of attacks by submarine, aircraft and most commonly mines. Great defensive belts of mines were laid during both World Wars to defend the east coast and coastal shipping and the entrance to the Thames estuary.

4.1.6 WWI saw the first systematic attempt to destroy British coastal trade, and between February and April 1917 well over a million tonnes of British merchant shipping was sunk, comprising more than 500 ships, much of which occurred in coastal waters (Hewitt 2008: 17). With the East coastal trade route facilitating the transport of cargos from the North to London, the single largest consumption for fuel in England (Hewitt 2008: 7).

4.1.7 To protect the maritime trade upon which Britain relied, WWI saw the introduction of coastal convoys, whereby steaming merchant vessels were escorted in groups by warships (Hewitt 2008: 17). The first convoys began on the east coast, and their use continued into WWII in an attempt to transform the east coastal trade route into an indestructible highway (Hewitt 2008: 17, 23). This is seen by the large amount of merchant vessels lost during wartime, by an action deemed an act of war like torpedoed or mined etc., that make up the known wreck losses provided both by the UKHO and NRHE respectively.

4.1.8 The combination of more accurate casualty recording and the more favourable preservation potential of metal hulled vessels mean that the confidence level that can be ascribed to this assessment of the modern period on the basis of the known resource is higher than that of preceding periods. However, for much of the 19th century and to some extent, the early to mid-20th century (particularly the two world wars) the quality of positional information being recorded was variable. Additionally, the partial use of wooden hulled vessels, particularly of small local craft which are unlikely to have been viewed to merit recording when lost, may also be present in the study areas.

4.2 Seabed Features Assessment Results

4.2.1 A number of seabed features of possible archaeological potential were identified within the study area. These are described below and in detail in **Appendix II**, and their distribution illustrated in **Figures 5** to **8**. Where wreck dimensions are given in the descriptions, the height values are measure from the base of any surrounding scour.

4.2.2 As with the palaeolandscape results, the different sub-areas of Area 507 are described independently below. Additionally, it is noted whether anomalies are located within the licence area boundary or inside the 500m buffer zone.

4.2.3 The entire study area is covered by seabed sediment of varying thickness, ranging from a thin veneer to thicker, mobile sand areas containing sand ripples and small sand waves. Within these areas of thicker mobile seabed sediment, it is possible that some debris may be buried. Due to this, the lack of magnetometer data for this assessment (which could identify buried ferrous material), and the data limitations outlined in Section 2.3, it cannot be guaranteed that all material of archaeological potential have been identified within the study area.

Area 507/1/3/4

4.2.1 A total of 50 seabed anomalies of possible archaeological potential have been identified within Area 507/1/3/4 (**Figure 5**). These have been classified as shown in **Table 4**:

Archaeological Discrimination	Quantity	Interpretation
A1	18	Anthropogenic origin of archaeological interest
A2	30	Uncertain origin of possible archaeological interest
A3	4	Historic record of possible archaeological interest with no corresponding geophysical anomaly
Total	**52**	

Table 4: Seabed Features of Archaeological Potential (Area 507/1/3/4)

4.2.2 Furthermore, these anomalies can be classified by probable type, which can further aid in the assigning of archaeological potential and importance (**Table 5**):

Feature Classification	Quantity
Recorded Wreck	4
Wreck	9
Debris / Debris Field	24
Mound	1
Seafloor Disturbance	2
Dark Reflector	11
Bright Reflector	1
Total	**52**

Table 5: Types of Seabed Feature Identified (Area 507/1/3/4)

4.2.3 As outlined in **Table 5**, a total of nine wrecks were identified within Area 507/1/3/4 – Four within Area 507/1 (**7008**, **7019**, **7022** and **7025**), one within Area 507/3 (**7037**), one within Area 507/4 (**7049**) and three within the buffer zone (**7032**, **7039** and **7050**). All of these wrecks are classified as of high archaeological potential.

4.2.4 Wreck **7008**, located within the western area of Area 507/1, is a relatively poorly defined structure identified as a large, NNE-SSW orientated debris field and surrounding scattered debris (**Sheet 1**). The main debris field has two mounds, with the largest (southern) mound displaying significant height, although no real coherent structure is visible. The whole wreck area measures approximately 114.7m x 60.9m x 4.5m, which includes the surrounding scattered debris as no definite distinction could be made between this and the main wreck.

4.2.5 This previously recorded wreck is reported to be that of the *Old Charlton* (UKHO 14711), a British steam ship lost on the 27th February 1941 whilst on passage from Hartlepool to London, after being bombed by German aircraft. The wreck was subsequently located and dispersed, which explains the current poor condition of the vessel – specifically, the original dimensions of the vessel were 73.2m x 11m x 5.5m which appears to have significantly increased due to debris spread and general structural degradation.

4.2.6 Additionally, MBES data indicates the area directly around wreck **7008** has been dredged previously at an unknown date. The data indicates little or no allowance was made for the existence of the wreck, and it is likely that it has been directly impacted by dredging in the past.

4.2.7 Wreck **7019**, located towards the centre of Area 507/1, is a distinct wreck site orientated approximately ENE – WSW and situated within a large NNE – SSW trending scour (**Sheet 2**). The wreck appears relatively upright and intact, displaying some structure and significant height, and measures approximately 84.4m x 22.9m x 7.7m. No debris field or individual pieces of detached debris have been definitively identified associated with the wreck.

4.2.8 This wreck has been previously identified and recorded as UKHO record 14709, although it has not been identified and remains unnamed. Because of this no further information of the nature of the vessel is available, although the generally intact nature of the structure and previous survey information suggests it is steel hulled.

4.2.9 Wreck **7022**, located towards the eastern end of Area 507/1, is a distinct wreck site orientated approximately E –W and situated within a large, NNE – SSW trending scour (**Sheet 3**). The wreck appears upright and relatively intact, displaying some structure and significant height, and measures approximately 101.5m x 32.7m x 12.0m. No debris field or individual pieces of detached debris have been definitively identified associated with the wreck.

4.2.10 The wreck is recorded as being that of the *Coal Gas* (previously the *George Allen*) (UKHO 14710), a British collier lost on 5th March 1918 after detonating a mine whilst en-route to London. Little data on the vessel is provided within the UKHO record, but previous surveys have identified a large magnetic anomaly suggesting a steel hull and a possible gun mounted on the stern. Past diver surveys have indicated the structure is generally intact, but collapsed between the bow and mid-ships.

4.2.11 Wreck **7025**, located on the eastern edge of Area 507/1, is a distinct wreck site orientated E- W with a distinct scour extending SSW from the western end (**Sheet 4**). The wreck is possibly upright but is fairly broken up, and appears partially buried at the eastern end, measuring approximately 101.5m x 38.8m x 8.0m. Significant height and some structure are visible, although some debris has been identified within the vicinity which, coupled with the partially buried nature of the eastern end, makes defining the exact extents of the wreck difficult. One particularly large piece of debris (**7026**) was identified a few metres north of the western end and is possibly related. As such, this has also been classified as being of high archaeological potential.

4.2.12 This wreck is recorded to possibly be that of the *Estrella* (UKHO 14706), a British steam ship lost on 5th March 1918 after detonating a mine whilst on passage from Le Havre to the Tyne. Little data on the vessel is provided within the UKHO record, but previous surveys have identified a large magnetic anomaly suggesting a steel hull. MBES data also indicate it is located on the edge of a previously dredged area, and could have been directly impacted by past dredging.

4.2.13 Wreck **7032**, located within the buffer zone between Area 507/1 and Area 507/3, is a distinct wreck site orientated NNW - SSE and situated within a large NNE – SSW trending scour (**Sheet 5**). The wreck measures approximately 92.0m x 32.9m x 12.0m and appears to be bent, with the SE section curving away to a different orientation to the rest of the structure. It is possible that this represents a break towards the centre of the wreck, and there are two separate pieces with debris between them.

4.2.14 Besides the possible break, the wreck appears relatively upright and intact, displaying structure and significant height. A small debris field has been identified along the eastern edge of the structure, and has been tagged separately (**7033**) as the distinction between debris and main wreck structure is quite apparent. As associated debris, **7033** has also been interpreted as of high archaeological potential.

4.2.15 This wreck has been previously identified and recorded as UKHO record 14721, although it has not been identified and remains unnamed. Because of this no further information of the nature of the vessel is available, although the generally intact nature of the structure and previous survey information suggests it is steel hulled.

4.2.16 Wreck **7037**, located approximately 175m east of **7032** and just inside Area 507/3, is a distinct wreck site orientated NNE – SSW with a small scour at the northern and southern edges (**Sheet 6**). The wreck measures approximately 89.2m x 32.7m x 8.5m, and appears possibly upright but relatively broken up. Some structure and height is visible, and no distinct debris field was identified, although part of the western side appears to have collapsed outwards.

4.2.17 The wreck has been previously identified and recorded as UKHO record 14720, although it has not been identified and remains unnamed. Because of this no further information of the nature of the vessel is available, although previous survey information suggests it is steel hulled, despite the lack of recent magnetometer data.

4.2.18 Wreck **7039**, located in the buffer zone north of Area 507/4, is a distinct wreck site orientated NNE – SSW with a small, shallow scour extending from each end of the structure along the same orientation (**Sheet 7)**. MBES data also indicates a possible broad, shallow, semi-circular depression along the western side, although this is unclear. The wreck appears upright and intact, measuring approximately 85.9m x 12.3m x 7.0m, and displays significant height and some structure. No debris fields were visible, but three distinct pieces of possible debris (**7040**, **7041** and **7042**) were identified immediately to the west and north of the wreck. As associated debris, these have also been classified as of high archaeological potential.

4.2.19 The wreck is recorded to be of the *Forth* (UKHO 14731), a British steam ship originally built in 1886. The vessel was lost on the 9th December 1916 whilst on passage to Leith from London, after detonating a mine laid by German submarine *UC-11*. Past diver surveys of the wreck have confirmed its identity as the *Forth*.

4.2.20 Wreck **7049**, located towards the southeast corner of Area 507/4, is a small, relatively poorly defined feature orientated NNE – SSW (**Sheet 8**). This wreck appears as an elongate mound, measuring approximately 16.0m x 13.0x x 1.7m, with a small depression to the south and is possibly partially buried at its northern end. No definite structure is visible, and no debris field was identified surrounding the structure.

4.2.21 This structure is located approximately 95m east of the recorded location of the HMS *Forward III* (UKHO 14716), a British drifter lost on the 31st March 1917 after detonating a mine. The UKHO record indicates the vessel has not been found at the recorded location

during previous surveys, and as such has been 'disproved'. However, the dimensions of the original vessel are reported to have been only 25.6m x 6.1m x 2.7m, and so it is possible that wreck **7049** represents the degraded, partially buried remains of the HMS *Forward III*.

4.2.22 Wreck **7050** is located within the buffer zone east of Area 507/4, and is a distinct wreck site generally orientated NE – SW and situated within a large, NNE – SSW trending scour (**Sheet 9**). The wreck is in two distinct pieces, with a gap of approximately 10m (and a total 20m lateral offset) between them, with both sections lying on slightly different orientations. Besides being in two pieces, the wreck appears upright and relatively intact, with height and structure visible, although the western section appears larger and more intact than the eastern section. A small debris field is located between the two sections, and both sections plus the debris field have been classified as a single feature, despite being separate objects, to match the single UKHO record associated with the wreck. The dimensions of the entire site are approximately 66.8m x 45.9m x 7.5m.

4.2.23 The wreck has been previously identified and recorded as UKHO record 14730, although it has not been identified and remains unnamed. Because of this no further information of the nature of the vessel is available, although previous survey information suggests it is steel hulled, despite the lack of recent magnetometer data.

4.2.24 In addition to these wrecks (and any associated debris already described), four pieces of debris (**7000**, **7005**, **7047** and **7030**) have been classified as being of high archaeological potential. Anomaly 7000, located within the buffer zone to the east of Area 507/1, is a relatively small but distinct, elongate dark reflector with shadow measuring approximately 13.5m x 5.0m x 1.3m and located within an elongate depression or scour (**Sheet 10**).

4.2.25 This has been interpreted as a piece of debris, and is situated approximately 90m SE of UKHO record 14704, which is described as "a small piece of wreckage", measuring approximately 20m. Despite the differences in dimensions, no anomaly was identified at the recorded location of UKHO 14704, and it is possible that anomaly **7000** represents the wreckage described in this record.

4.2.26 Anomaly **7005** is a distinct, irregular object within a distinct but relatively shallow scour, located within Area 507/1 and measuring approximately 12.2m x 9.3m x 0.5m (**Sheet 11**). The anomaly is located approximately 20m south of UKHO recorded obstruction 65639, and likely represents this obstruction. The record describes the anomaly as a container, although there is no further information, either within the UKHO record or the current geophysical data, to confirm or deny this interpretation. As such, it is classified for the purposes of this assessment as debris and as of possible high archaeological potential.

4.2.27 Anomaly **7030**, situated within Area 507/1, is two adjacent dark reflectors with shadows within a small depression measuring approximately 12.3m x 10.1m x 0.2m (**Sheet 12**). This has been interpreted as a small debris field, and is approximately 70m east of UKHO record 14714. This record describes and "area of debris" at the recorded location and the identified debris field probably represents this debris.

4.2.28 Anomaly **7047**, located within the buffer zone south of Area 507/4, is an elongate mound within a depression, measuring approximately 16.2m x 4.5m x 1.2m (**Sheet 13**). This anomaly was originally identified by FEMU during the processing of the current dataset, and designated UKHO record number 82878. No further details are available, and the anomaly has been classified here as a possible piece of debris.

4.2.29 Another 13 anomalies identified within the Area 507/1/3/4 study area have been classified as individual pieces of debris. Of these, anomalies **7017**, **7018**, **7020**, **7021**, **7029**, **7031**, **7038** and **7048** are located within the licence area, and **7001**, **7004**, **7034**, **7046** and **7051** are located within the buffer zone.

4.2.30 All of these are irregular dark reflectors, often with shadows and associated scour, which appear different to the natural seabed and surrounding geology. Anomalies **7021** and **7034** are related between wreck sites (**7019** and **7022**, and **7033** and **7037** respectively) although it is not clear whether or not they are related. Anomaly 7017 is a particularly large, curvilinear feature, measuring approximately 43.0m x 0.7m x 0.2m, and is potentially a significant piece of partially buried debris.

4.2.31 Additionally two debris fields, **7044** (within the licence area) and **7028** (within the buffer zone), have been identified in addition to those previously described associated with wreck sites. These are areas of irregular, relatively poorly defined dark and bright reflectors and possibly represent partially buried debris.

4.2.32 All of these pieces of debris and debris fields have been interpreted as of medium archaeological potential.

4.2.33 One large mound feature (**7003**) has been identified, located within the buffer zone to the west of Area 507/1. This is a complex feature, and comprises a distinct, elongate mound with two separate peaks and two curvilinear ridge features extending south from the east end of the mound. The entire site measures approximately 170.0m x 133.0m x 1.8m, and is of an unknown origin. It appears different to any other natural feature identified elsewhere within the study area, but could be a natural feature or indicate buried debris.

4.2.34 Two areas of seafloor disturbance, **7010** (within the licence area) and **7014** (within the buffer zone) have been identified within the Area 507/1/3/4 study area. These are relatively poorly defined areas of irregular seabed, possibly containing small objects that could represent natural changes in the seabed, anthropogenic disturbance (e.g. trawling or dredging) or debris buried just below the seabed.

4.2.35 A total of 11 anomalies have been interpreted as dark reflectors, six of which (**7006**, **7007**, **7023**, **7024**, **7043** and **7044**) lie within the licence area and five of which (**7002**, **7015**, **7027**, **7035** and **7036**) lie within the buffer zone. These are relatively small features, all with shadows and some located within small depressions or scours, the nature and origins of which are uncertain. All could be either natural features such as boulders, or small pieces of debris.

4.2.36 A single bright reflector, **7009**, was identified within the licence area. This could represent a piece of debris that absorbs acoustic waves instead of reflecting them (e.g. saturated wood or synthetic material), or it could be a natural feature (e.g. small ill-defined depression).

4.2.37 Four recorded wreck locations, **7011**, **7012**, **7013** and **7016**, were identified within the study area, all within Area 507/1. Record **7011** (UKHO 14683) is the recorded location of both the *Foreland* and the *Huguenot*, both British steam ships mined and lost in 1917 and 1916 respectively. Neither has been found by previous surveys in the vicinity of the recorded location.

4.2.38 Record **7012** (UKHO 14681) is the recorded location of the wreck of the HMS *Strymon*, a British trawler lost in 1917. The wreck has not been found by previous surveys in the vicinity of the recorded location.

4.2.39 Record **7013** (UKHO 14692) is the recorded location of the wreck of the *Tusnastabb*, a Norwegian steam ship lost in 1918 after detonating a mine. The original position was recorded shortly after loss in 1918, but subsequent surveys of the area surrounding the recorded location have not identified a vessel.

4.2.40 Record **7016** (UKHO 14705) is the recorded location of the wreck of the *Coal Gas*, which has also been attributed to the wreck previously described under number **7022**. Previous surveys have not identified a wreck at this location, and it is unclear whether this is a misplaced record associated with wreck **7022** or whether it represents a separate wreck entirely.

4.2.41 None of the above recorded wrecks have been identified at their recorded positions within the current geophysical data set. It is likely that they are either misplaced records associated with some of the currently unnamed wrecks identified within the study area, or they are actually located elsewhere outside of the study area boundaries.

Area 507/2

4.2.42 A total of 12 seabed anomalies of possible archaeological potential have been identified within Area 507/2 (**Figure 6**). These have been classified as shown in **Table 6**:

Archaeological Discrimination	Quantity	Interpretation
A1	3	Anthropogenic origin of archaeological interest
A2	8	Uncertain origin of possible archaeological interest
A3	1	Historic record of possible archaeological interest with no corresponding geophysical anomaly
Total	**12**	

Table 6: Seabed Features of Archaeological Potential (Area 507/2)

4.2.43 Furthermore, these anomalies can be classified by probable type, which can further aid in the assigning of archaeological potential and importance (**Table 7**):

Feature Classification	Quantity
Recorded Wreck	1
Wreck	2
Debris / Debris Field	2
Seafloor Disturbance	1
Dark Reflector	5
Bright Reflector	1
Total	**12**

Table 7: Types of Seabed Feature Identified (Area 507/2)

4.2.44 As outlined in **Table 7**, two wrecks were identified within Area 507/2 - one within the buffer zone (**7052**) and one just inside the licence area (**7061**). Both of these wrecks are classified as of high archaeological potential.

4.2.45 Wreck **7052** is a distinct wreck site orientated NNE – SSW, with a distinct scour observed along the same orientation (**Sheet 14**). The wreck is probably upright, and exhibits significant height and some structure, but appears to be relatively broken up and possibly partially buried. The main structure is clearly broken into two sections, with each section being on a slightly different orientation and an approximately 10m gap between the two.

4.2.46 This is recorded as the wreck of the *Polgarth* (UKHO 10184), a British steam ship lost on the 1st March 1942 after detonating a mine whilst on passage from Blyth to Southampton. The wreck was subsequently dispersed, which will partially explain the current broken up appearance of the structure. The wreck was originally recorded as possibly being two separate vessels, although it is now thought to represent a single broken wreck.

4.2.47 Wreck **7061** is a distinct wreck site located in the north-eastern corner of the Area 507/2 licence area, and was identified orientated approximately NNW – SSE and situated within a distinct NNE – SSW trending scour (**Sheet 15**). The wreck appears to be upright and relatively intact, measuring approximately 95.2m x 29.3m x 8.5m, displaying significant height and structure, although there is evidence for degradation and break-up of the wreck. A single, distinct piece of debris (**7062**) has been identified immediately to the northwest of the vessel and is possibly related. As such, **7062** has been classified as of high archaeological potential.

4.2.48 The wreck has been previously identified and recorded as UKHO record 10204, although it has not been identified and remains unnamed. Because of this no further information of the nature of the vessel is available, although previous survey information suggests it is steel hulled.

4.2.49 In addition to these wrecks, a number of other features of archaeological potential have been identified with Area 507/2. An additional piece of debris, **7053**, was identified within the buffer zone approximately 75m west of wreck **7052**. Although relatively close to the wreck, it could not be determined whether it was associated and so is classified as of medium archaeological potential.

4.2.50 One area of seafloor disturbance, **7055**, has been identified within the buffer zone to the east of the licence area. This is a relatively poorly defined area of irregular seabed, possibly a depression containing small objects, which could represent natural changes in the seabed, anthropogenic disturbance (e.g. trawling or dredging) or debris buried just below the seabed.

4.2.51 Five of the anomalies identified within Area 507/2 have been classified as dark reflectors, four of which (**7054**, **7058**, **7059** and **7060**) are located within the licence area and one (**7063**) within the buffer zone. These are relatively small features, all with shadows and generally located within small depressions or areas of seafloor disturbance, the nature and origins of which are uncertain. All could be either natural features such as boulders, or small pieces of debris.

4.2.52 A single bright reflector, **7056**, was identified within the buffer zone. This could represent a piece of debris that absorbs acoustic waves instead of reflecting them (e.g. saturated wood or synthetic material), or it could be a natural feature.

4.2.53 A single recorded wreck location, **7057**, is also located within the buffer zone. This record, UKHO 10197, is for an unnamed vessel added to the charts in 1919. In 1926 it was assessed as possibly being a record associated with the *Princess Marie Cecile*, thought to be located approximately 1km WNW (outside of the study area).

4.2.54 No evidence for a wreck was identified at the recorded location within the current data set, and MBES data suggests the seabed at the recorded location has previously been dredged. If this is the case, and should a wreck have been present, it is likely (although not guaranteed) that material would have been found during past dredging operations and a wreck confirmed at this location.

Area 507/5

4.2.55 Only three seabed anomalies of possible archaeological potential have been identified within Area 507/5 (**Figure 7**). These have been classified as shown in **Table 8**:

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

Table 8: Seabed Features of Archaeological Potential (Area 507/5)

4.2.56 Furthermore, these anomalies can be classified by probable type, which can further aid in the assigning of archaeological potential and importance (**Table 9**):

Feature Classification	Quantity
Debris / Debris Field	1
Seafloor Disturbance	1
Dark Reflector	1
Total	**3**

Table 9: Types of Seabed Feature Identified (Area 507/5)

4.2.57 No wreck sites were identified within Area 507/5 or within its associated buffer zone, and no previously recorded wrecks are located within the area.

4.2.58 A single piece of debris, **7064**, was identified within the buffer zone to the east of the licence area. These are two distinct, immediately adjacent dark reflectors with shadows located within a small depression, and possibly represent two exposed pieces of the same partially buried feature.

4.2.59 A single area of seafloor disturbance, **7065**, was identified within the licence area. This was identified as a distinct irregular depression, which possibly contains an object or objects but this could not be definitively determined from the data. This could be a natural feature or indicate partially buried debris.

4.2.60 A single dark reflector, **7066**, was identified just inside the buffer zone to the east of the licence area. This is a relatively small feature with a shadow and located within a small depression, the nature and origin of which are uncertain. It could be either a natural features such as a boulder, or a small piece of debris.

Area 507/6

4.2.61 A total of eight seabed anomalies of possible archaeological potential have been identified within Area 507/6. These have been classified as shown in **Table 10**:

Archaeological Discrimination	Quantity	Interpretation
A1	2	Anthropogenic origin of archaeological interest
A2	6	Uncertain origin of possible archaeological interest
A3	0	Historic record of possible archaeological interest with no corresponding geophysical anomaly
Total	**8**	

Table 10: Seabed Features of Archaeological Potential (Area 507/6)

4.2.62 Furthermore, these anomalies can be classified by probable type, which can further aid in the assigning of archaeological potential and importance (**Table 11**):

Feature Classification	Quantity
Wreck	1
Debris / Debris Field	2
Dark Reflector	5
Total	**8**

Table 11: Types of Seabed Feature Identified (Area 507/6)

4.2.63 As outlined in **Table 11**, one wreck, **7073**, was identified within Area 507/6. This wreck was situated within the buffer zone to the west of the licence area, and is a relatively poorly defined feature with dimensions 45.7m x 17.8m x 2.9m orientated NW – SE situated within a distinct, elongate, NNE – SSW trending depression or scour (**Sheet 16**). The wreck exhibits some height and structure, but is relatively low lying and is likely to be broken up and partially buried. A distinct piece of debris (**7074**) has been identified to the east of the wreck, and is likely a related detached piece of structure. Due to this, **7074** has also been classified as of high archaeological potential.

4.2.64 The wreck is recorded as being that of the *Warrenpoint* (UKHO 14738), a British steam ship lost on the 28th February 1908 following a collision with the German vessel SS *Schwalbe* whilst on passage from Boston to Dunkirk. The wreck is recorded as being steel hulled, and previous diver surveys have confirmed the broken up nature of the vessel. The separate piece of debris (**7074**) may represent a previously reported detached section of the bow, although this is uncertain from the data.

4.2.65 In addition to this wreck and associated debris, another piece of debris (**7067**) has been identified within the licence area. This is an elongate object located within a small depression and surrounding seafloor disturbance, and may be partially buried.

4.2.66 The remaining five anomalies identified within Area 507/6 have been classified as dark reflectors, three of which (**7069**, **7071** and **7072**) are located within the licence area and two (**7068** and **7070**) within the buffer zone. These are relatively small features, all with shadows and generally located within small depressions or areas of seafloor disturbance, the nature and origins of which are uncertain. All could be either natural features such as boulders, or small pieces of debris.

4.2.67 No previously recorded wrecks or obstructions (in addition to the *Warrenpoint*) are located within Area 507/6.

5 ARCHAEOLOGICAL MITIGATION

5.1.1 With regards to mitigation of archaeology, the marine planning authority, working with the relevant regulator and advisors, takes account of the desirability of sustaining and enhancing the significance of heritage assets and adopts a general presumption in favour of the conservation of designated heritage assets within an appropriate setting (HM Government 2011; DCALG 2012).

5.1.2 A number of features of archaeological potential, both on the seabed and within the shallow geology, have been identified within the study areas. Area 507 is a proposed aggregate extraction area, meaning the proposed commercial activities will involve direct removal of material from the seabed. Obviously, removal of material in such a manner is potentially very destructive to any shallow or surficial archaeological deposits and steps must be taken to mitigate the potential impact upon such deposits whenever it is feasible.

5.1.3 From a palaeogeographic perspective, a number of palaeolandscape features of archaeological potential have been identified within Area 507. The area represents part of a preserved prehistoric landscape, comprising a complex river system and associated deposits alongside possible areas of preserved terrestrial deposits.

5.1.4 These deposits are likely to be part of the old Thames – Medway river system, and have the potential to contain *in-situ* and derived archaeological and palaeoenvironmental material, potentially dating from a period of time spanning from the pre-Anglian (Cromerian) to the Early Holocene.

5.1.5 The seabed sediments within the study area are generally relatively thin, and have the potential to include reworked sediment originating from these underlying Pleistocene deposits. As such, there is also the possibility for archaeological material to be present within the sediment targeted for dredging, indicating the potential impact upon such archaeological deposits is this area is relatively high.

5.1.6 From a palaeogeographic and prehistoric perspective, since there is the potential for archaeological and palaeoenvironmental material to be present within the target resource, complete avoidance of the identified palaeogeographic features and their associated sediments is unfeasible. As such, it is recommended that, should any objects of archaeological interest (e.g. lithic artefacts, peat etc.) be recovered during dredging operations, they should be reported using the established Marine Aggregate Industry *Protocol for Reporting of Finds of Archaeological Interest* (BMAPA and EH 2005).

5.1.7 A total of 12 wrecks, plus four large pieces of debris, deemed to be of high archaeological potential have been identified within Area 507. Due to the significant potential impact of aggregate extraction upon these features, it is recommended that 50m exclusion zones be placed around all features that lie within the licence area. This will apply to the following wreck sites (also illustrated in **Figures 5** to **8**):

Licence Area	WA ID	UKHO ID	Recommended Exclusion Zone		
			Centroid Latitude (WGS84)	Centroid Longitude (WGS84)	Exclusion Zone Details
Area 507/1	7008	14711	51° 57.805 N	01° 40.152 E	50m around wreck boundary.
	7005	65639	51° 56.865 N	01° 40.425 E	50m around wreck boundary.
	7019	14709	51° 57.766 N	01° 42.240 E	50m around wreck boundary.
	7022	14710	51° 57.769 N	01° 42.821 E	50m around wreck boundary.
	7025	14706	51° 57.588 N	01° 43.748 E	50m around wreck boundary.
	7030	14714	51° 58.219 N	01° 42.952 E	50m around single point.
Area 507/2	7061	10204	52° 01.613 N	01° 44.471 E	50m around wreck boundary.
Area 507/3	7037	14720	51° 58.560 N	01° 43.789 E	50m around wreck boundary.
Area 507/4	7049	14716	51° 58.353 N	01° 47.471 E	50m around wreck boundary.
Area 507/6	7073	14738	51° 59.317 N	01° 51.595 E	50m around wreck boundary.

Table 12: List of Sites Recommended for 50m Exclusion Zones

5.1.8 This list includes any wreck completely within the buffer zone, the 50m exclusion zone of which partially extends within a licence area (e.g. wreck **7073**). It also includes any debris found immediately associated with the wreck sites and classified as of high archaeological potential, the positions of which have been taken into account and the exclusion zones extended as necessary.

5.1.9 Regarding the four A3 recorded wrecks situated in Area 507/1/3/4, no archaeological exclusion zones are recommended at this time. Each of the wreck records was based on a ship loss record and none of the wrecks have been identified in this or any previous survey. Also, as the four records relate to substantial WW1 wrecks, it is considered that there would be evidence in the geophysical data. Although no archaeological exclusion zones are recommended, these positions should be noted and any artefacts from these areas should be reported through the Marine Aggregate Industry *Protocol for the Reporting of Finds of Archaeological Interest.* If any finds are found in the future associated with these positions then further investigations may be required.

5.1.10 The remainder of the identified anomalies are identified as A2: of uncertain origin of possible archaeological interest. No exclusion zones are recommended but their positions should be noted, particularly those within licence areas. Should any objects of archaeological interest be recovered during dredging operations, they should be reported using the established Marine Aggregate Industry *Protocol for Reporting of Finds of Archaeological Interest*.

6 REFERENCES

British Geological Survey 1990, *British Geological Survey 1:250,000 Series, Thames Estuary, Sheet 51°N - 00°, Seabed Sediments and Quaternary Geology*, Copyright NERC 1990

British Marine Aggregate Producers Association and English Heritage 2003, *Marine Aggregate Dredging and the Historic Environment*, BMAPA/EH guidance note, prepared by Wessex Archaeology

British Marine Aggregate Producers Association and English Heritage 2005, *Protocol for the Reporting of Finds of Archaeological Interes*t, BMAPA/EH reporting protocol, prepared by Wessex Archaeology

Cameron, T.D.J, Crosby, A, Balson, P.S, Jeffery, D.H, Lott, G.K, Bulat, J. and Harrison, D.J. 1992, *The Geology of the Southern North Sea*. British Geological Survey United Kingdom Offshore Report, London HMSO

Department for Communities and Local Government, 2012, National Planning Policy Framework, March 2012 Available online (accessed on 05/02/2014): https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/6077/2116950.pdf

Dix, J.K. and Sturt, F. 2011. *The Relic Palaeo-landscapes of the Thames Estuary,* published by the MALSF, Crown Copyright 2011

Emu Ltd. 2009, *Outer Thames Estuary Regional Environmental Characterisation*, ISBN 978-00907545-28-9, published by the MALSF, Crown Copyright 2009

HM Government, 2011, Marine Policy Statement, March 2011, Available online (accessed on 13/01/2015): https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/69322/pb3654-marine-policy-statement-110316.pdf

Hewitt, N., 2008, 'Coastal Convoys 1939-1945: The Indestructible Highway', England: Pen and Sword Maritime

Parfitt, S. A., Barendregt, R. W., Breda, M., Candy, I., Collins, M. J., Coope, G. R., Durbidge, P., Field, M. H., Lee, J. R., Lister, A. M., Mutch, R., Penkman, K. E. H., Preece, R. C., Rose, J., Stringer, C. B., Symmons, R., Whittaker, J. E., Wymer J. J., and Stuart, A. J. 2005. 'The earliest record of human activity in northern Europe', *Nature*, 438, 1008- 1012

Wessex Archaeology, 2003. *England's Shipping: Year 1 Report*, unpublished report 51552.02.

Wessex Archaeology, 2006. *Seabed Prehistory Round 2: Happisburgh and Pakefield Exposures Project*, unpublished report, ref. 57422.01

Wessex Archaeology 2010a, Appendix III-IV: Technical Report: Archaeology, in ERM 2010, *Thames Estuary Dredging Association, Marine Aggregate Regional Environmental Assessment*, report ref: 66061.04

Wessex Archaeology, 2010b, G*reater Gabbard Offshore Wind Farm Project, Desk-Based Archaeological Assessment*. Unpublished report, ref: 66802

Wessex Archaeology 2012, *Aggregate Dredging Licence Area 507, Archaeological Assessment*, unpublished report, ref: 74050.04

Wessex Archaeology 2015a, *Harwich Haven Approach Channel Deepening Project*, Marine Archaeological Assessment, unpublished report, ref: 107420.01

Wessex Archaeology 2015b, Galloper Offshore Wind Farm, *Archaeological Assessment of Geophysical Data and Stage 1 Geoarchaeological Assessment of Geotechnical Logs*, unpublished report, ref: 106221.01

APPENDIX I – PALAEOGEOGRAPHIC FEATURES OF ARCHAEOLOGICAL POTENTIAL

Area 507/1/3/4

WA ID	Classification	Archaeological Discrimination	Description	Area
7500	Channel	P1	Large, E-W trending channel feature cut into the underlying London Clay (often through surrounding overbank deposits). Characterised by a distinct basal reflector, and generally a single acoustically blank/unstructured fill. Occasionally overlain by a second, acoustically layered fill, particularly in the SW, but this could be modern seabed sediment. Probable remnant of the main channel of the old Thames-Medway river system. Feature is possibly underlain by a gravel area or previous fluvial deposits.	507/1/3/4
7501	Overbank Deposits	P1	Extensive, relatively shallow layer identified between channel features **7500** and **7511**. Characterised by an often indistinct, sub-horizontal basal reflector and a fill containing poorly defined internal reflectors. Possible overbank deposits associated with the surrounding channels, but also could be the remnants of a channel complex deposit and so could also contain fluvial material.	507/1/3/4
7502	Cut and Fill	P2	Small cut and fill feature cut into **7501**. Single phase of acoustically unstructured/blank fill and a distinct basal reflector. Possibly the eroded remains of a channel, possibly originally directly associated with feature **7500**.	507/1/3/4
7503	Overbank Deposits	P1	Relatively shallow layer identified adjacent to feature **7500**. Characterised by an indistinct, sub-horizontal basal reflector and an acoustically unstructured fill. Possible overbank deposits directly associated with channel **7500**.	507/1/3/4
7504	Overbank Deposits	P1	Relatively shallow layer identified adjacent to feature **7500**. Characterised by an indistinct, sub-horizontal basal reflector and an acoustically unstructured fill. Possible overbank deposits directly associated with channel **7500**.	507/1/3/4
7505	Overbank Deposits	P1	Relatively shallow layer identified adjacent to feature **7500**. Characterised by an indistinct, sub-horizontal basal reflector and an acoustically unstructured fill. Possible overbank deposits directly associated with channel **7500**.	507/1/3/4
7506	Overbank Deposits	P2	Extensive, relatively shallow layer identified to the north of **7500**. Characterised by an indistinct, sub-horizontal basal reflector and an acoustically unstructured fill. Often a basal reflector isn't present, and the distinction is based on a change of acoustic characteristic relative to the underlying London Clay. Possible overbank deposits associated with the surrounding channels, but the unit is poorly defined and it could include areas of modern seabed sediment. Extents of feature are uncertain.	507/1/3/4

WA ID	Classification	Archaeological Discrimination	Description	Area
7507	Cut and Fill	P2	Small cut and fill feature cut into **7506**. Single phase of acoustically unstructured/blank fill and a distinct basal reflector. Possibly the eroded remains of a channel, possibly originally directly associated with feature **7500**.	507/1/3/4
7508	Overbank Deposits	P2	Relatively shallow layer identified adjacent to feature **7506**, and probably originally directly related. Characterised by an indistinct, sub-horizontal basal reflector and an acoustically unstructured fill. Possible overbank deposits directly associated with the surrounding channels, although the feature is poorly defined and could include some modern seabed sediment. Extents of feature uncertain.	507/1/3/4
7509	Overbank Deposits	P2	Relatively shallow layer identified adjacent to feature **7506**, and probably originally directly related. Characterised by an indistinct, sub-horizontal basal reflector and an acoustically unstructured fill. Possible overbank deposits directly associated with the surrounding channels, although the feature is poorly defined and could include some modern seabed sediment. Extents of feature uncertain.	507/1/3/4
7510	Overbank Deposits	P2	Relatively shallow layer identified adjacent to feature **7506**, and probably originally directly related. Characterised by an indistinct, sub-horizontal basal reflector and an acoustically unstructured fill. Possible overbank deposits directly associated with the surrounding channels, although the feature is poorly defined and could include some modern seabed sediment. Extents of feature uncertain.	507/1/3/4
7511	Channel	P1	Distinct, sinuous, N-S trending channel feature cut into London Clay. Characterised by a distinct basal reflector and generally a single phase of acoustically unstructured/blank fill. A second, acoustically layered fill may be present in some places, but this is potentially seabed sediment. Possible tributary of the main E-W trending Thames-Medway channel, although any confluence between the two is located outside of the study area.	507/1/3/4
7512	Overbank Deposits	P2	Irregular area of a shallow, poorly defined deposit situated between channels **7511** and **7515**. Characterised by an indistinct, sub-horizontal basal reflector and an acoustically unstructured fill. Possible overbank deposits directly associated with the surrounding channels, although the feature is poorly defined and could include some modern seabed sediment. Extents of feature uncertain.	507/1/3/4
7513	Overbank Deposits	P2	Relatively shallow layer identified between features **7511** and **7515**. Characterised by an indistinct, sub-horizontal basal reflector and an acoustically unstructured fill. Possible overbank deposits directly associated with the surrounding channels, although the feature is poorly defined and could include some modern seabed sediment. Extents of feature uncertain.	507/1/3/4
7514	Overbank Deposits	P2	Relatively shallow layer identified between features **7511** and **7515**. Characterised by an indistinct, sub-horizontal basal reflector and an acoustically unstructured fill. Possible overbank deposits directly associated with the surrounding channels, although the feature is poorly defined and could include some modern seabed sediment. Extents of feature uncertain.	507/1/3/4

WA ID	Classification	Archaeological Discrimination	Description	Area
7515	Channel	P1	Small, shallow but distinct, sinuous, N-S trending channel feature cut into London Clay. Characterised by a distinct basal reflector and generally a single phase of acoustically unstructured/blank fill. Possible tributary of the main E-W trending Thames-Medway channel, although any confluence between the two is located outside of the study area.	507/1/3/4
7516	Overbank Deposits	P2	Relatively shallow layer to the north of channel **7515**, and possibly originally directly related. Characterised by an indistinct, sub-horizontal basal reflector and an acoustically unstructured fill. Possible overbank deposits directly associated with the surrounding channels, although the feature is poorly defined and could include some modern seabed sediment. Extents of feature uncertain.	507/1/3/4
7517	Overbank Deposits	P2	Extensive but intermittent, relatively shallow layer identified to the east of channel **7515.** Characterised by an indistinct, sub-horizontal basal reflector and an acoustically unstructured fill. Often a basal reflector isn't present, and the distinction is based on a change of acoustic characteristic relative to the underlying London Clay. Possible remnants of mostly eroded overbank deposits associated with the surrounding channels, but the unit is poorly defined and it could include areas of modern seabed sediment. Extents of feature are uncertain.	507/1/3/4
7518	Overbank Deposits	P2	Relatively shallow layer identified adjacent to feature **7517**, and probably originally directly related. Characterised by an indistinct, sub-horizontal basal reflector and an acoustically unstructured fill. Possible overbank deposits directly associated with the surrounding channels, although the feature is poorly defined and could include some modern seabed sediment. Extents of feature uncertain.	507/1/3/4
7519	Channel	P2	Broad, distinct channel feature identified at the edge of the study area. Characterised by a distinct basal reflector and single phase of acoustically unstructured/blank fill. Probable northern edge of the main channel of the old Thames-Medway river system, the rest of which likely lies just outside of the study area to the south. Feature is possibly underlain by a gravel area or previous fluvial deposits.	507/1/3/4
7520	Overbank Deposits	P2	Relatively shallow layer identified adjacent to feature **7517**, and probably originally directly related. Characterised by an indistinct, sub-horizontal basal reflector and an acoustically unstructured fill. Possible overbank deposits directly associated with the surrounding channels, although the feature is poorly defined and could include some modern seabed sediment. Extents of feature uncertain.	507/1/3/4
7521	Overbank Deposits	P2	Relatively shallow layer identified adjacent to feature **7517**, and probably originally directly related. Characterised by an indistinct, sub-horizontal basal reflector and an acoustically unstructured fill. Possible overbank deposits directly associated with the surrounding channels, although the feature is poorly defined and could include some modern seabed sediment. Extents of feature uncertain.	507/1/3/4

WA ID	Classification	Archaeological Discrimination	Description	Area
7522	Overbank Deposits	P2	Relatively shallow layer identified adjacent to feature **7517**, and probably originally directly related. Characterised by an indistinct, sub-horizontal basal reflector and an acoustically unstructured fill. Possible overbank deposits directly associated with the surrounding channels, although the feature is poorly defined and could include some modern seabed sediment. Extents of feature uncertain.	507/1/3/4

Area 507/2

WA ID	Classification	Archaeological Discrimination	Description	Area
7523	Channel	P1	Relatively small but distinct channel feature identified within the SW corner of the study area (feature extends beyond this boundary). Characterised by a well-defined basal reflector and acoustically unstructured fill. Possible remnant channel feature, possibly a northerly extension of channel **7511** identified within area 507/1/3/4.	507/2
7524	Overbank Deposits	P2	Relatively shallow layer to the north of channel **7523**, and possibly originally directly related. Characterised by an indistinct, sub-horizontal basal reflector and an acoustically unstructured fill. Possible overbank deposits directly associated with the surrounding channels, although the feature is poorly defined and could include some modern seabed sediment. Extents of feature uncertain.	507/2
7525	Channel	P1	Relatively small but generally distinct channel feature cut into underlying feature **7526**. Relatively poorly defined basal reflector with a generally structureless fill, although sub-parallel reflectors can be seen in some areas. Possibly originally an extension of channel **7523**. Overlain by thin deposit of modern seabed sediment.	507/2
7526	Cut and Fill	P2	E-W trending channel-like feature cut into the underlying London Clay. Generally relatively poorly defined basal reflector with single phase of acoustically unstructured fill, although it is cut by channel **7525** in the west. The edges of the feature cannot be identified on most lines, although the feature becomes smaller and more distinct to the east. Possibly an outlier of one of the Pliocene crag formations (Red or Coralline Crag), although could be the remnants of an older channel system.	507/2

Area 507/5

WA ID	Classification	Archaeological Discrimination	Description	Area
7527	Underfilled Channel	P2	Distinct, underfilled channel feature identified within the multibeam bathymetry data. Appears to comprise a main, E-W trending channel with a second, shallower channel joining it from the NW. Some sediment was identified within the channel, but is likely to be modern seabed sediment. Feature is likely to be a remnant channel associated with the wider Thames - Medway river system.	507/5

Area 507/6

WA ID	Classification	Archaeological Discrimination	Description	Area
7528	Underfilled Channel	P2	Possible underfilled channel feature identified within the multibeam bathymetry data, but does not appear to contain any surviving associated sediment. The identified channels 7529 and 7530 appear to flow into it. Feature is likely to be a remnant channel associated with the wider Thames - Medway river system.	507/6
7529	Channel	P1	Distinct, N-S trending channel feature identified cutting into London Clay. Generally characterised by a distinct basal reflector and a single phase of acoustically unstructured fill. Appears to flow into underfilled channel 7528 in the south, and is likely part of the wider Thames-Medway channel system present within the area.	507/6
7530	Channel	P1	Small but generally distinct, E-W trending channel feature identified cutting into London Clay. Generally characterised by a distinct basal reflector and a single phase of acoustically unstructured fill. Appears to flow into underfilled channel 7528, and is likely part of the wider Thames-Medway channel system present within the area.	507/6
7531	Overbank Deposits	P2	Irregular area of a shallow, poorly defined deposit situated between channels 7529 and 7530. Characterised by an indistinct, sub-horizontal basal reflector and an acoustically unstructured fill. Often a basal reflector isn't present, and the distinction is based on a change of acoustic characteristic relative to the underlying London Clay. Possible overbank deposits directly associated with the surrounding channels, although the feature is poorly defined and could include some modern seabed sediment. Extents of feature uncertain.	507/6

WA ID	Classification	Archaeological Discrimination	Description	Area
7532	Overbank Deposits	P2	Irregular area of a shallow, poorly defined deposit situated at the southeast end of channel 7529. Characterised by an indistinct, sub-horizontal basal reflector and an acoustically unstructured fill. Often a basal reflector isn't present, and the distinction is based on a change of acoustic characteristic relative to the underlying London Clay. Possible overbank deposits directly associated with the surrounding channels, although the feature is poorly defined and could include some modern seabed sediment. Extents of feature uncertain.	507/6

APPENDIX II – SEABED FEATURES OF ARCHAEOLOGICAL POTENTIAL

Area 507/1/3/4

WA_ID	Classification	Easting	Northing	Archaeological Discrimination	L (m)	W (m)	H (m)	Notes	Area	Sources
7000	Debris	407826	5757146	A1	13.5	5.0	1.3	Elongate dark reflector with shadow, possibly with a small associated depression or scour. Identified within both the sidescan sonar and multibeam bathymetry data sets. Possible piece of debris, possibly associated with UKHO wreck 14704 located approximately 90m to the NW. This wreck record is described as a "small piece of wreckage" measuring approximately 20m, but no such anomaly was identified at the recorded location. It is possible that this anomaly relates to the known record.	507/1/3/4 Buffer	14704 (UKHO)
7001	Debris	408198	5757123	A2	5.9	7.3	0.6	Distinct, irregular dark reflector with shadow, identified on more than one survey line. Possible piece of debris.	507/1/3/4 Buffer	-
7002	Dark Reflector	408253	5757425	A2	7.3	0.9	0.8	Elongate, poorly defined dark reflector with small shadow. Identified on adjacent line as a poorly defined area of seafloor disturbance. Could be a natural feature or a piece of debris.	507/1/3/4 Buffer	-
7003	Mound	407826	5758390	A2	170.0	133.0	1.8	Irregular elongate mound with two distinct 'peaks' identified within the multibeam bathymetry data. Possible slight scour on north and south side, but could be data/processing artefact. Associated with two curvilinear ridges extending south from the east end of the mound. Possible area of buried debris. Dimensions area of entire area.	507/1/3/4 Buffer	-
7004	Debris	408747	5755626	A2	5.7	5.4	1.2	Small, distinct object identified within the multibeam bathymetry data, identified as a dark reflector with shadow in the sidescan sonar data. Associated with a small scour. Possible piece of debris.	507/1/3/4 Buffer	-

WA_ID	Classification	Easting	Northing	Archaeological Discrimination	L (m)	W (m)	H (m)	Notes	Area	Sources
7005	Debris	408849	5756058	A1	12.2	9.3	0.5	Distinct, irregular object with distinct but relatively shallow scour identified within the multibeam bathymetry data. Not definitively identified within the sidescan sonar data, although this is probably due to relatively poor data and the anomaly being located directly beneath the fish. Possible piece of debris. Associated with a recorded obstruction (UKHO 65639), described as a possible shipping container although there is no evidence within the geophysical data to confirm or deny this interpretation.	507/1	65639 (UKHO)
7006	Dark Reflector	408770	5757821	A2	1.7	1.0	0.8	Small but distinct dark reflector with large shadow, located adjacent to similar feature **7007**. Could be a natural feature or debris, possibly associated with wreck **7008** (approx. 200m W).	507/1	-
7007	Dark Reflector	408766	5757821	A2	1.5	1.0	0.8	Small but distinct dark reflector with large shadow, located adjacent to similar feature **7006**. Could be a natural feature or debris, possibly associated with wreck **7008** (approx. 200m W).	507/1	-
7008	Wreck	408566	5757791	A1	114.7	60.9	4.5	Large debris field orientated NNE-SSW, comprising two main mounds with surrounding area of scattered debris. The largest, southern mound displays significant height, although no real coherent structure is visible. Recorded as the wreck of the *Old Charlton* (UKHO 14711), a British steam ship built in 1919 and lost in 1941 after being bombed by a German aircraft. The wreck is recorded as being dispersed which matches the observed current state of the structure. The highest observed point possibly represents the single boiler. The sonar dimensions are much larger than the original vessel due to dispersal.	507/1	14711 (UKHO)
7009	Bright Reflector	408813	5758289	A2	4.4	2.8	0.0	Bright reflector with possible associated scour. Partially beneath the fish and only identified on one survey line, but could be a natural feature or piece of debris.	507/1	-

WA_ID	Classification	Easting	Northing	Archaeological Discrimination	L (m)	W (m)	H (m)	Notes	Area	Sources
7010	Seafloor Disturbance	409042	5759515	A2	66.5	10.4	0.0	Elongate area of irregular dark reflectors with small shadows and possible slight associated scour, identified on more than one survey line. Located in an area of mobile seabed sediment, and could be natural sediment streaking or an area of partially buried debris.	507/1	-
7011	Recorded Wreck	409676	5756349	A3	-	-	-	Recorded location of the wrecks of both the *Foreland* (UKHO 14683), and the *Huguenot* (UKHO 14683), both British steam ships mined and lost in 1917 and 1916 respectively. Neither has been identified by recent surveys or within the current geophysical data set, and they are probably located elsewhere.	507/1	14683 (UKHO)
7012	Recorded Wreck	410535	5756334	A3	-	-	-	Recorded location of the wreck of the HMS *Strymon* (UKHO 14681), a British trawler lost in 1917. The wreck was not identified within the geophysical data, and does not appear to have been found during recent surveys, and so is potentially located elsewhere.	507/1	14681 (UKHO)
7013	Recorded Wreck	410999	5756696	A3	-	-	-	Recorded location of the wreck of the *Tusnastabb* (UKHO 14692), a Norwegian steam ship mined and lost in 1918. Not identified within the geophysical data, and possibly located elsewhere.	507/1	14692 (UKHO)
7014	Seafloor Disturbance	410997	5755262	A2	24.5	16.5	0.0	Small area of seafloor disturbance, possibly containing small objects but this is uncertain. Could be natural or indicate buried debris.	507/1/3/4 Buffer	-
7015	Dark Reflector	411229	5755238	A2	3.0	0.7	1.0	Slightly elongate dark reflector with distinct shadow, could be natural or a piece of debris.	507/1/3/4 Buffer	-
7016	Recorded Wreck	411238	5757248	A3	-	-	-	Recorded location of the wreck of the *Coal Gas* (UKHO 14705), a British steam ship mined and lost in 1918. Not identified within the geophysical data and possibly located elsewhere. A vessel with the same name is also recorded at WA ID **7022**.	507/1	14705 (UKHO)
7017	Debris	410569	5757616	A2	43.0	0.7	0.2	Curvilinear dark reflector with associated seafloor disturbance, identified on more than one survey line and also tentatively within the multibeam bathymetry data. Does not look like a natural feature, and is possibly a piece of partially buried debris, possibly a length of rope or chain (although this is uncertain).	507/1	-

WA_ID	Classification	Easting	Northing	Archaeological Discrimination	L (m)	W (m)	H (m)	Notes	Area	Sources
7018	Debris	410678	5757728	A2	4.0	2.6	0.8	Dark reflector with shadow, shown by multibeam bathymetry data to be a small object within a distinct depression. Possible piece of debris.	507/1	-
7019	Wreck	410959	5757693	A1	84.4	22.9	7.7	Distinct wreck site, orientated ENE - WSW and situated within a large NNE - SSW trending scour. Appears upright and relatively intact, and displays significant height and visible structure, and is assumed to be steel hulled (although no magnetometer data is available). No visible associated debris field. Associated with a previously recorded but unnamed wreck, UKHO 14709.	507/1	14709 (UKHO)
7020	Debris	411231	5757793	A2	4.4	4.1	0.1	Distinct bright reflector, shown by multibeam bathymetry data to represent a small object within a depression. Located between wrecks **7019** (280m WSW) and **7022** (420m ESE), and may be debris related to either (or neither) of these.	507/1	-
7021	Debris	411285	5757724	A2	4.4	2.8	0.1	Distinct bright reflector, shown by multibeam bathymetry data to represent a small object within a depression. Located between wrecks **7019** (320 W) and **7022** (350m E), and may be debris related to either (or neither) of these.	507/1	-
7022	Wreck	411622	5757684	A1	101.5	32.7	12.0	Distinct wreck site, orientated E - W and situated within a large NNE - SSW trending scour. Appears upright and relatively intact, displays significant height and visible structure, and is assumed to be steel hulled (although no magnetometer data is available). Height measurement taken from the base of the scour. No visible associated debris field. Recorded as being the wreck of the *Coal Gas* (formerly the *George Allen,* UKHO 14710), a British collier mined and lost en-route to London in 1918. A second record with the same name is represented by WA ID **7016**.	507/1	14710 (UKHO)
7023	Dark Reflector	411499	5757579	A2	7.1	1.2	0.6	Elongate dark reflector (or two very closely adjacent anomalies) with distinct shadow. Located approximately 165m SW of wreck **7022**. Could be natural or debris.	507/1	-

WA_ID	Classification	Easting	Northing	Archaeological Discrimination	L (m)	W (m)	H (m)	Notes	Area	Sources
7024	Dark Reflector	411611	5757889	A2	4.2	0.2	0.3	Small, elongate dark reflector with shadow, also tentatively identified within the multibeam bathymetry data. Located approximately 200m N of wreck **7022.** Could be natural or debris.	507/1	-
7025	Wreck	412671	5757334	A1	101.5	38.8	8.0	Distinct wreck orientated E-W, structure appears partially buried, especially in the east, although has a distinct scour at the western end. Appears upright but relatively broken up, with significant height and some structure visible. Some debris possibly identified in the vicinity, although the partial burial makes the precise extents and dimensions difficult to determine. Height measurement taken from base of scour. Recorded as possibly the wreck of the *Estrella* (UKHO 14706), a British steam ship mined and lost in 1918 whilst on passage to the Tyne.	507/1	14706 (UKHO)
7026	Debris	412647	5757338	A1	26.7	0.7	2.4	Possible distinct, linear dark reflector with shadow adjacent to wreck **7025.** Possibly a piece of associated debris, although could represent the edge of a scour identified at the western end of the wreck.	507/1	-
7027	Dark Reflector	412775	5757342	A2	2.6	1.3	0.4	Poorly defined, irregular dark reflector identified approximately 90m E of wreck **6049**. Could be a natural feature or a piece of debris.	507/1/3/4 Buffer	-
7028	Debris Field	413074	5757322	A2	14.3	6.4	0.0	Small area of relatively poorly defined short, linear dark and bright reflectors. Possible small area of partially buried debris.	507/1/3/4 Buffer	-
7029	Debris	410663	5759880	A2	9.9	7.6	0.6	Distinct dark reflector (or small group of dark reflectors) with shadow and possible small depression. Tentatively identified within the multibeam bathymetry data. Possible piece of debris.	507/1	-
7030	Debris Field	411788	5758516	A1	12.3	10.1	0.2	Two adjacent dark reflectors with shadows within a small depression, tentatively identified within the multibeam bathymetry data. Possible debris. Associated with a recorded obstruction (UKHO 14714), recorded as a Foul Ground and described as "area of debris".	507/1	14714 (UKHO)

WA_ID	Classification	Easting	Northing	Archaeological Discrimination	L (m)	W (m)	H (m)	Notes	Area	Sources
7031	Debris	411925	5759938	A2	3.1	1.8	0.2	Small but distinct, elongate object identified within a small depression/scour. Not definitively identified within the sidescan sonar data, although this is probably due to relatively poor data and the anomaly being located directly beneath the fish. Possible piece of debris.	507/1	-
7032	Wreck	412584	5759122	A1	92.0	32.9	12.0	Distinct wreck site, orientated NNW - SSE and situated within a large, NNE - SSW trending scour. The wreck appears 'bent', with the south-eastern section curving away to a separate orientation to the rest of the wreck, and could possibly be in two pieces with debris between. Besides this, the wreck appears upright and relatively intact, with structure and significant height visible, although a small debris field has been identified along the eastern side. Height measurement taken from the base of the scour. Recorded as a known but currently unnamed wreck (UKHO 14721).	507/1/3/4 Buffer	14721 (UKHO)
7033	Debris Field	412593	5759136	A1	34.2	10.8	0.0	Scattered area of dark and bright reflectors to the east of wreck **7032.** probably related wreck debris.	507/1/3/4 Buffer	-
7034	Debris	412651	5759169	A2	7.1	1.4	0.6	Distinct, irregular dark reflector with shadow. Located between wrecks **7033** (78m SW) and **7037** (110m ESE) and is potentially debris related to either (or neither) of these.	507/1/3/4 Buffer	-
7035	Dark Reflector	412653	5759140	A2	0.4	0.6	0.6	Small, dark reflector with shadow located between wrecks **7033** (67m W) and **7037** (105m E). Could be a natural feature or debris related to either (or neither) wreck.	507/1/3/4 Buffer	-
7036	Dark Reflector	412647	5759133	A2	3.9	0.1	0.2	Small, dark reflector with shadow located between wrecks **7033** (60m W) and **7037** (115m E). Could be a natural feature or debris related to either (or neither) wreck.	507/1/3/4 Buffer	-

WA_ID	Classification	Easting	Northing	Archaeological Discrimination	L (m)	W (m)	H (m)	Notes	Area	Sources
7037	Wreck	412758	5759133	A1	89.2	32.7	8.5	Distinct wreck site orientated NNE-SSW with a small scour at the northern and southern edges. Appears upright but relatively broken up, although still displays height and some structure, and seems partially buried. No distinct debris field identified, although part of the western side seems to have collapsed outwards. Recorded as a known but currently unnamed wreck (UKHO 14720)	507/3	14720 (UKHO)
7038	Debris	412995	5759490	A2	4.7	3.1	0.2	Small but distinct, elongate object identified within a small depression/scour. Not definitively identified within the sidescan sonar data, although this is probably due to relatively poor data and the anomaly being located directly beneath the fish. Possible piece of debris.	507/3	-
7039	Wreck	414088	5759661	A1	85.9	12.3	7.0	Distinct wreck, orientated NNE-SSW with a small, shallow scour extending from each end along the same orientation. Bathymetry data shows a possible broad, semi-circular depression along the western side, although this is unclear. Appears upright and intact, showing height and structure, with very little associated surrounding debris. Recorded as the wreck of the Forth (UKHO 14731), a British steam ship lost in 1916 after detonating a mine *en-route* to Leith.	507/1/3/4 Buffer	14731 (UKHO)
7040	Debris	414059	5759658	A1	1.6	0.2	0.4	Small but distinct dark reflector with shadow, located within the slight depression to the west of wreck **7039.** Possible associated debris.	507/1/3/4 Buffer	-
7041	Debris	414070	5759679	A1	3.8	0.5	0.4	Small but distinct dark reflector with shadow, located within the slight depression to the west of wreck **7039.** Possible associated debris.	507/1/3/4 Buffer	-
7042	Debris Field	414099	5759699	A1	18.5	18.4	0.0	Small area of irregular dark and bright reflectors at the northern end of wreck **7039.** Probable area of detached, associated debris.	507/1/3/4 Buffer	-
7043	Dark Reflector	414778	5759099	A2	4.8	1.4	0.4	Distinct dark reflector with shadow within a small depression. Could be natural or debris.	507/4	-
7044	Dark Reflector	414758	5758975	A2	6.4	0.4	0.4	Elongate dark reflector with small shadow, only identified on one survey line. Could be natural or debris.	507/4	-

WA_ID	Classification	Easting	Northing	Archaeological Discrimination	L (m)	W (m)	H (m)	Notes	Area	Sources
7045	Debris Field	415456	5758699	A2	10.0	7.7	0.5	Two adjacent dark reflectors with shadows within a small depression, tentatively identified within the multibeam bathymetry data. Possible small debris field.	507/4	-
7046	Debris	415566	5757993	A2	5.7	2.0	1.0	Distinct, elongate dark reflector with shadow. Possible piece of debris.	507/1/3/4 Buffer	-
7047	Debris	415921	5757993	A1	16.2	4.5	1.2	Low, elongate mound within a depression, found to be an irregular piece of debris with shadow and visible structure. Structure comprises short, parallel lines. Probable debris. Associated with a recorded obstruction (UKHO 82878), although no details provided.	507/1/3/4 Buffer	82878 (UKHO)
7048	Debris	416810	5758442	A2	6.1	1.0	0.7	Small but distinct dark reflector with shadow, shown by multibeam bathymetry data to be located within an elongate depression. Possible piece of debris.	507/4	-
7049	Wreck	416965	5758677	A1	16.0	13.0	1.7	Distinct elongate piece of debris with height and possible structure, located within a small depression. Located approximately 95m E of the recorded location of the wreck of the HMS *Forward III*, a British drifter mined and lost in 1917. No wreck was identified at the recorded location, and the vessel is reported to have only been 25.9m long, and so this could represent the partially buried, degraded remains of the HMS *Forward III*.	507/4	14716 (UKHO)

WA_ID	Classification	Easting	Northing	Archaeological Discrimination	L (m)	W (m)	H (m)	Notes	Area	Sources
7050	Wreck	417492	5759467	A1	66.8	45.9	7.5	Distinct wreck site. Wreck is split into two separate features laterally offset by approximately 20m and on slightly different orientations, although both generally NE-SW. Situated in a large scour, which extends NNE from the western section and SSW from the eastern section. Besides the break, the wreck appears upright and relatively intact, with height and structure visible, although the western section appears larger and more intact than the eastern section. A small debris field is located between the two halves. Recorded as a known but currently unknown wreck (UKHO 14730). As the wreck has a single UKHO number it is also considered a single wreck here, despite being in two distinct, separate pieces. Dimensions given are of the entire site.	507/1/3/4 Buffer	14730 (UKHO)
7051	Debris	418009	5759134	A2	6.0	3.0	0.5	Small, irregular object identified within the base of a broad depression. Not identified within the sidescan sonar data, probably due to poor data and the anomaly being situated beneath the fish. Possible piece of debris.	507/1/3/4 Buffer	-

Area 507/2

WA_ID	Classification	Easting	Northing	Archaeological Discrimination	L (m)	W (m)	H (m)	Notes	Area	Sources
7052	Wreck	412449	5763295	A1	111.5	24.8	7.0	Distinct wreck site orientated NNE-SSW within a distinct scour along the same orientation, mainly to the SSW. Wreck exhibits significant height and some structure, and is probably upright, but is fairly broken up and possibly partially buried. Main structure is broken into two distinct pieces, with each piece being on a slightly different orientation and an approximately 10m gap between them. Recorded as the wreck of the *Polgarth* (UKHO 10184), a British steam ship lost in 1942 after hitting a mine whilst on transit to Southampton.	507/2 Buffer	10184 (UKHO)

WA_ID	Classification	Easting	Northing	Archaeological Discrimination	L (m)	W (m)	H (m)	Notes	Area	Sources
7053	Debris	412375	5763317	A2	4.7	0.7	0.0	Curvilinear bright reflector with possible small area of associated seafloor disturbance. Possible piece of partially buried debris, possibly associated with wreck **7052**.	507/2 Buffer	-
7054	Dark Reflector	413053	5763361	A2	0.2	0.2	0.9	Small dark reflector with shadow situated within a distinct depression/scour, identified within both the sidescan sonar and multibeam bathymetry data. Could be natural or a piece of debris.	507/2	-
7055	Seafloor Disturbance	412606	5763796	A2	8.1	6.9	0.0	Small area of seafloor disturbance, possibly a depression containing a small object but this is unclear. Could be natural or indicate partially buried debris.	507/2 Buffer	-
7056	Bright Reflector	412619	5763967	A2	7.3	3.3	0.0	Elongate bright reflector with possible small amount of seafloor disturbance, located on the edge of an area of mobile seabed sediment. Could be natural or partially buried debris.	507/2 Buffer	-
7057	Recorded Wreck	412203	5764338	A3	-	-	-	Recorded location of an unnamed wreck (UKHO 10197). Not identified within the current geophysical data and not present within the Admiralty Chart, possibly located elsewhere.	507/2 Buffer	10197 (UKHO)
7058	Dark Reflector	413357	5764155	A2	3.2	1.7	0.8	Small, poorly defined dark reflector with irregular shadow and possible small area of associate seafloor disturbance. Could be natural or partially buried debris.	507/2	-
7059	Dark Reflector	413265	5764385	A2	0.8	0.5	0.3	Small dark reflector with shadow situated within a distinct depression/scour, also tentatively identified within the multibeam bathymetry data. Could be natural or a piece of debris.	507/2	-
7060	Dark Reflector	413983	5764555	A2	1.2	0.3	0.6	Small dark reflector with shadow situated within a depression/scour, appears elongated in one image but this is possibly due to data stretching. Could be natural or a piece of debris.	507/2	-
7061	Wreck	413635	5764782	A1	95.2	29.3	8.5	Distinct wreck site orientated NNW-SSE, located within a large, distinct NNE-SSW trending scour. Wreck appears upright and relatively intact, exhibiting structure and significant height, although the visible structure indicates some partial break-up. Recorded as a known but unnamed wreck (UKHO 10204).	507/2	10204 (UKHO)
7062	Debris	413614	5764810	A1	5.9	8.2	0.0	Irregular bright reflector immediately adjacent to wreck **7061**. Possible separate piece of associated debris.	507/2 Buffer	-

WA_ID	Classification	Easting	Northing	Archaeological Discrimination	L (m)	W (m)	H (m)	Notes	Area	Sources
7063	Dark Reflector	414106	5764891	A2	5.1	0.6	0.7	Elongate dark reflector with distinct, irregular shadow. Could be natural or a piece of debris.	507/2 Buffer	-

Area 507/5

WA_ID	Classification	Easting	Northing	Archaeological Discrimination	L (m)	W (m)	H (m)	Notes	Area	Sources
7064	Debris	420398	5765447	A2	2.9	3.3	4.8	Two adjacent dark reflectors with shadows located within a small depression, also tentatively identified within the multibeam bathymetry data. Possible debris.	507/5 Buffer	-
7065	Seafloor Disturbance	420644	5765548	A2	7.4	8.7	0.0	Small area of seafloor disturbance, shown by multibeam bathymetry data to be a distinct depression, possibly containing an object. Could be natural or indicate partially buried debris.	507/5	-
7066	Dark Reflector	421689	5765615	A2	0.5	0.4	0.6	Small dark reflector with shadow located within a distinct small depression/scour. Could be debris or a natural feature.	507/5 Buffer	-

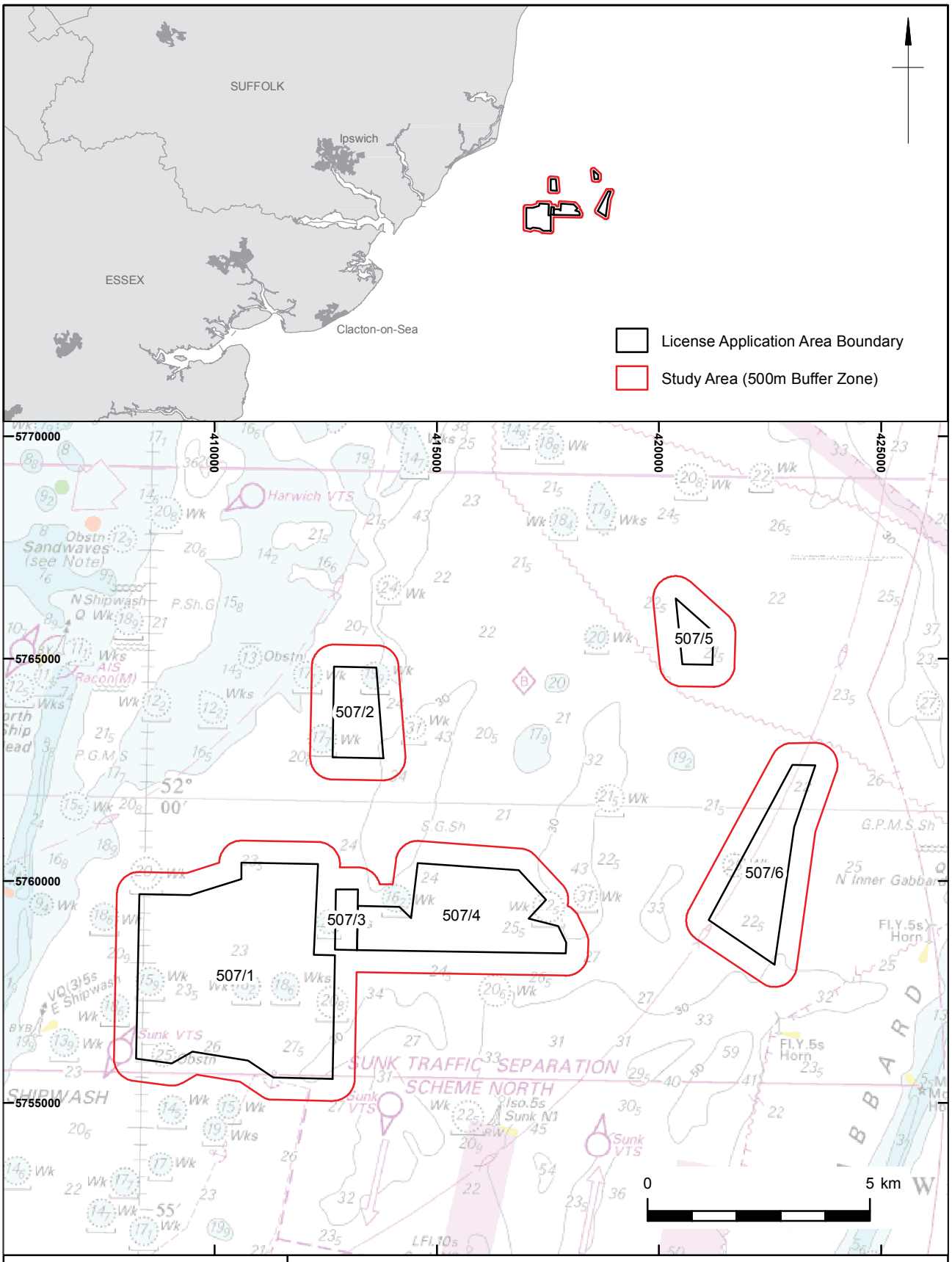
Area 507/6

WA_ID	Classification	Easting	Northing	Archaeological Discrimination	L (m)	W (m)	H (m)	Notes	Area	Sources
7067	Debris	422027	5758845	A2	6.2	1.5	0.1	Poorly defined area of seafloor disturbance identified within the sidescan sonar, shown by multibeam bathymetry data to be an elongate feature located within a depression with associated surrounding disturbed seabed. Possible piece of debris.	507/6	-
7068	Dark Reflector	423120	5758681	A2	3.2	0.4	0.3	Small dark reflector with shadow located within a small, elongate depression. Could be natural or debris.	507/6 Buffer	-
7069	Dark Reflector	422442	5759154	A2	0.5	0.5	0.3	Small dark reflector with shadow located within a small, elongate depression. Could be natural or debris.	507/6	-
7070	Dark Reflector	422847	5759395	A2	5.8	0.2	0.4	Elongate dark reflector with irregular shadow, could be natural or debris.	507/6 Buffer	-

WA_ID	Classification	Easting	Northing	Archaeological Discrimination	L (m)	W (m)	H (m)	Notes	Area	Sources
7071	Dark Reflector	421716	5759842	A2	4.8	0.2	0.5	Small dark reflector with shadow located within a small, elongate depression. Could be natural or debris.	507/6	-
7072	Dark Reflector	422644	5760070	A2	0.5	0.3	0.3	Small dark reflector with shadow located within a small, elongate depression. Could be natural or debris.	507/6	-
7073	Wreck	421705	5760391	A1	45.7	17.8	2.9	Relatively poorly defined wreck, identified orientated NW-SE within a distinct NNE-SSW elongated depression/scour. Wreck exhibits some height and structure. But is relatively low lying and likely broken up and partially buried, especially towards the SE. Recorded as the wreck of the *Warrenpoint* (UKHO 14738), a British steam ship lost in 1908 following a collision with the German vessel SS Schwalbe in poor weather.	507/6 Buffer	14738 (UKHO)
7074	Debris	421746	5760373	A1	9.3	2.0	1.1	Distinct, irregular dark reflector with shadow, shown by multibeam bathymetry data to be situated within a small depression. Possible debris associated with wreck **7173**.	507/6 Buffer	-

Notes

1. Co-ordinates are in WGS84 UTM31N
2. Positional accuracy estimated ±20m



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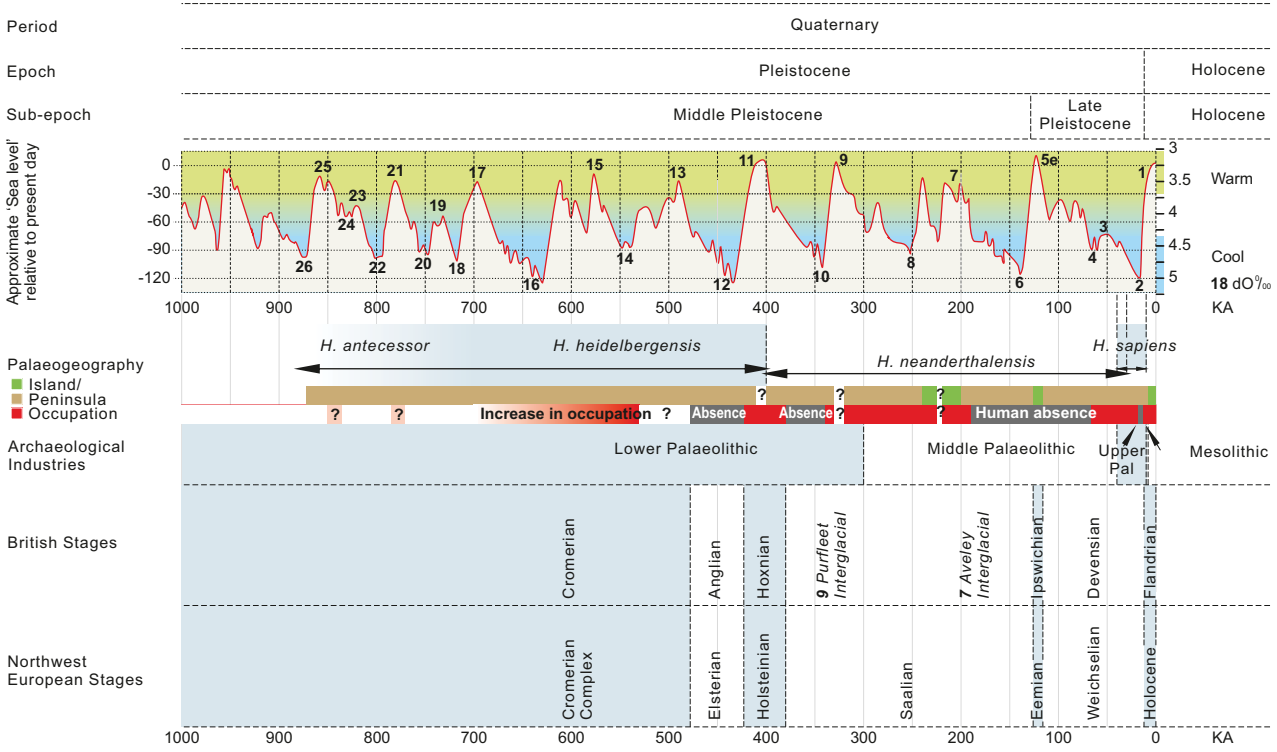
Study Area Location

Figure 1



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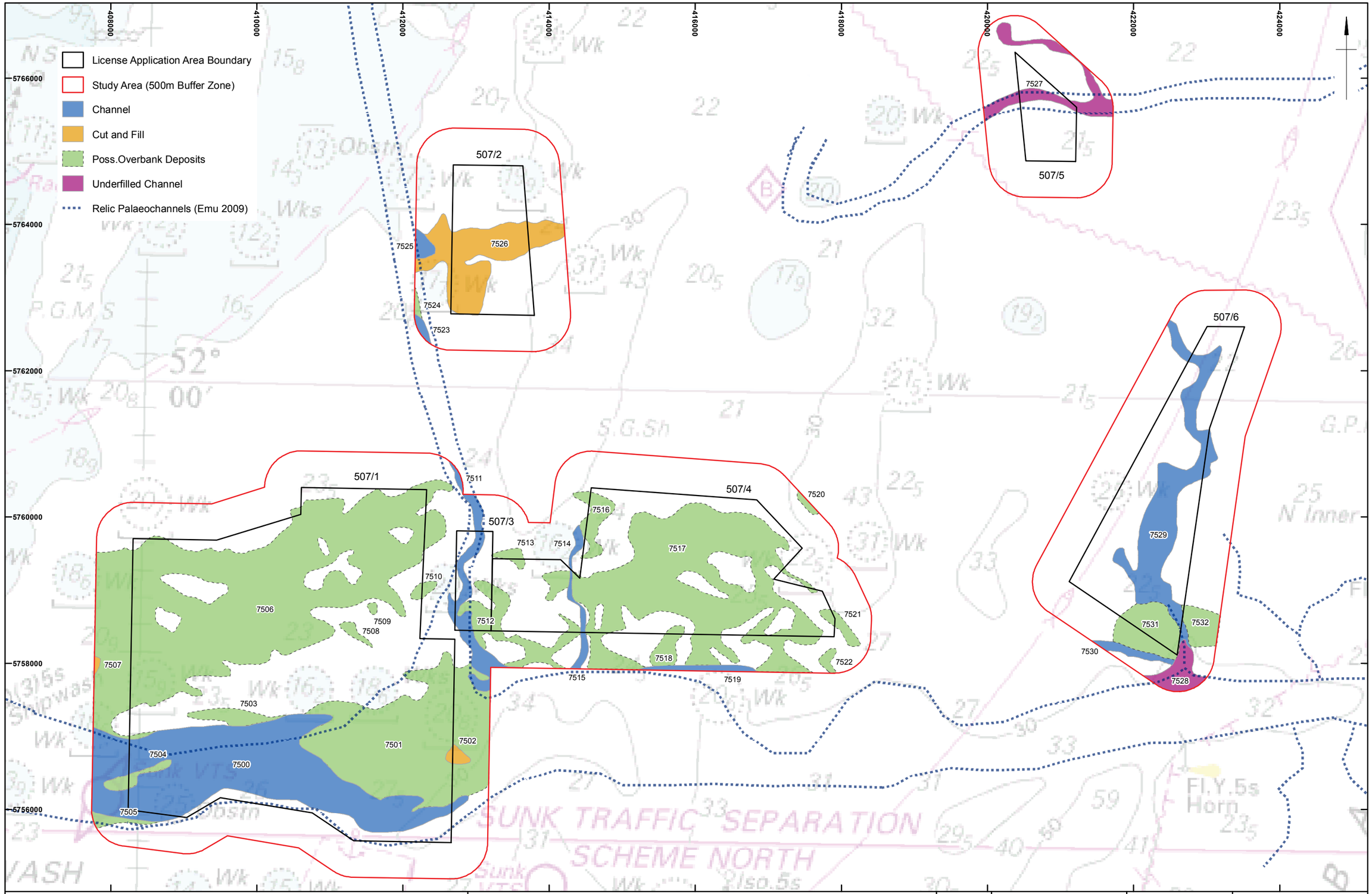
Sea Level Curve and Chronology of the Southern North Sea Landscape

Figure 2



0 2.5 km

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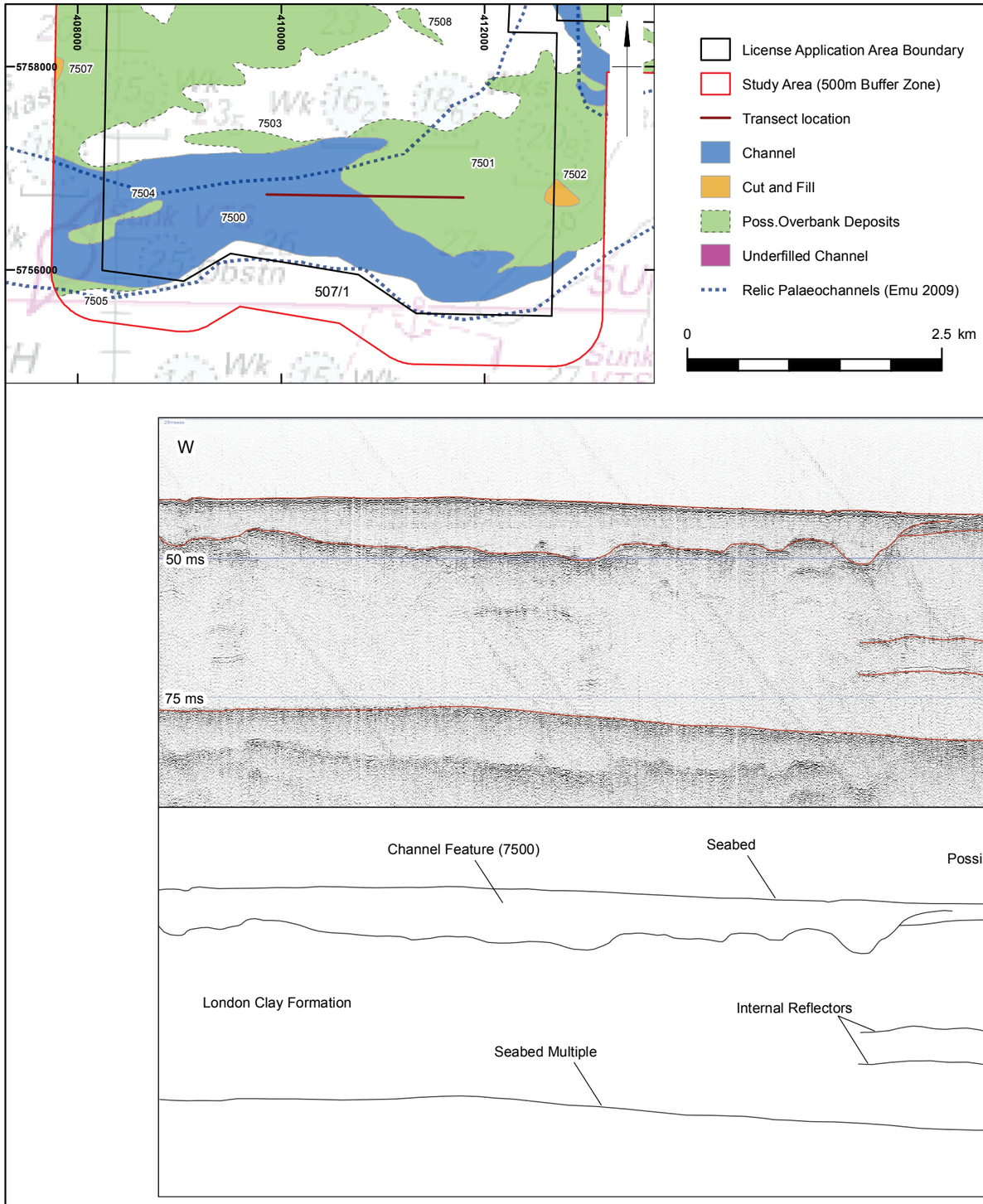
Palaeogeographic Features of Archaeological Potential

Figure 3



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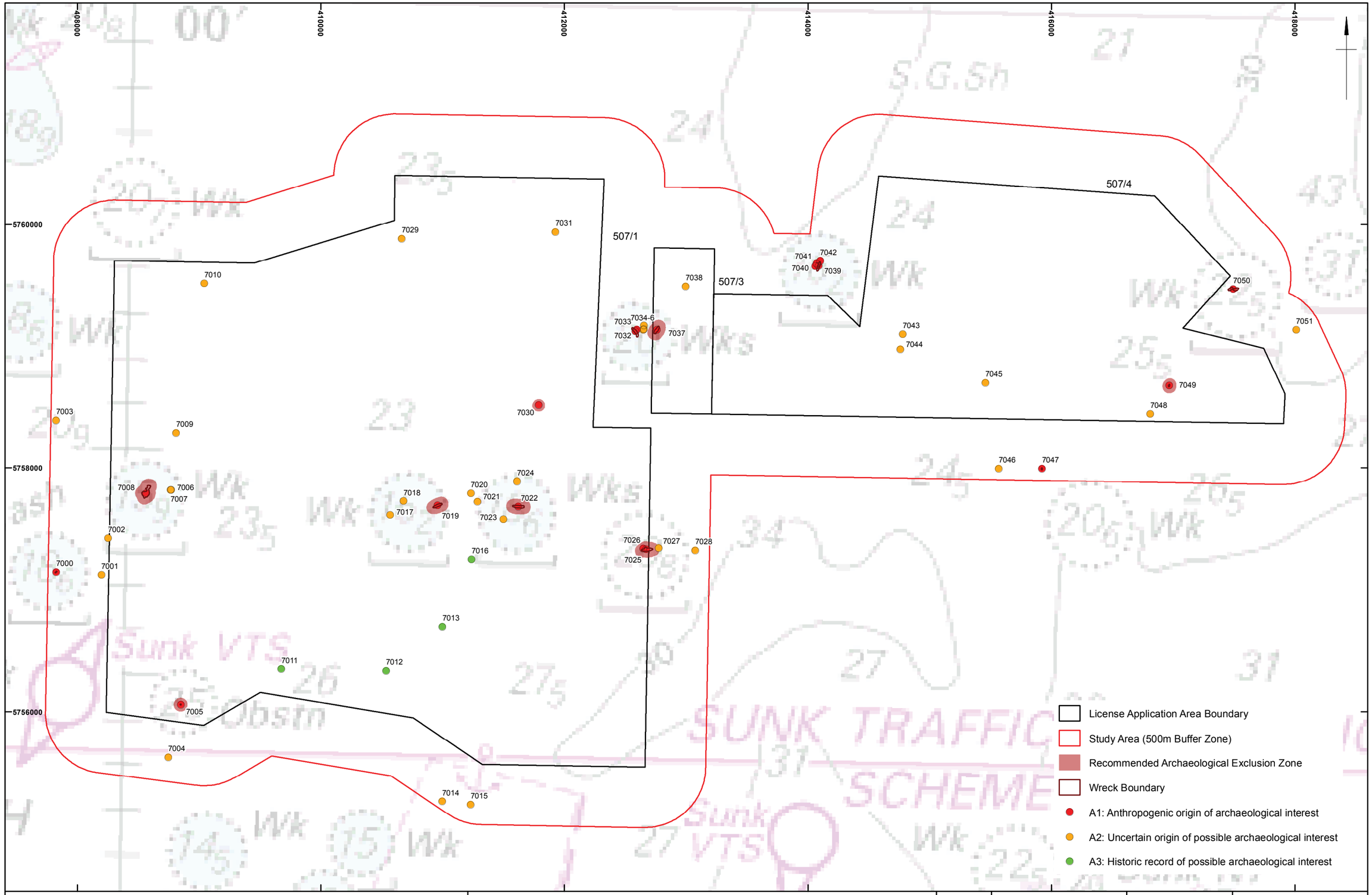
Sub-Bottom Profiler Data Example

Figure 4



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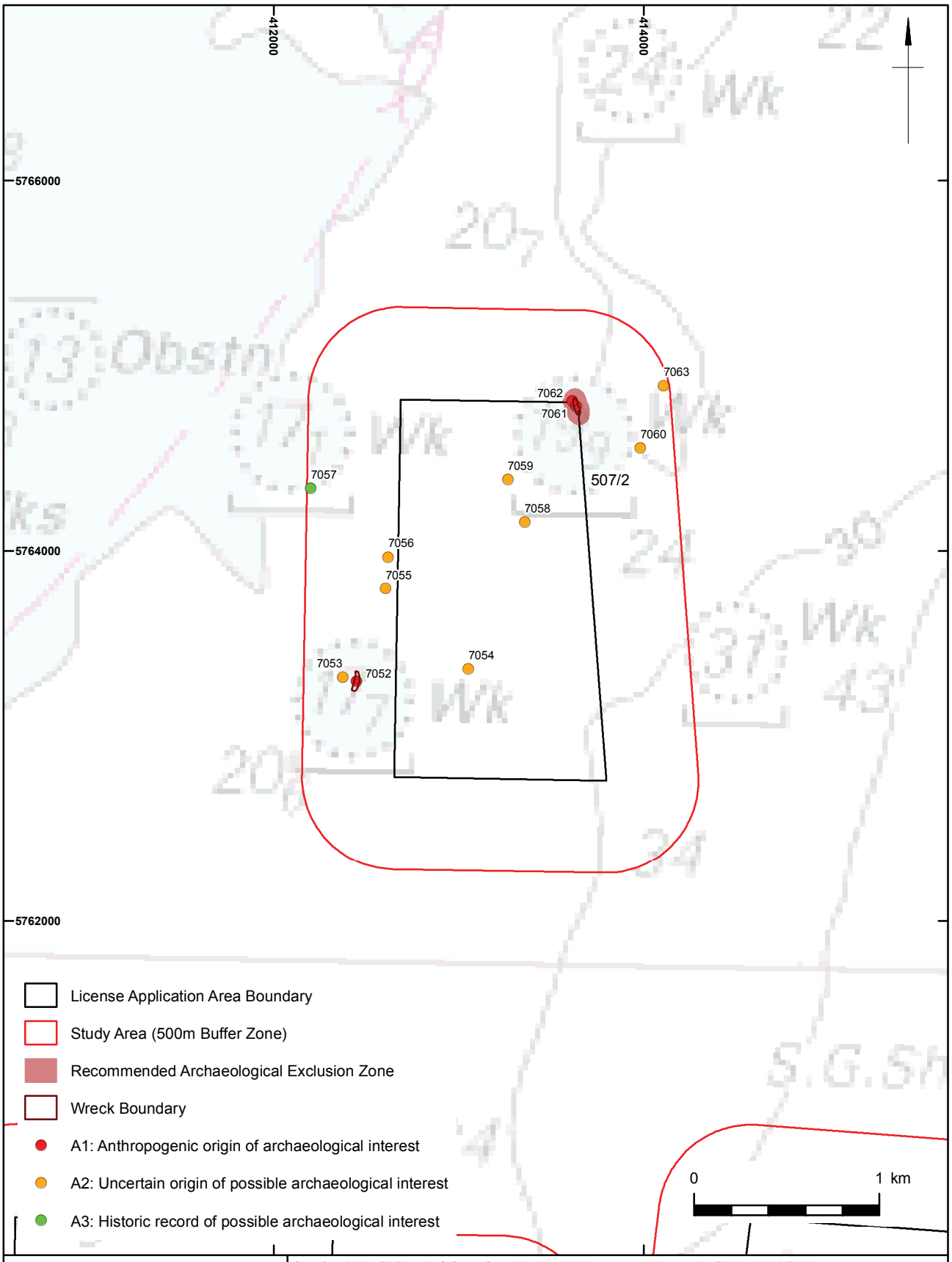
Seabed Features of Archaeological Potential (Area 507/1/3/4)

Figure 5



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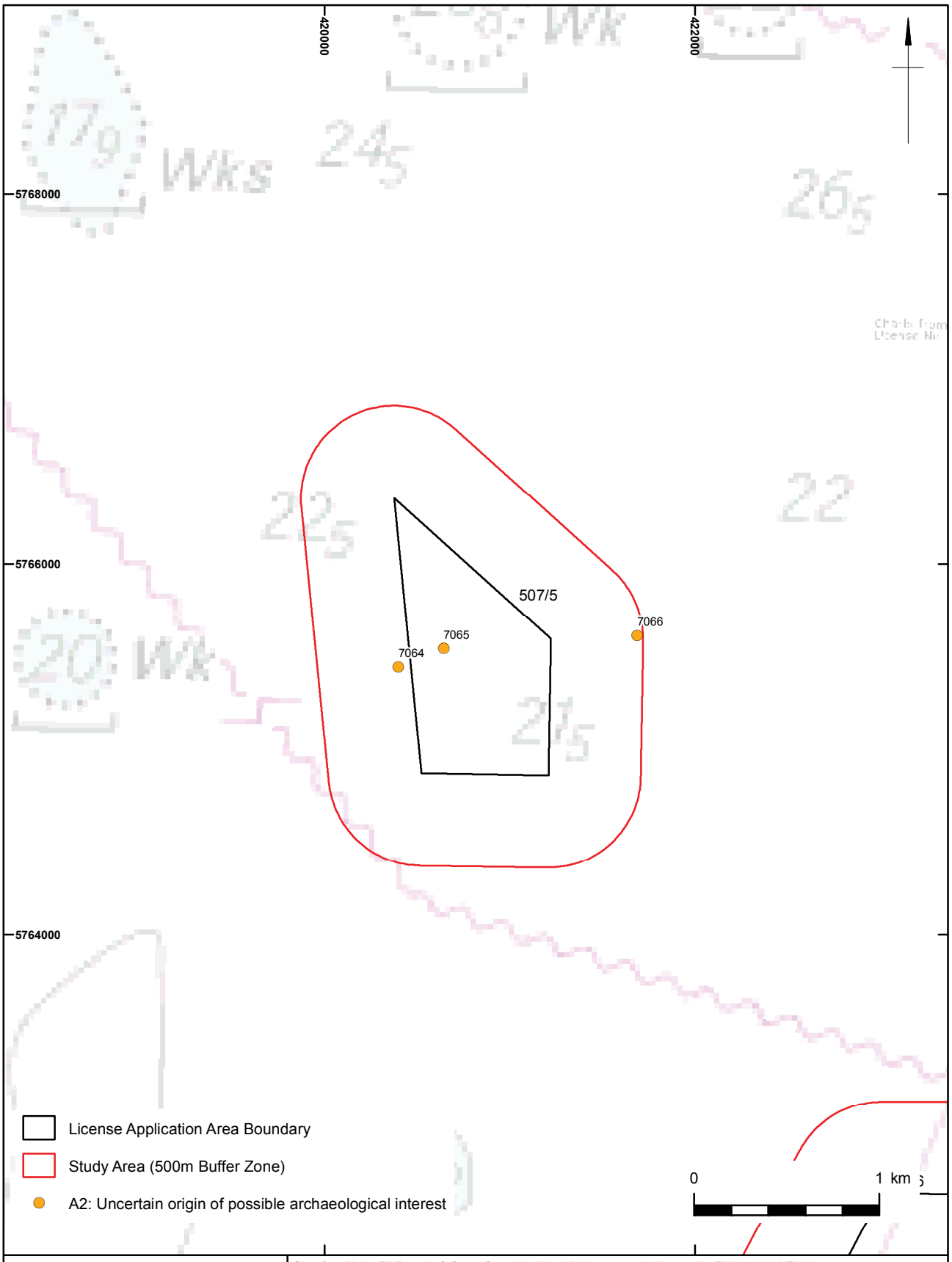
Seabed Features of Archaeological Potential (Area 507/2)

Figure 6



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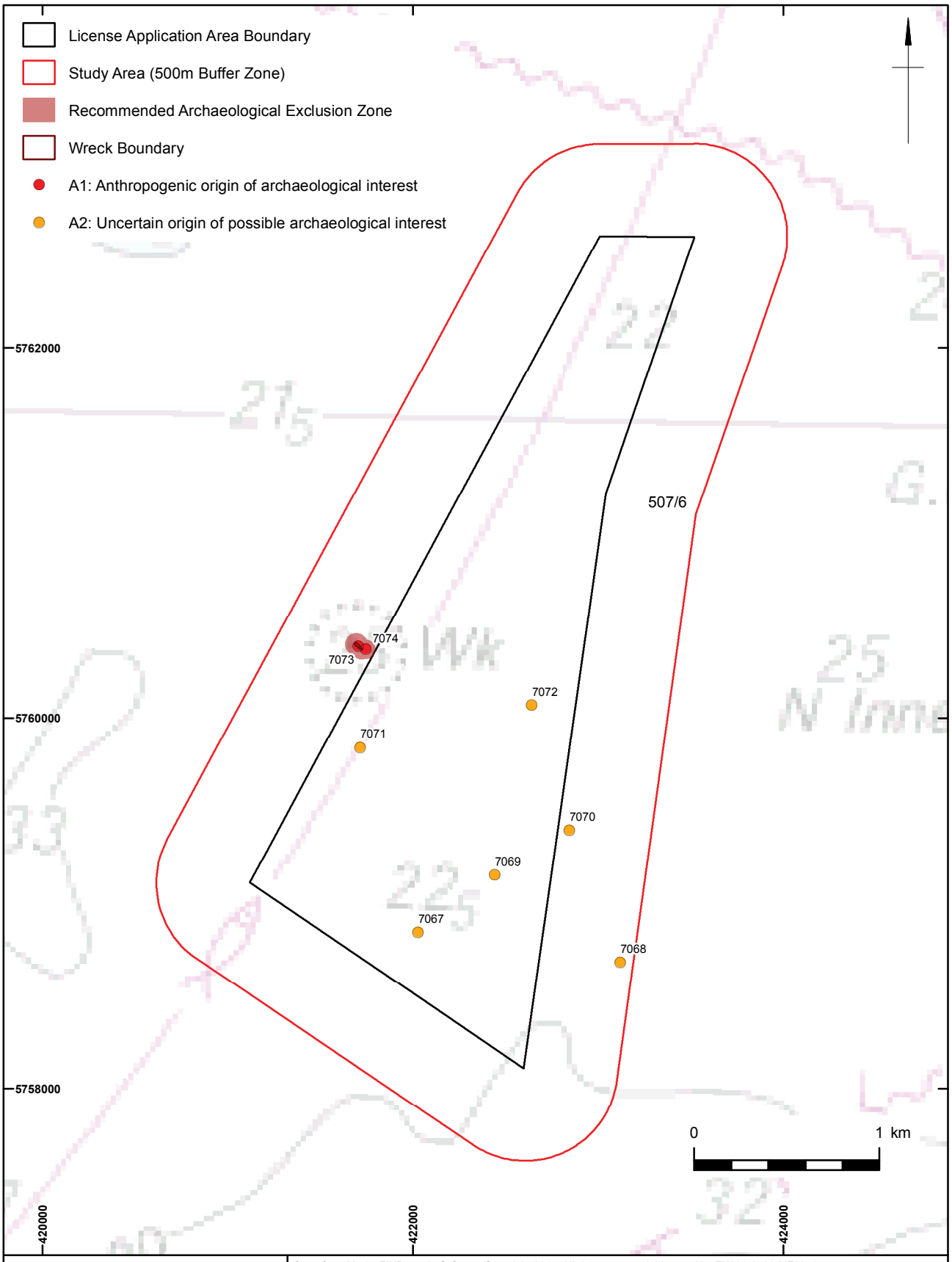
Seabed Features of Archaeological Potential (Area 507/5)

Figure 7



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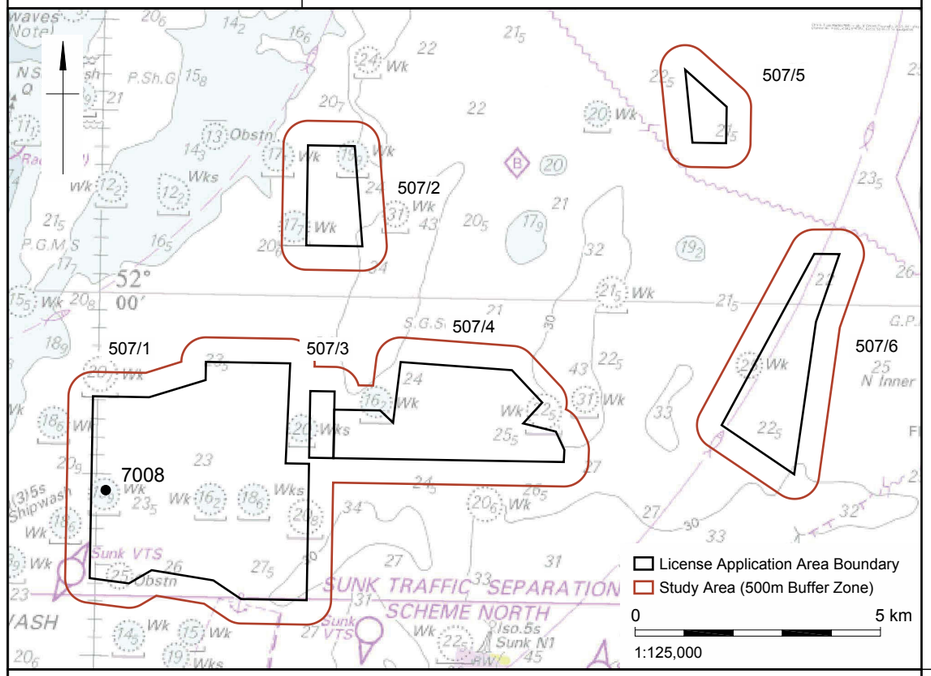
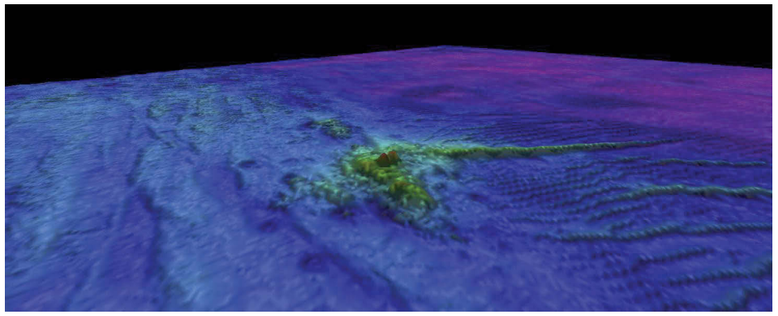
Seabed Features of Archaeological Potential (Area 507/6)

Figure 8

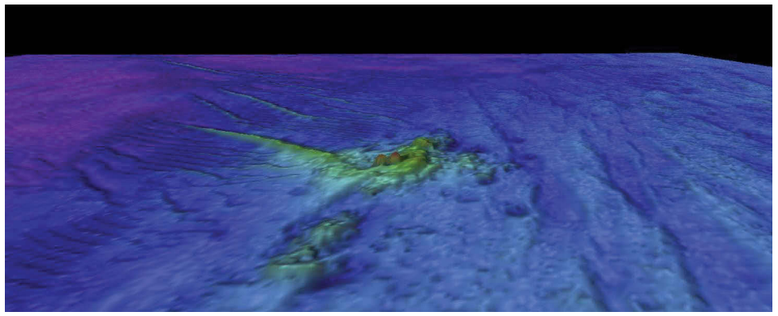
WA ID 7008 *Old Charlton* UKHO 14711

Location		408566 E, 5757791 N (UTM31N)	Area 507/1
Archaeological Importance		High	
Geophysical survey dimensions and notes		Dimensions: 114.7m x 60.9m x 4.5m. Large debris field orientated NNE-SSW, comprising two main mounds with surrounding area of scattered debris. The largest, southern mound displays significant height, although no real coherent structure is visible.	
Build	**Type**	British steam ship	
	Construction	Single boiler, triple expansion engine, single shaft.	
	Dimensions	73.2m x 11m x 5.5m	
	Shipyard	Dublin DY Co Ltd in 1919	
Loss	**Cause**	Reportedly lost after being bombed by German aircraft on passage Hartlepool to London 27th February 1941.	
Extent of Survival		The wreck is recorded as being dispersed, which matches the observed current state of the structure as a large debris field with little coherent structure. The sonar dimensions are much larger than the original vessel due to dispersal. The highest observed point possibly represents the single boiler.	

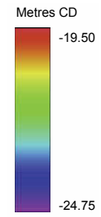


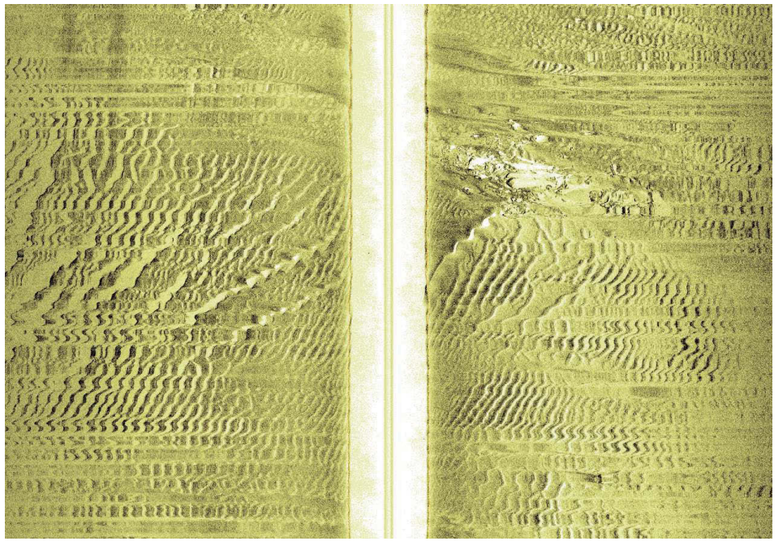


Multibeam bathymetry (looking NE, vertical exaggeration x1)



Multibeam bathymetry (looking S, vertical exaggeration x1)





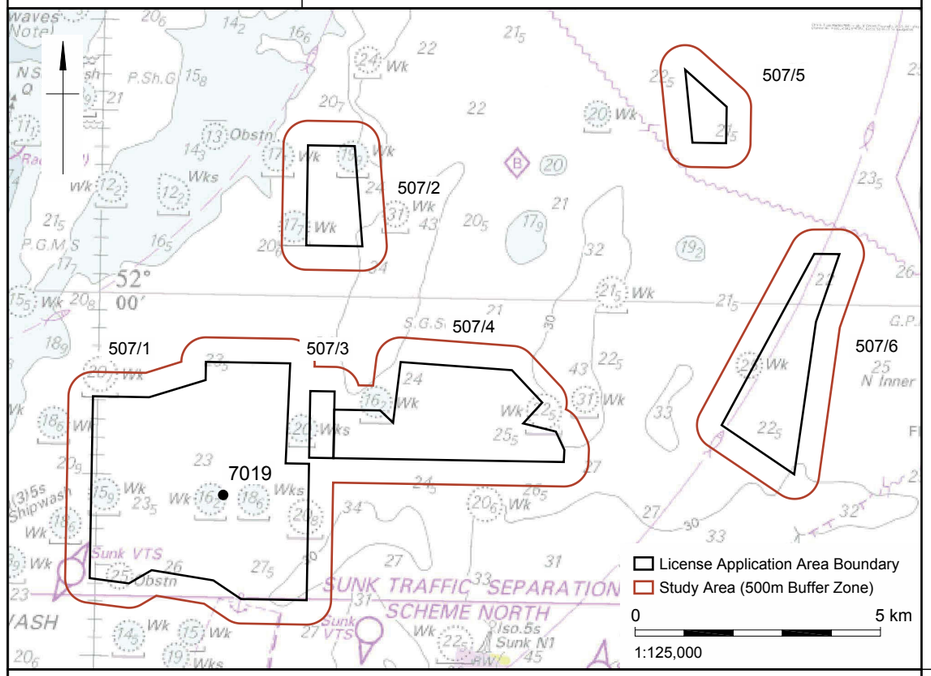
Sidescan sonar waterfall image

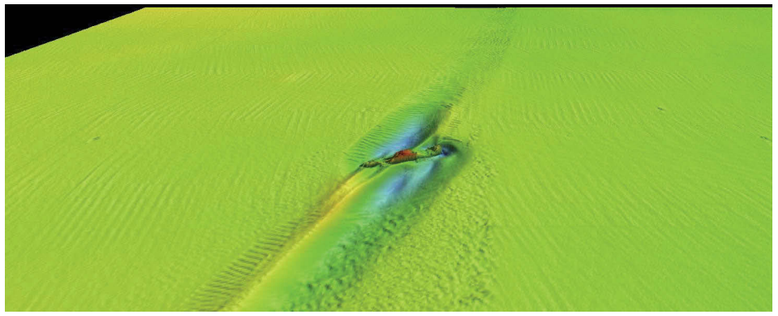
Drawing projection: UTM WGS84 z31N

Date:	16/10/2015	Revision Number:	0	Illustrator:	KJF
Path:	W:\Projects\110930\Graphics_Office\Rep figs\Geophys\2015_10_16				

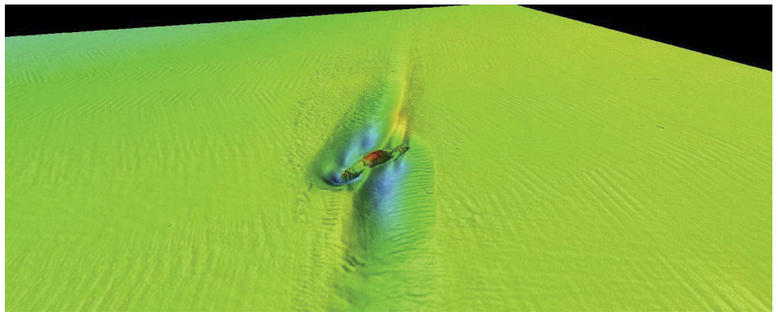
WA ID 7019 Unidentified Wreck UKHO 14709

Location		410959 E, 5757693 N (UTM31N)	Area 507/1
Archaeological Importance		High	
Geophysical survey dimensions and notes		Dimensions: 84.4m x 22.9m x 7.7m. Distinct wreck site, orientated ENE - WSW, and situated within a large NNE - SSW trending scour. Appears upright and relatively intact, and displays significant height and visible structure, and is assumed to be steel hulled (although no magnetometer data is available). No visible associated debris field.	
Build	**Type**	Unknown	
	Construction	Assumed steel hulled	
	Dimensions	Unknown	
	Shipyard	Unknown	
Loss	**Cause**	Unknown	
Extent of Survival		Associated with a previously recorded but unnamed wreck, observed as being 72m x 15m x 8.5m. Described as being upright and intact matching the observed current state of the structure. Was recorded as being partially buried which would explain the increase in sonar dimensions in the current data.	

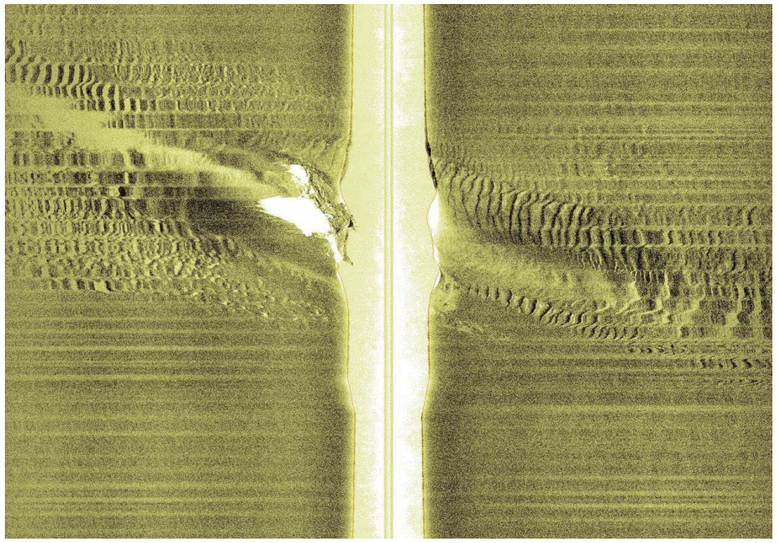




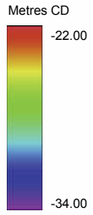
Multibeam bathymetry (looking N, vertical exaggeration x1)



Multibeam bathymetry (looking SW, vertical exaggeration x1)



Sidescan sonar waterfall image

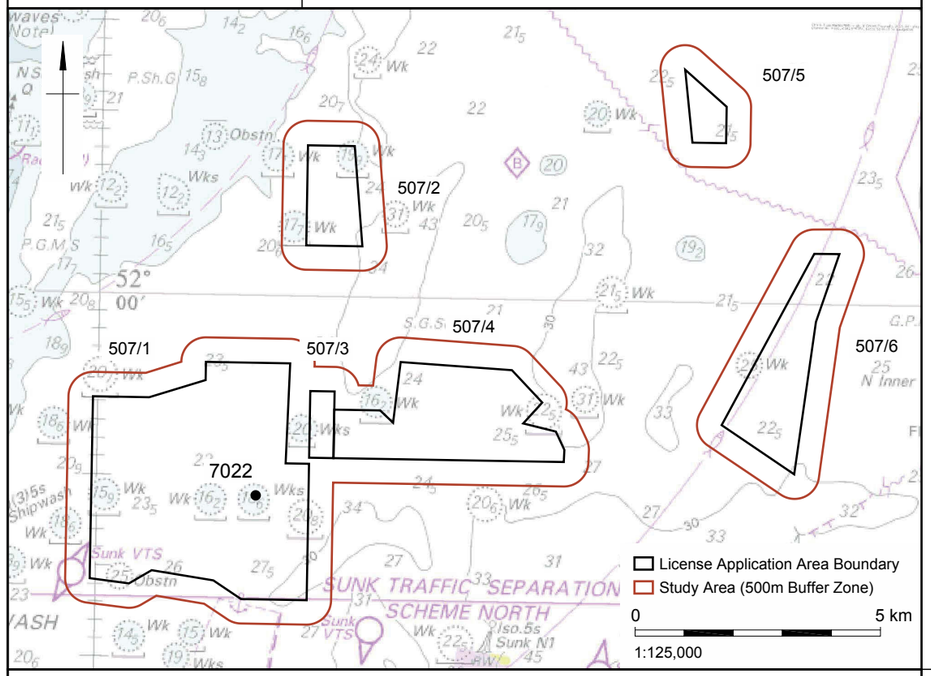


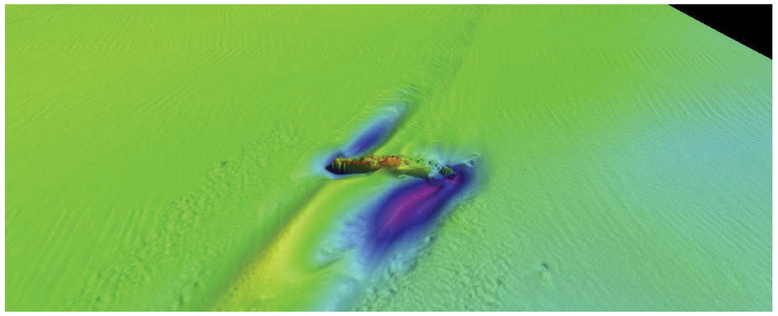
Drawing projection: UTM WGS84 z31N

Date:	16/10/2015	Revision Number:	0	Illustrator:	KJF
Path:	W:\Projects\110930\Graphics_Office\Rep figs\Geophys\2015_10_16				

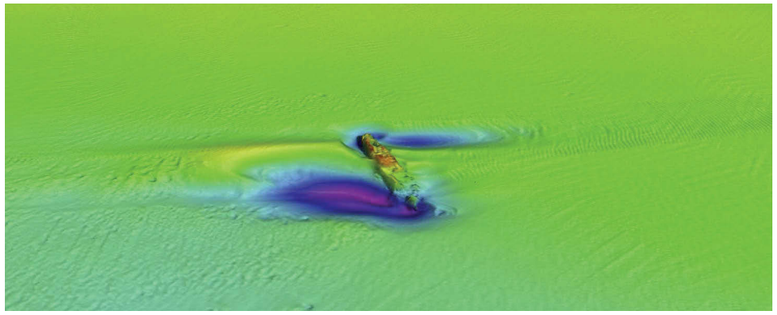
WA ID 7022 *Coal Gas* UKHO 14710

Location		411622 E, 5757684 N (UTM31N)	Area 507/1
Archaeological Importance		High	
Geophysical survey dimensions and notes		Dimensions: 101.5m x 32.7m x 12.0m. Distinct wreck site, orientated E - W and situated within a large NNE - SSW trending scour. Appears upright and relatively intact, displays significant height and visible structure, and is assumed to be steel hulled (although no magnetometer data is available). Height measurement taken from the base of the scour. No visible associated debris field.	
Build	**Type**	British collier	
	Construction	Assumed steel hulled	
	Dimensions	88.4m x 11.9m	
	Shipyard	Unknown	
Loss	**Cause**	Mined and lost en-route to London 5th March 1918	
Extent of Survival		Recorded as being the wreck of the *Coal Gas* (formerly the *George Allen*). A second record with the same name is represented by WA ID 7016. Previously observed by divers as intact, though collapsed between the bow and mid-ships, which would match with current observations. Previous surveys show a good magnetic anomaly, suggesting a steel hull. Survey in 1996 indicates the presence of a small gun mounted on the stern.	

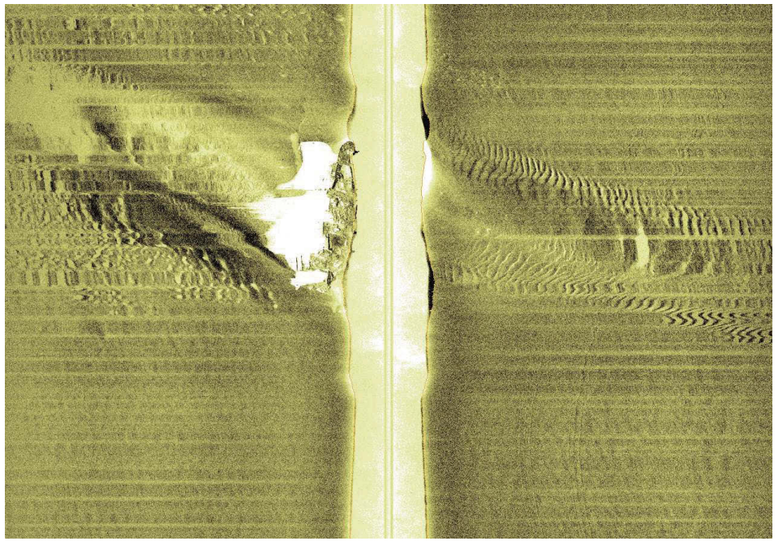




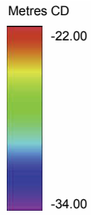
Multibeam bathymetry (looking N, vertical exaggeration x1)



Multibeam bathymetry (looking NW, vertical exaggeration x1)



Sidescan sonar waterfall image

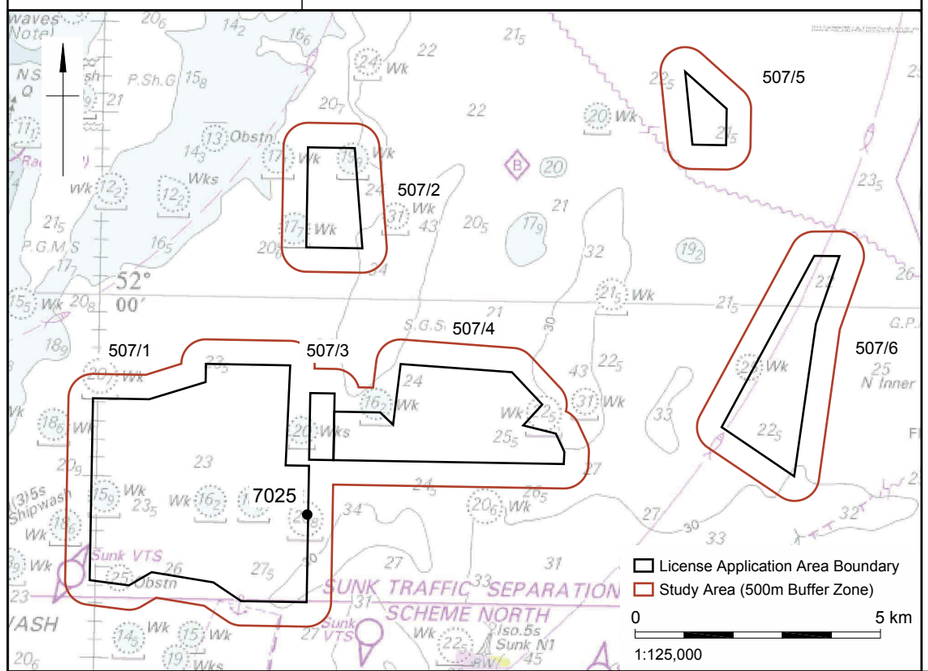


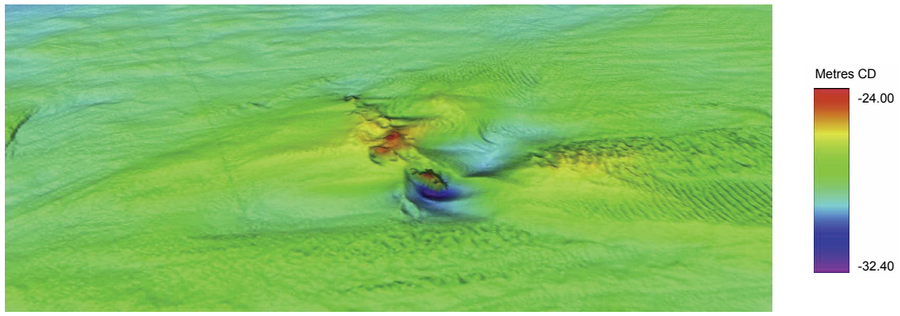
Drawing projection: UTM WGS84 z31N

Date:	16/10/2015	Revision Number:	0	Illustrator:	KJF
Path:	W:\Projects\110930\Graphics_Office\Rep figs\Geophys\2015_10_16				

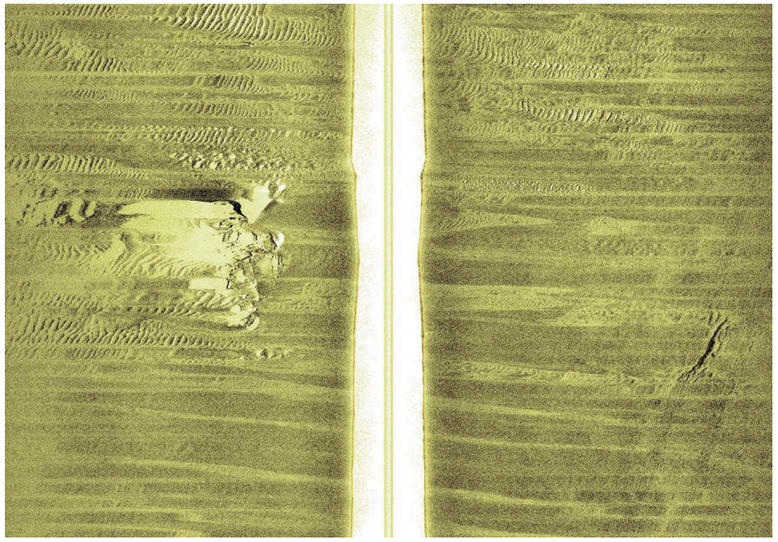
WA ID 7025 *Estrella* (Possibly) UKHO 14706

Location		412671 E, 5757334 N (UTM31N)	Area 507/1
Archaeological Importance		High	
Geophysical survey dimensions and notes		Dimensions: 101.5m x 38.8m x 8.0m. Distinct wreck orientated E-W, structure appears partially buried, especially in the east, although has a distinct scour at the western end. Appears upright but relatively broken up, with significant height and some structure visible. Some debris possibly identified in the vicinity, although the partial burial makes the precise extents and dimensions difficult to determine. Height measurement taken from base of scour.	
Build	**Type**	British steam ship	
	Construction	Assumed steel hulled	
	Dimensions	85.3m x 12.8m x 5.2m	
	Shipyard	Unknown	
Loss	**Cause**	Mined and sunk whilst on passage from Le Havre to Tyne 5th March 1918	
Extent of Survival		Previously recorded as upright with east section partially buried, with dimensions of 85m x 29m x 7.9m. This matches with most recent observation that precise dimensions are difficult to determine. The presence of debris around the wreck would account for discrepancy in dimensions. Previous surveys have identified a strong magnetic anomaly, suggesting a steel hull.	





Multibeam bathymetry (looking SE, vertical exaggeration x1)



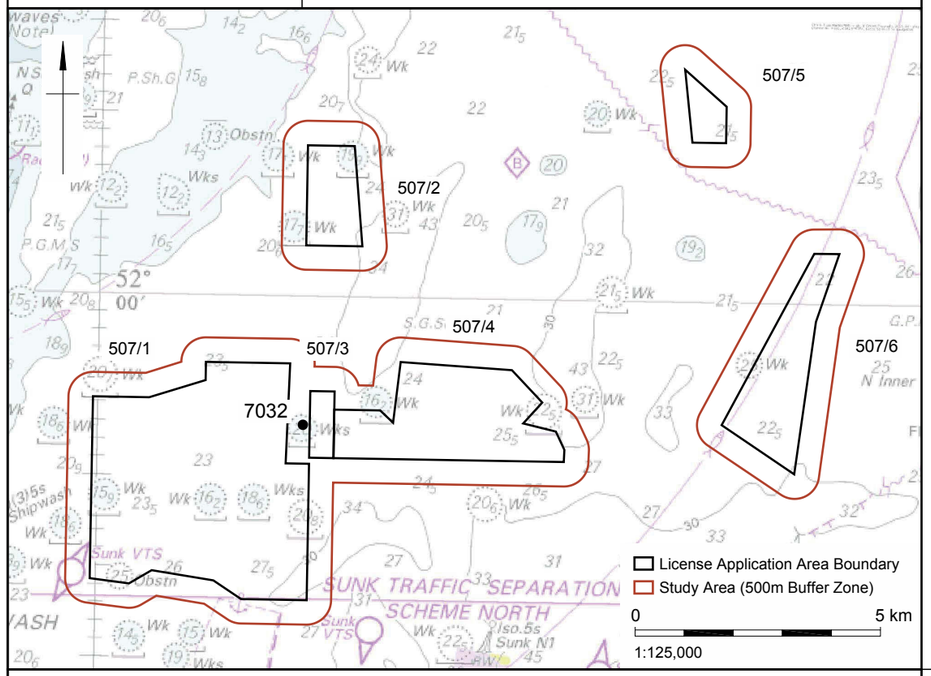
Sidescan sonar waterfall image

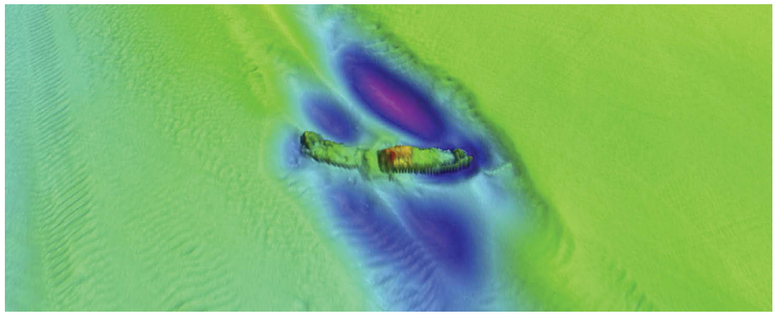
Drawing projection: UTM WGS84 z31N

Date:	16/10/2015	Revision Number:	0	Illustrator:	KJF
Path:	W:\Projects\110930\Graphics_Office\Rep figs\Geophys\2015_10_16				

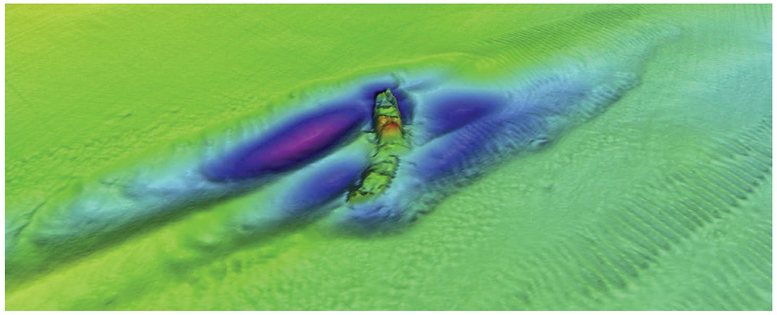
WA ID 7032 Unidentified Wreck UKHO 14721

Location		412584 E, 5759122 N (UTM31N)	Area 507/1/3/4 Buffer
Archaeological Importance		High	
Geophysical survey dimensions and notes		Dimensions: 92.0m x 32.9m x 12.0m. Distinct wreck site, orientated NNW - SSE and situated within a large, NNE - SSW trending scour. The wreck appears 'bent', with the south-eastern section curving away to a separate orientation to the rest of the wreck, and could possibly be in two pieces with debris between. Besides this, the wreck appears upright and relatively intact, with structure and significant height visible, although a small debris field has been identified along the eastern side. Height measurement taken from the base of the scour.	
Build	**Type**	Unknown	
	Construction	Assumed steel hulled	
	Dimensions	Unknown	
	Shipyard	Unknown	
Loss	**Cause**	Unknown	
Extent of Survival		Previously identified as intact (though in two pieces), well collapsed, with the largest piece to the north. This would match with the current observation of the wreck. Previous surveys have identified a strong magnetic anomaly, suggesting a steel hull. Previous reports indicate the wreck is covered with numerous buoys and nets.	

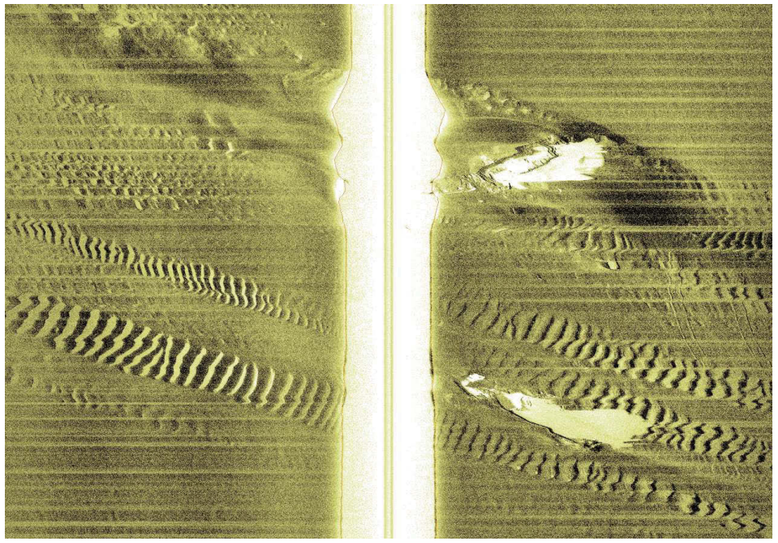




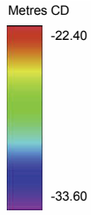
Multibeam bathymetry (looking SW, vertical exaggeration x1)



Multibeam bathymetry (looking NW, vertical exaggeration x1)



Sidescan sonar waterfall image (7032 at top)

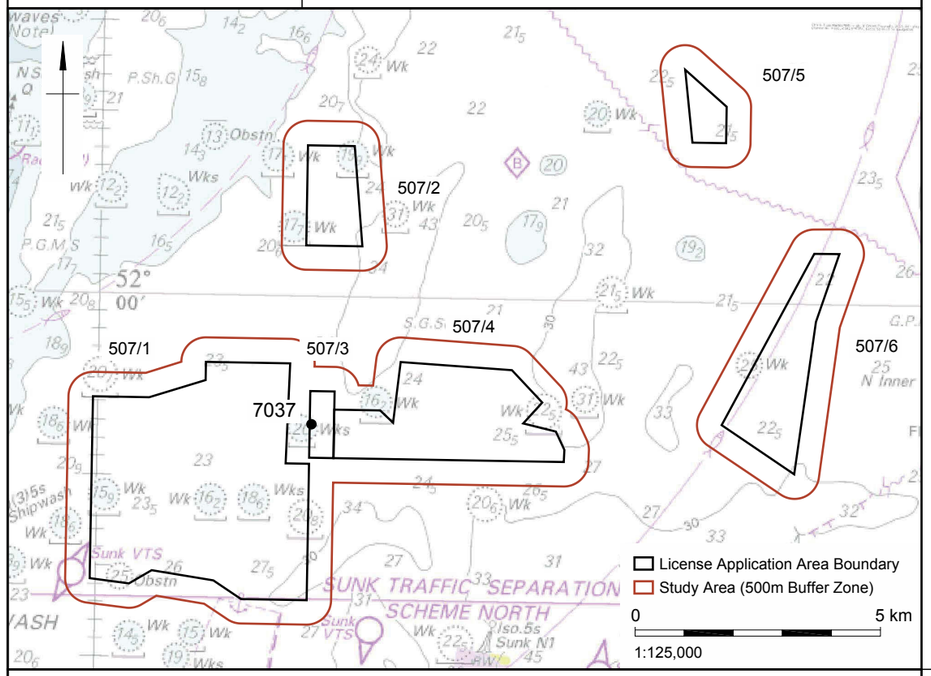


Drawing projection: UTM WGS84 z31N

Date:	16/10/2015	Revision Number:	0	Illustrator:	KJF
Path:	W:\Projects\110930\Graphics_Office\Rep figs\Geophys\2015_10_16				

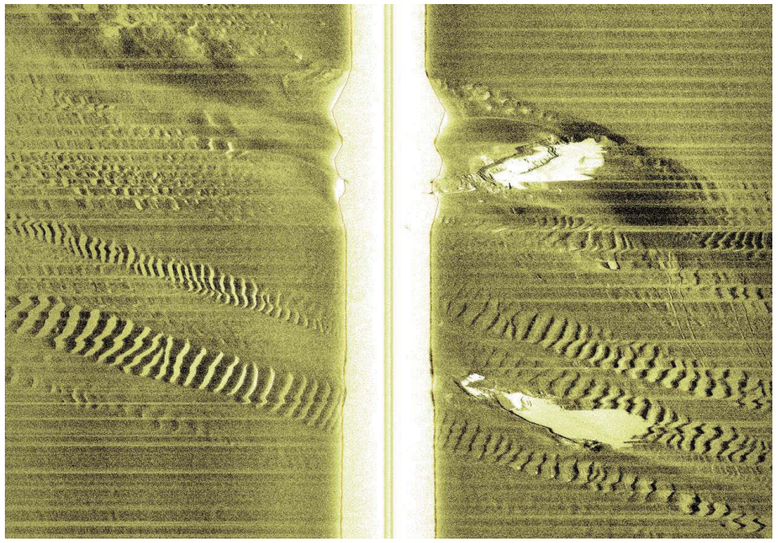
WA ID 7037 Unidentified Wreck UKHO 14720

Location		412758 E, 5759133 N (UTM31N)	Area 507/3
Archaeological Importance		High	
Geophysical survey dimensions and notes		Dimensions: 89.2m x 32.7m x 8.5m. Distinct wreck site orientated NNE-SSW with a small scour at the northern and southern edges. Appears upright but relatively broken up, although still displays height and some structure, and seems partially buried. No distinct debris field identified, although part of the western side seems to have collapsed outwards.	
Build	**Type**	Unknown	
	Construction	Assumed steel hulled	
	Dimensions	Unknown	
	Shipyard	Unknown	
Loss	**Cause**	Unknown	
Extent of Survival		Previously observed in two separate sections and partially buried with dimensions of 60m x 14m x 8m. This would match with current observation and would appear to be further uncovered at the time of recent survey. Previous surveys have identified a strong magnetic anomaly, suggesting a steel hull.	

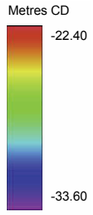


Multibeam bathymetry (looking NE, vertical exaggeration x1)

Multibeam bathymetry (looking WSW, vertical exaggeration x1)



Sidescan sonar waterfall image (7037 at bottom)

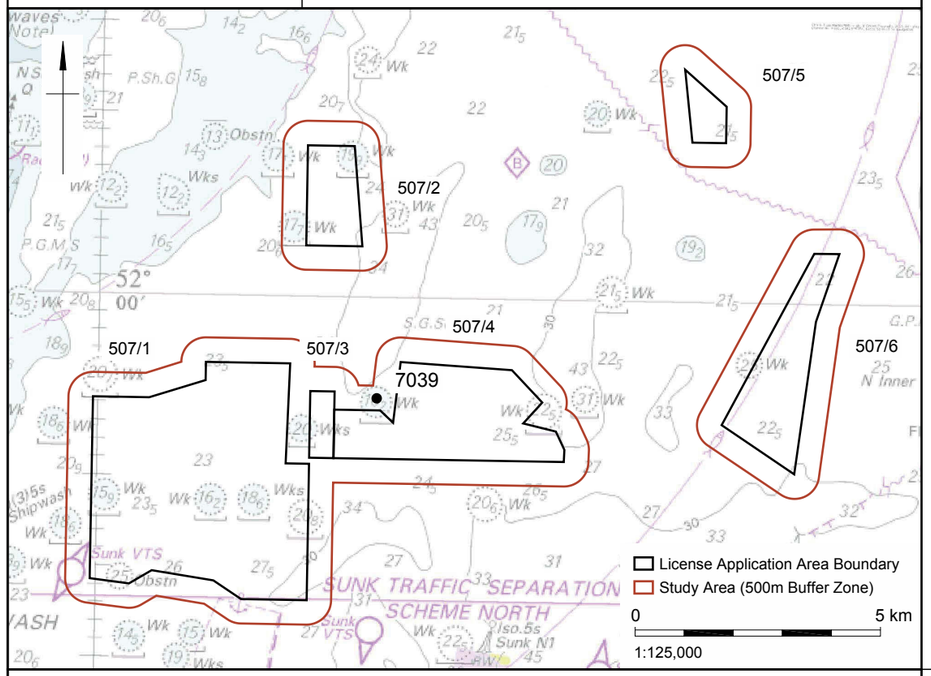


Drawing projection: UTM WGS84 z31N

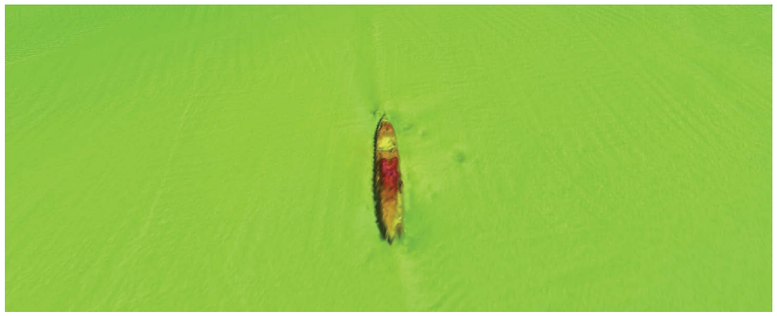
Date:	16/10/2015	Revision Number:	0	Illustrator:	KJF
Path:	W:\Projects\110930\Graphics_Office\Rep figs\Geophys\2015_10_16				

WA ID 7039 *Forth* UKHO 14731

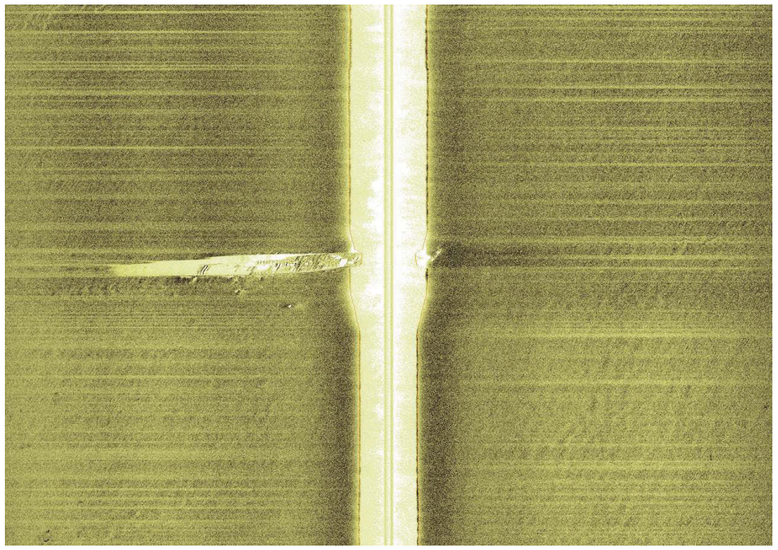
Location		414088 E, 5759661 N (UTM31N)	Area 507/1/3/4 Buffer
Archaeological Importance		High	
Geophysical survey dimensions and notes		Dimensions: 85.9m x 12.3m x 7.0m. Distinct wreck, orientated NNE-SSW with a small, shallow scour extending from each end along the same orientation. Bathymetry data shows a possible broad, semi-circular depression along the western side, although this is unclear. Appears upright and intact, showing height and structure, with very little associated surrounding debris.	
Build	**Type**	British steam ship	
	Construction	Two boilers, triple expansion engine, single shaft, assumed steel hull	
	Dimensions	82m x 9.4m x 4.9m	
	Shipyard	Built 1886 A & J Ingles, Glasgow	
Loss	**Cause**	Detonated by mine laid by UC-11and lost en-route to Leith from London, 9th December 1916	
Extent of Survival		Recorded as the wreck of the *Forth*, previously the *Figulina*. This position was dived in 1994 and positively identified as the *Forth*. Previously recorded as upright and intact but with collapsed superstructure which would match the current observation. Previous surveys record a strong magnetic anomaly, indicating a steel hull.	



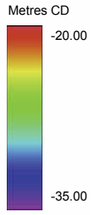
Multibeam bathymetry (looking NE, vertical exaggeration x1)



Multibeam bathymetry (looking SSW, vertical exaggeration x1)



Sidescan sonar waterfall image

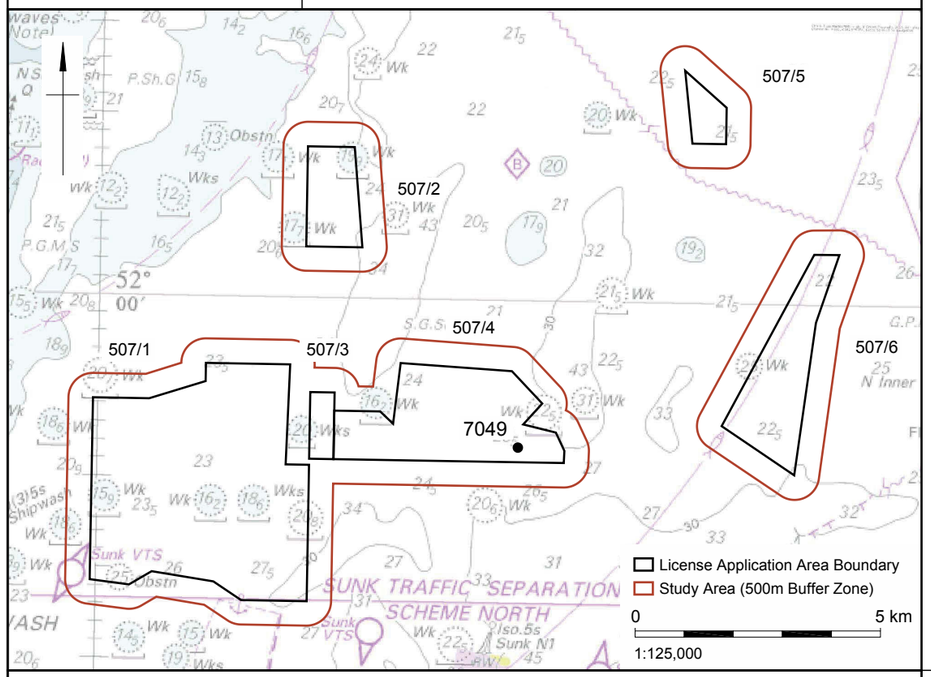


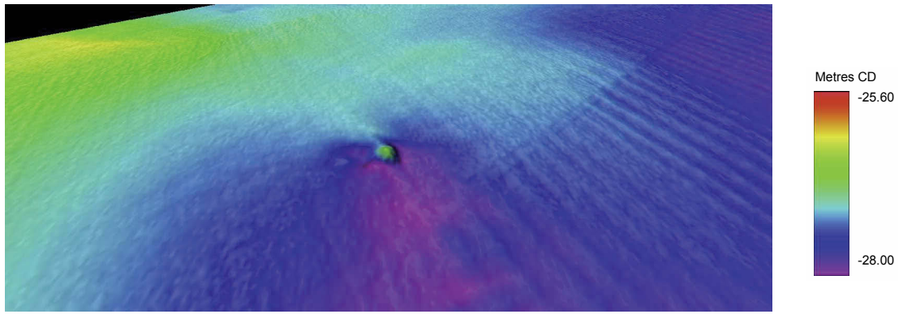
Drawing projection: UTM WGS84 z31N

Date:	16/10/2015	Revision Number:	0	Illustrator:	KJF
Path:	W:\Projects\110930\Graphics_Office\Rep figs\Geophys\2015_10_16				

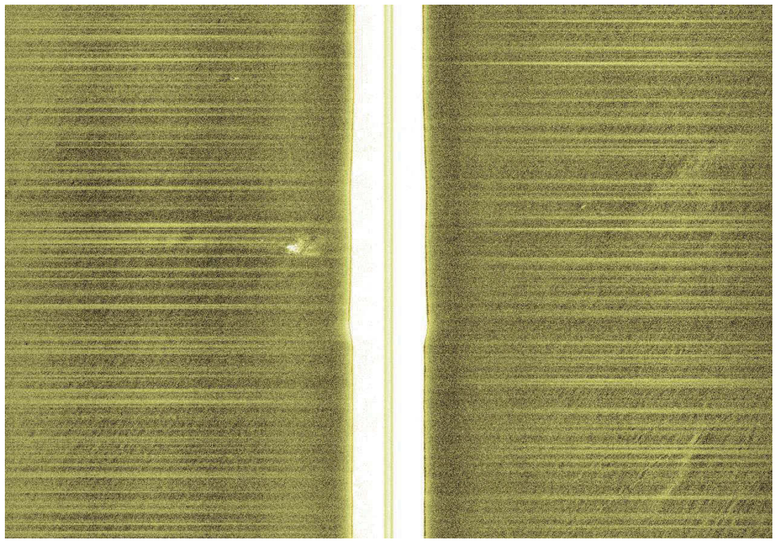
WA ID 7049 *HMS Forward III (possibly)* UKHO 14716

Location		416965 E, 5758677 N (UTM31N)	Area 507/4
Archaeological Importance		High	
Geophysical survey dimensions and notes		Dimensions: 16.0m x 13.0m x 1.7m. Distinct elongate piece of debris with height and possible structure, located within a small depression.	
Build	**Type**	British drifter	
	Construction	Unknown	
	Dimensions	25.9m x 6.1m x 2.7m	
	Shipyard	Unknown	
Loss	**Cause**	Mined and lost, 31st March 1917	
Extent of Survival		Located approximately 95m E of the recorded location of the wreck of the HMS *Forward III*. No wreck was identified at the recorded location, and has previously been 'disproved' and recorded as dead. However, the vessel is reported to have only been 25.9m long, and so this identified feature could represent the partially buried, degraded remains of the HMS *Forward III*.	





Multibeam bathymetry (looking NE, vertical exaggeration x1)



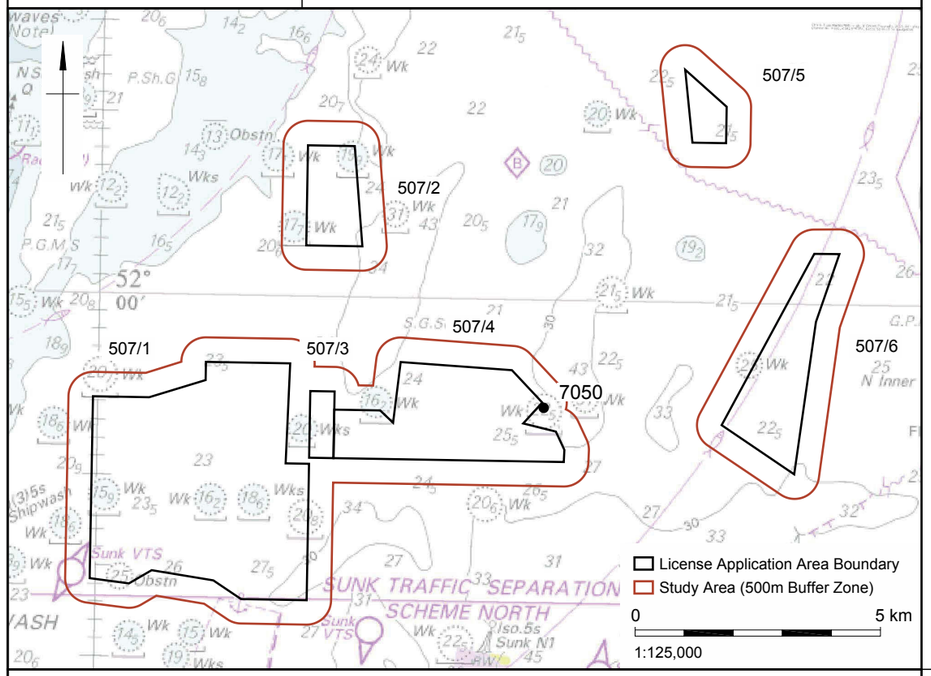
Sidescan sonar waterfall image

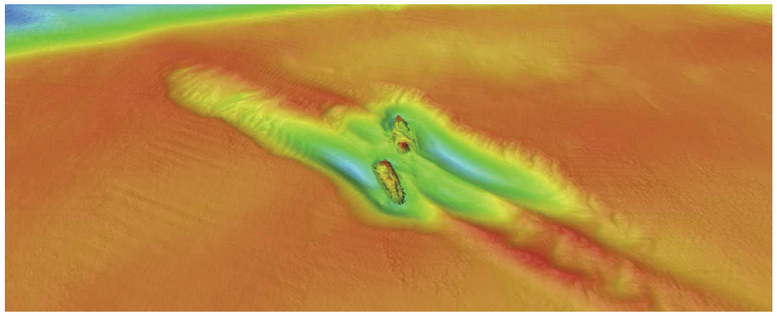
Drawing projection: UTM WGS84 z31N

Date:	16/10/2015	Revision Number:	0	Illustrator:	KJF
Path:	W:\Projects\110930\Graphics_Office\Rep figs\Geophys\2015_10_16				

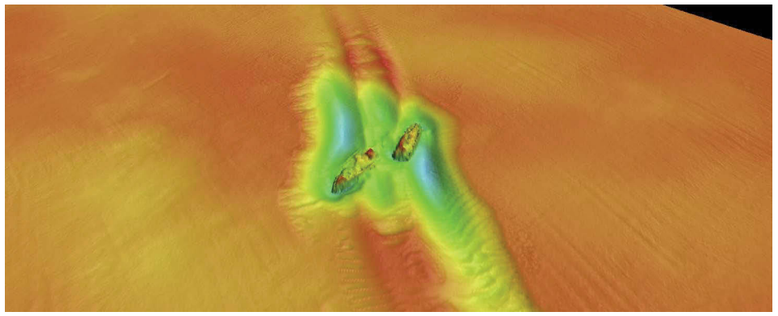
WA ID 7050 Unidentified Wreck UKHO 14730

Location		417492 E, 5759467 N (UTM31N)	Area 507/1/3/4 Buffer
Archaeological Importance		High	
Geophysical survey dimensions and notes		Dimensions: 66.8m x 45.9m x 7.5m. Distinct wreck site. Wreck is split into two separate features laterally offset by approximately 20m and on slightly different orientations, although both generally NE-SW. Situated in a large scour, which extends NNE from the western section and SSW from the eastern section. Besides the break, the wreck appears upright and relatively intact, with height and structure visible, although the western section appears larger and more intact than the eastern section. A small debris field is located between the two halves. Dimensions given are of the entire site.	
Build	**Type**	Unknown	
	Construction	Assumed steel hull	
	Dimensions	Unknown	
	Shipyard	Unknown	
Loss	**Cause**	Unknown	
Extent of Survival		In two distinct, separate pieces, 10m apart. This matches the current observation. In 1995 dimensions of 55m x 20m x 5.2m were recorded suggesting that the wreck has broken up further in this intervening period. Previous surveys have recorded a strong magnetic anomaly, suggesting a steel hull.	

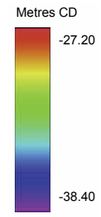


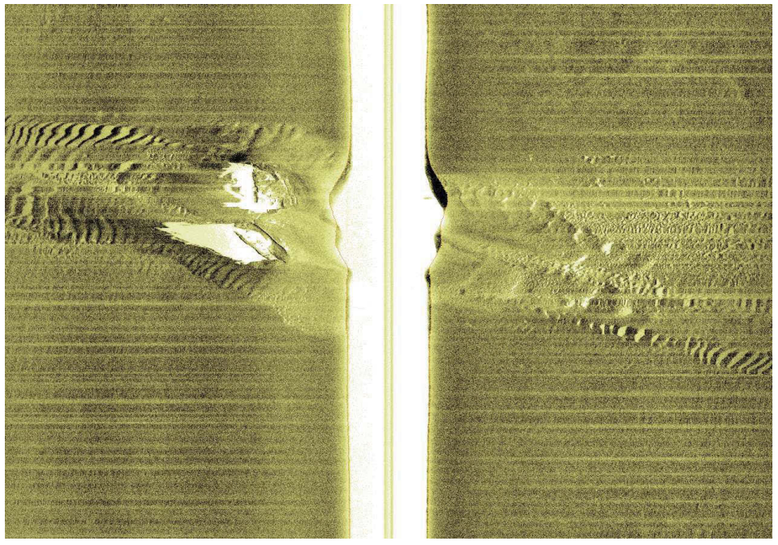


Multibeam bathymetry (looking ENE, vertical exaggeration x1)



Multibeam bathymetry (looking SW, vertical exaggeration x1)





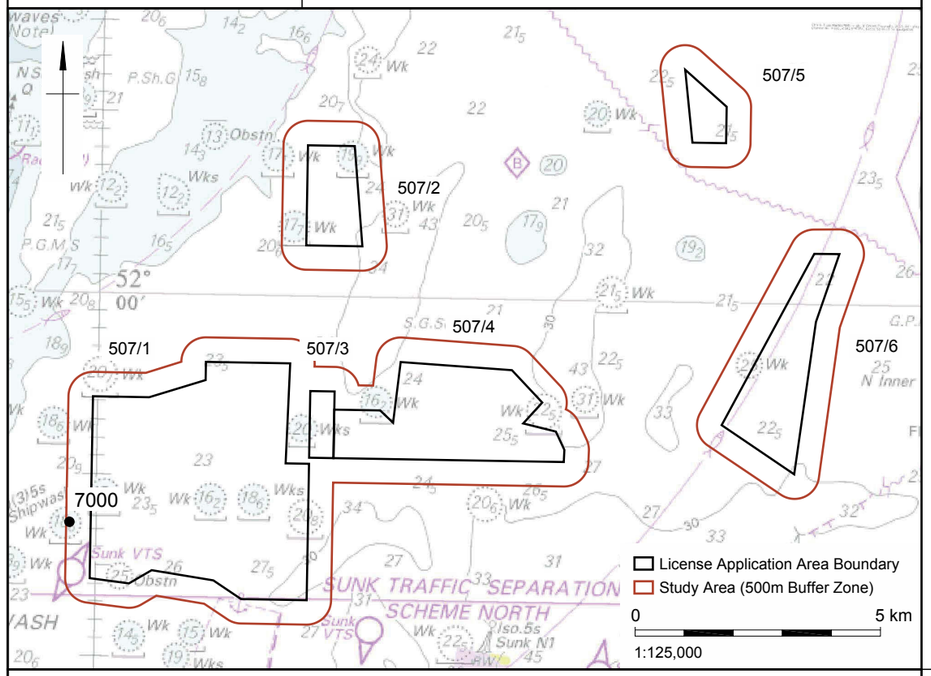
Sidescan sonar waterfall image

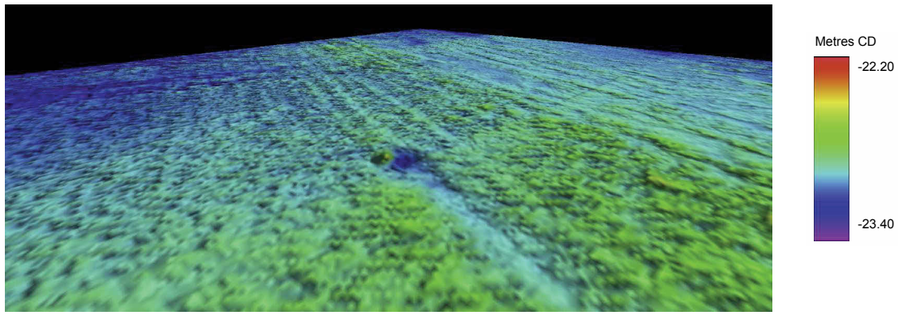
Drawing projection: UTM WGS84 z31N

Date:	16/10/2015	Revision Number:	0	Illustrator:	KJF
Path:	W:\Projects\110930\Graphics_Office\Rep figs\Geophys\2015_10_16				

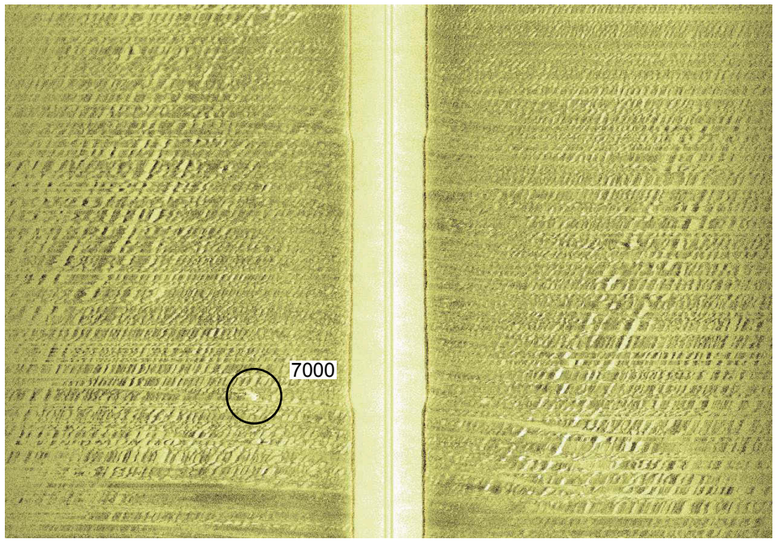
WA ID 7000 Debris UKHO 14704

Location		407826 E, 5757146 N (UTM31N)	Area 507/1/3/4 Buffer
Archaeological Importance		High	
Geophysical survey dimensions and notes		Dimensions: 13.5m x 5.0m x 1.3m. Elongate dark reflector with shadow, possibly with a small associated depression or scour. Identified within both the sidescan sonar and multibeam bathymetry data sets.	
Build	**Type**	Unknown	
	Construction	Unknown	
	Dimensions	Unknown	
	Shipyard	Unknown	
Loss	**Cause**	Unknown	
Extent of Survival		Possible piece of debris, possibly associated with UKHO wreck 14704, located approximately 90m to the NW. This wreck record is described as a "small piece of wreckage" measuring approximately 20m, but no such anomaly was identified at the recorded location. It is possible that this anomaly relates to the known record.	





Multibeam bathymetry (looking E, vertical exaggeration x1)



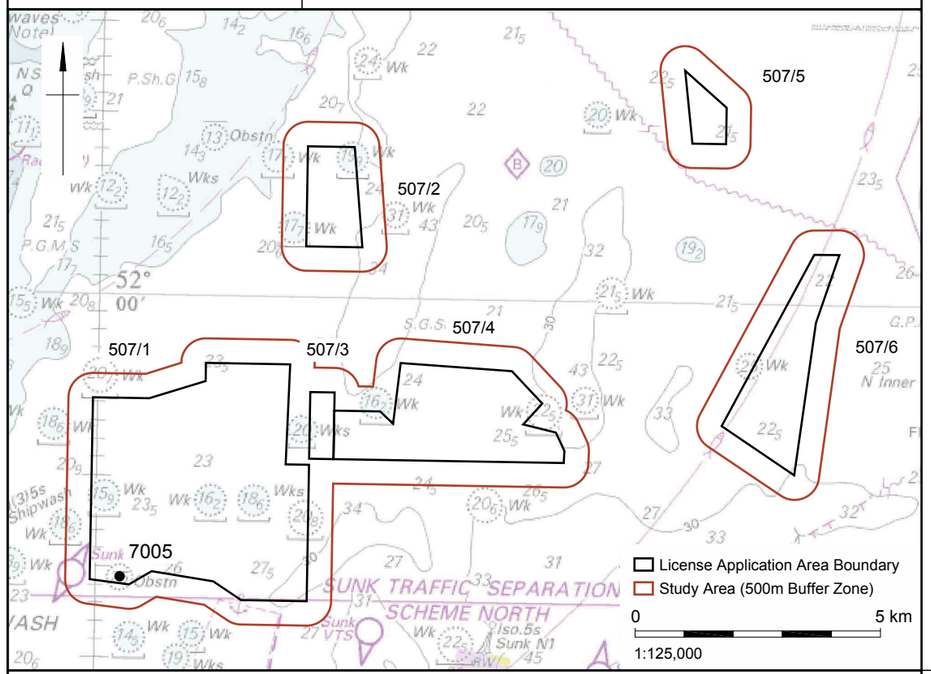
Sidescan sonar waterfall image

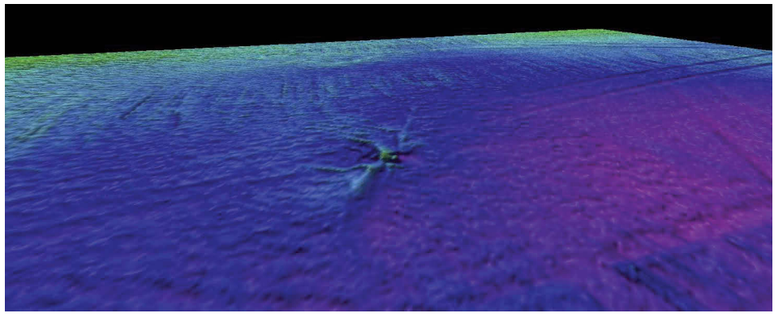
Drawing projection: UTM WGS84 z31N

Date:	16/10/2015	Revision Number:	0	Illustrator:	KJF
Path:	W:\Projects\110930\Graphics_Office\Rep figs\Geophys\2015_10_16				

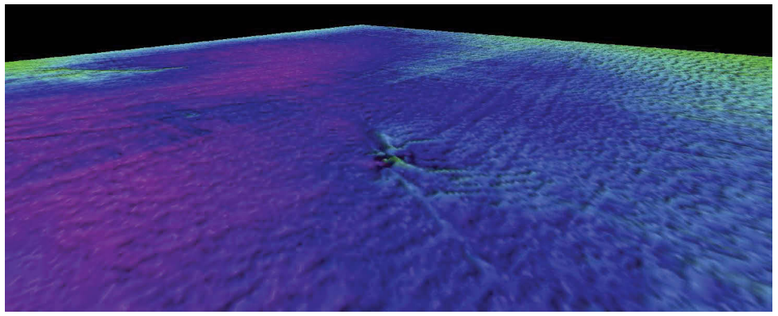
WA ID 7005 Recorded Obstruction UKHO 65639

Location		408849 E, 5756058 N (UTM31N)	Area 507/1
Archaeological Importance		Medium	
Geophysical survey dimensions and notes		Dimensions: 12.2m x 9.3m x 0.5m. Distinct, irregular object with distinct but relatively shallow scour identified within the multibeam bathymetry data. Not definitively identified within the sidescan sonar data, although this is probably due to the anomaly being located directly beneath the fish. Possible piece of debris.	
Build	**Type**	Unknown	
	Construction	Unknown	
	Dimensions	Unknown	
	Shipyard	Unknown	
Loss	**Cause**	Unknown	
Extent of Survival		Associated with a recorded obstruction (UKHO 65639), described as a possible shipping container although there is no evidence within the geophysical data to confirm or deny this interpretation.	

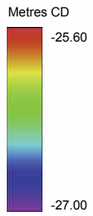




Multibeam bathymetry (looking NNE, vertical exaggeration x1)



Multibeam bathymetry (looking SW, vertical exaggeration x1)

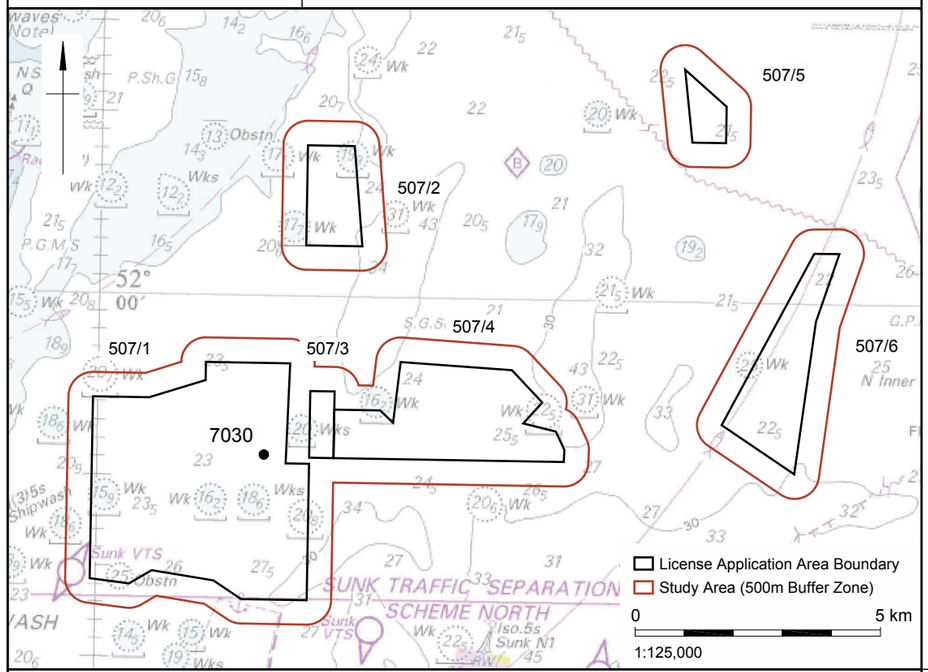


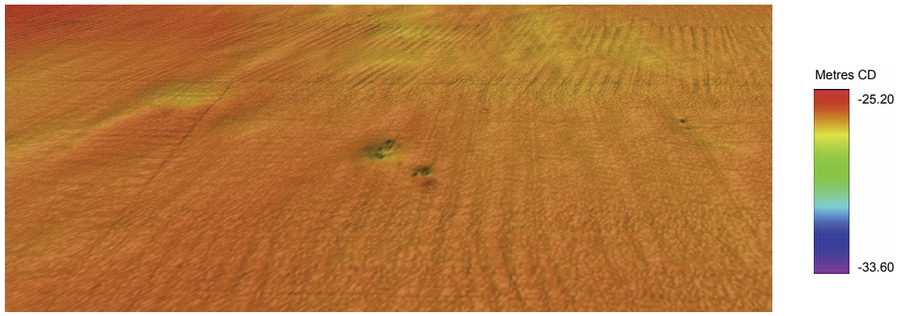
Drawing projection: UTM WGS84 z31N

Date:	16/10/2015	Revision Number:	0	Illustrator:	KJF
Path:	W:\Projects\110930\Graphics_Office\Rep figs\Geophys\2015_10_16				

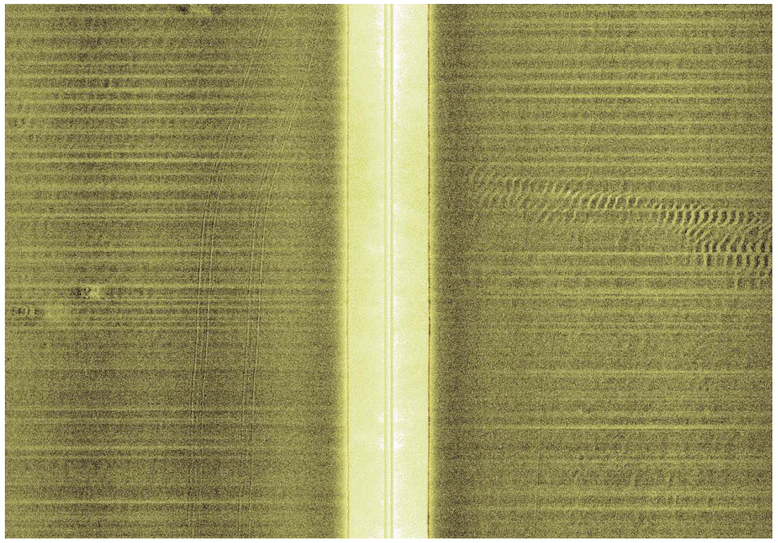
WA ID 7030 Debris Field UKHO 14714

Location		411788 E, 5758516 N (UTM31N)	Area 507/1
Archaeological Importance		High	
Geophysical survey dimensions and notes		Dimensions: 12.3m x 10.1m x 0.2m. Two adjacent dark reflectors with shadows within a small depression. Tentatively identified within both the sidescan sonar and multibeam bathymetry data sets.	
Build	**Type**	Unknown	
	Construction	Unknown	
	Dimensions	Unknown	
	Shipyard	Unknown	
Loss	**Cause**	Unknown	
Extent of Survival		Possible debris field, possibly associated with UKHO record 14714. Recorded as a foul ground, and previously described as an area of debris measuring approximately 20m x 20m x1m. Nature and origin of debris is unknown, but strong magnetic anomaly identified by previous surveys suggest it is ferrous in nature.	





Multibeam bathymetry (looking N, vertical exaggeration x1)

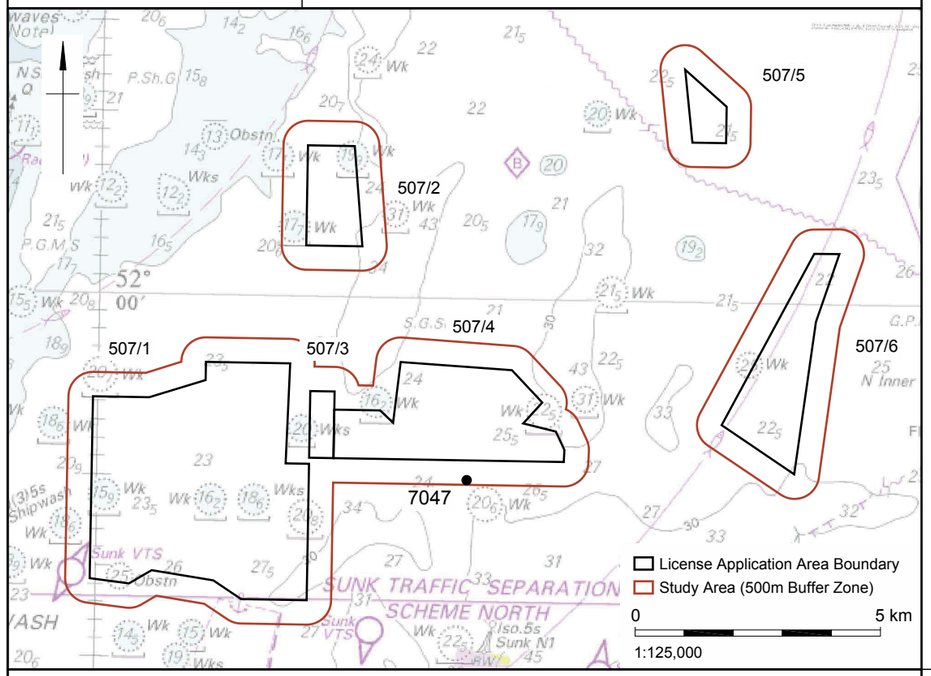


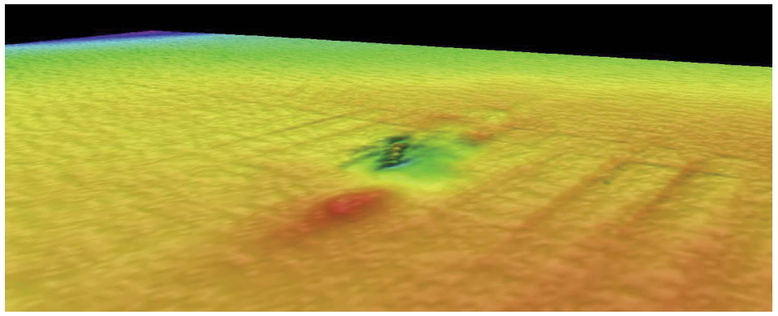
Sidescan sonar waterfall image

Date:	16/10/2015	Revision Number:	0	Illustrator:	KJF
Path:	W:\Projects\110930\Graphics_Office\Rep figs\Geophys\2015_10_16				

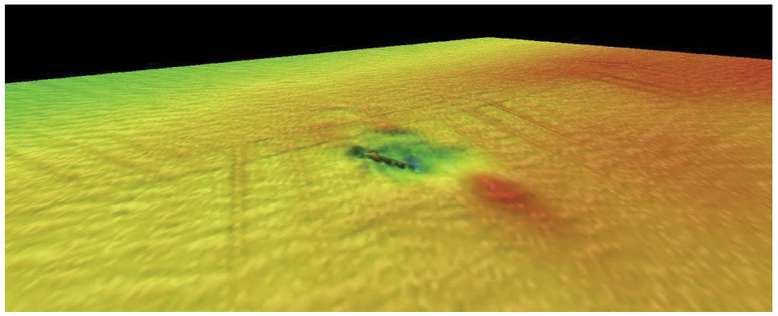
WA ID 7047 Recorded Obstruction UKHO 82878

Location		415921 E, 5757993 N (UTM31N)	Area 507/1/3/4 Buffer
Archaeological Importance		Medium	
Geophysical survey dimensions and notes		Dimensions: 16.2m x 4.5m x 1.2m. Low, elongate mound within a depression, found to be an irregular piece of debris with shadow and visible structure. Structure comprises short, parallel lines. Probable debris.	
Build	**Type**	Unknown	
	Construction	Unknown	
	Dimensions	Unknown	
	Shipyard	Unknown	
Loss	**Cause**	Unknown	
Extent of Survival		Associated with a recorded obstruction (UKHO 82878). No other information available.	

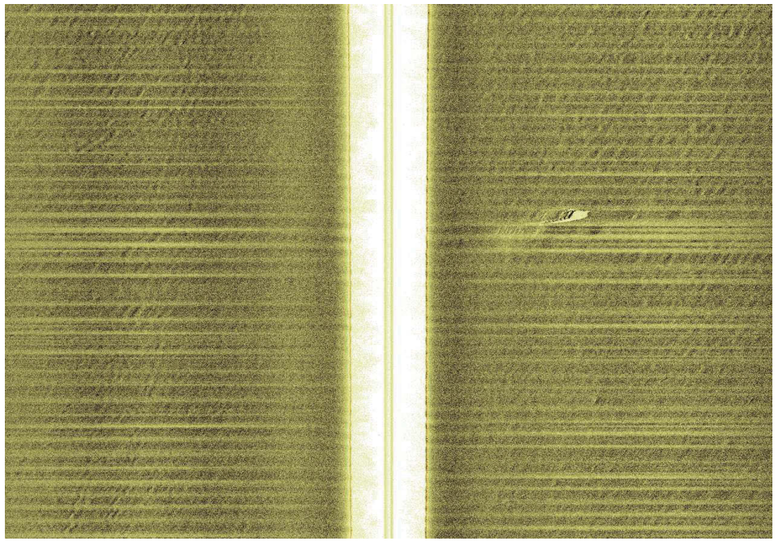




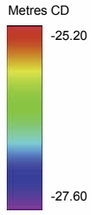
Multibeam bathymetry (looking SE, vertical exaggeration x1)



Multibeam bathymetry (looking SW, vertical exaggeration x1)



Sidescan sonar waterfall image

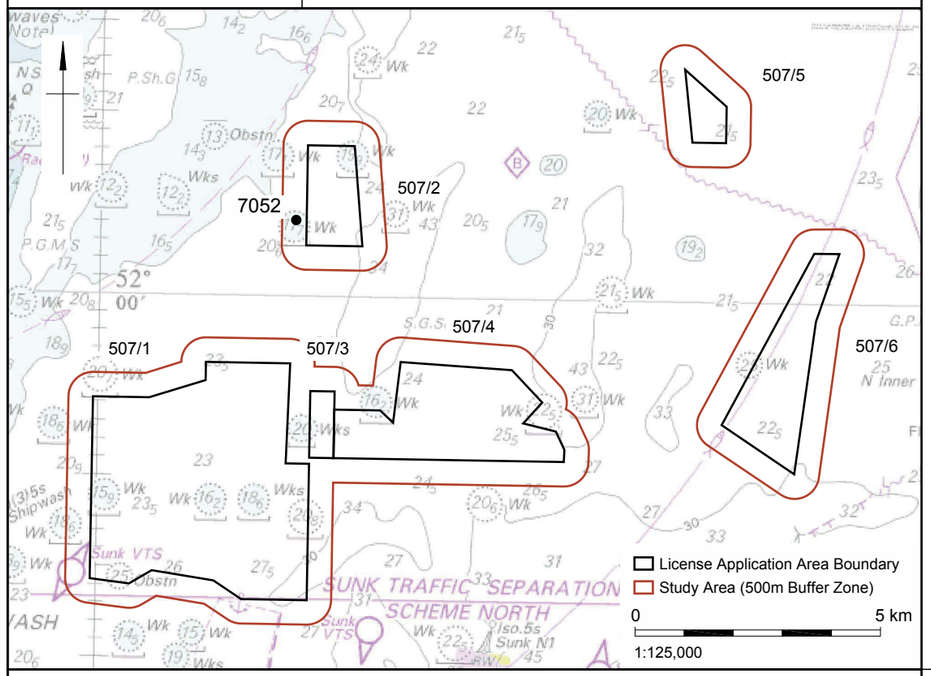


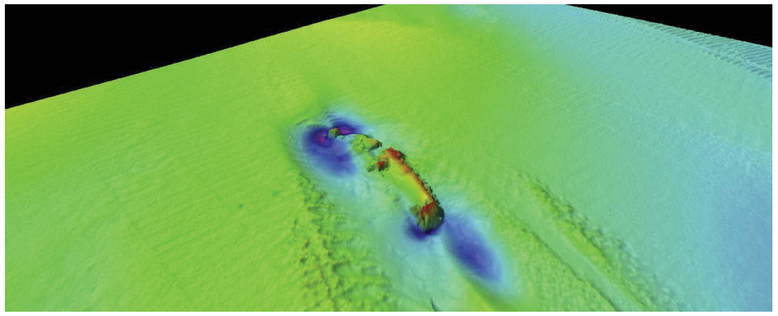
Drawing projection: UTM WGS84 z31N

Date:	16/10/2015	Revision Number:	0	Illustrator:	KJF
Path:	W:\Projects\110930\Graphics_Office\Rep figs\Geophys\2015_10_16				

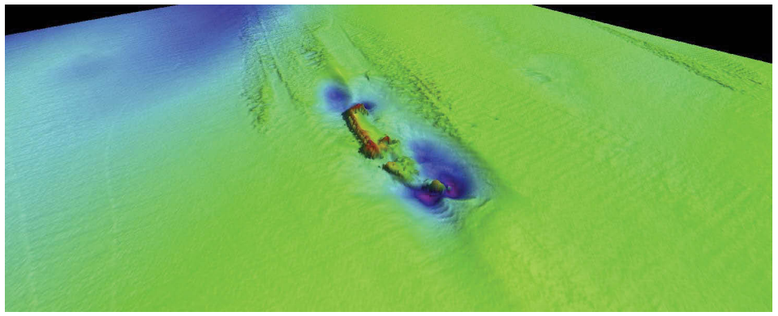
WA ID 7052 *Polgarth* UKHO 10184

Location		412449 E, 5763295 N (UTM31N)	Area 507/2 Buffer
Archaeological Importance		High	
Geophysical survey dimensions and notes		Dimensions: 111.5m x 24.8m x 7.0m. Distinct wreck site orientated NNE-SSW within a distinct scour along the same orientation, mainly to the SSW. Wreck exhibits significant height and some structure, and is probably upright, but is fairly broken up and possibly partially buried. Main structure is broken into two distinct pieces, with each piece being on a slightly different orientation and an approximately 10m gap between them.	
Build	**Type**	British steam ship	
	Construction	Two boilers, triple expansion engine of 111HP, single shaft, assumed steel hull	
	Dimensions	56.4m x 9.4m 3.7m	
	Shipyard	Cochran & Sons, Selby	
Loss	**Cause**	Mined on passage Blyth for Southampton, 1st March 1942	
Extent of Survival		Recorded as being upright in two sections with total dimensions of 106m x 25m x 4.7m. This matches the current observation. Recorded as being previously dispersed by explosives, which matches the general broken up appearance of the structure. Thought at one time to be two separate ships but has not been dived. Previous surveys have identified a strong magnetic anomaly, suggesting a steel hull.	

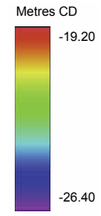


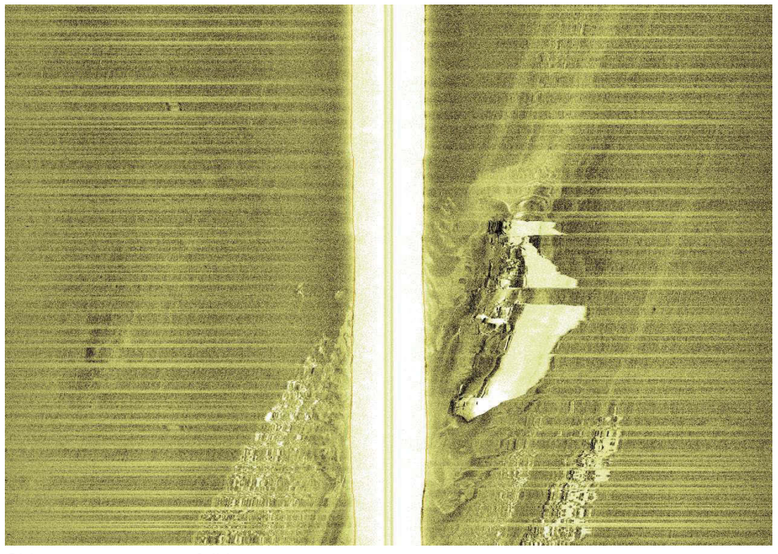


Multibeam bathymetry (looking NE, vertical exaggeration x1)



Multibeam bathymetry (looking SW, vertical exaggeration x1)



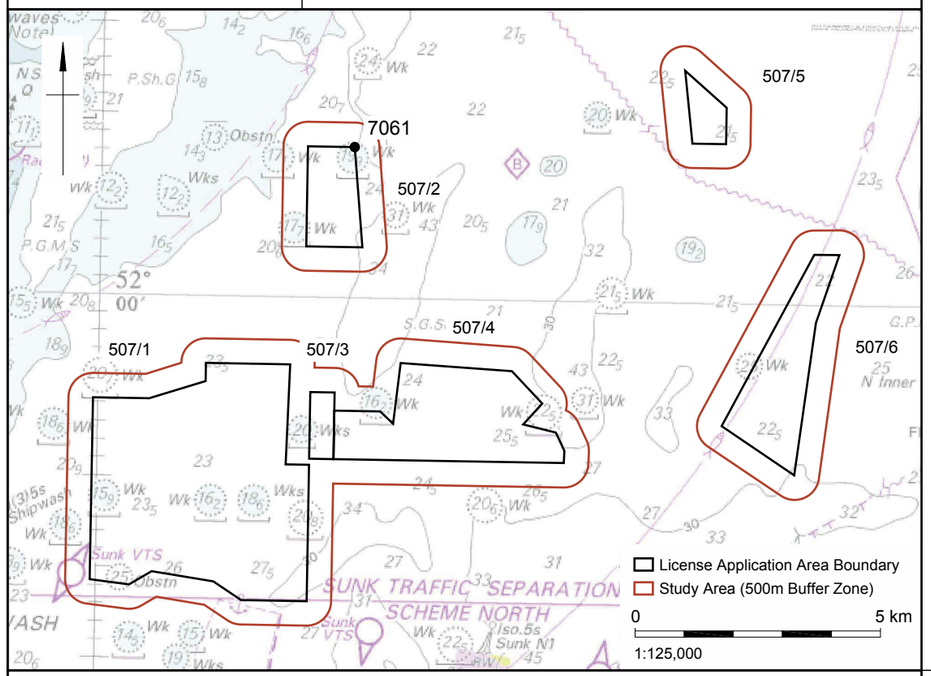


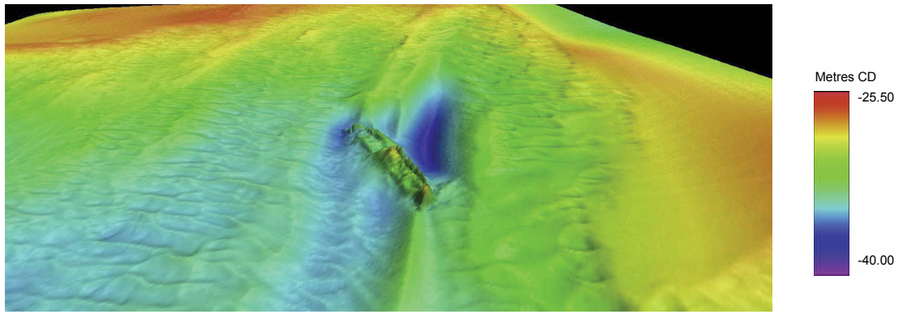
Sidescan sonar waterfall image

Date:	16/10/2015	Revision Number:	0	Illustrator:	KJF
Path:	W:\Projects\110930\Graphics_Office\Rep figs\Geophys\2015_10_16				

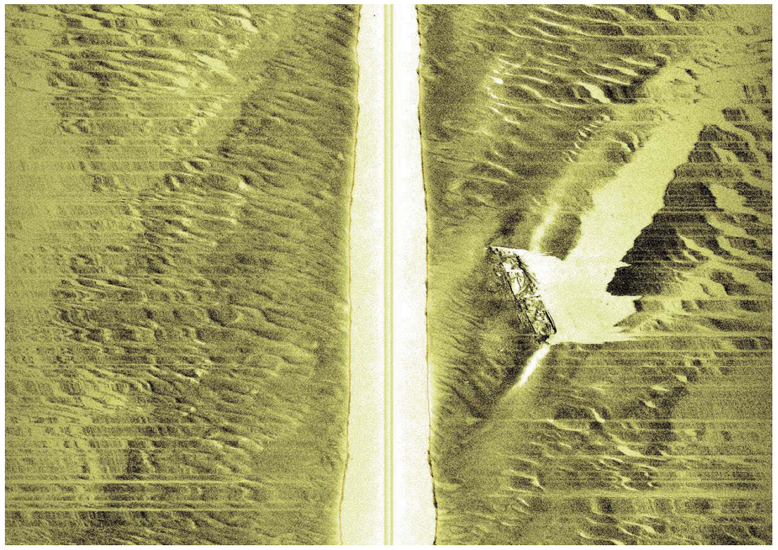
WA ID 7061 Unidentified Wreck UKHO 10204

Location		413635 E, 5764782 N (UTM31N)	Area 507/2
Archaeological Importance		High	
Geophysical survey dimensions and notes		Dimensions: 95.2m x 29.3m x 8.5m. Distinct wreck site orientated NNW-SSE, located within a large, distinct NNE-SSW trending scour. Wreck appears upright and relatively intact, exhibiting structure and significant height, although the visible structure indicates some partial break-up.	
Build	**Type**	Unknown	
	Construction	Assumed steel hull	
	Dimensions	Unknown	
	Shipyard	Unknown	
Loss	**Cause**	Unknown	
Extent of Survival		Associated with known but unnamed wreck (UKHO 10204), recorded as intact and upright, probably collapsed, with dimensions 80m x 22m x 8.8m. These dimensions match the current observation though would suggest further break-up of the wreck. Previous surveys have identified a strong magnetic anomaly, suggesting a steel hull.	





Multibeam bathymetry (looking SSW, vertical exaggeration x1)



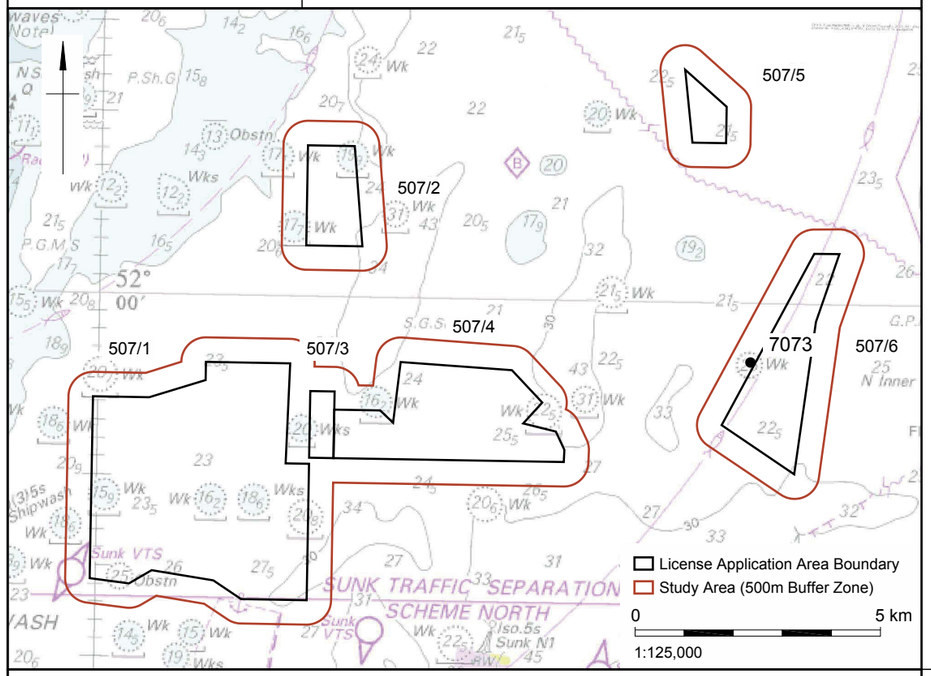
Sidescan sonar waterfall image

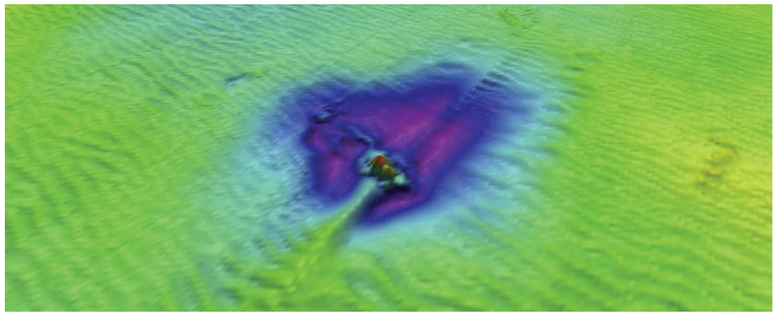
Drawing projection: UTM WGS84 z31N

Date:	16/10/2015	Revision Number:	0	Illustrator:	KJF
Path:	W:\Projects\110930\Graphics_Office\Rep figs\Geophys\2015_10_16				

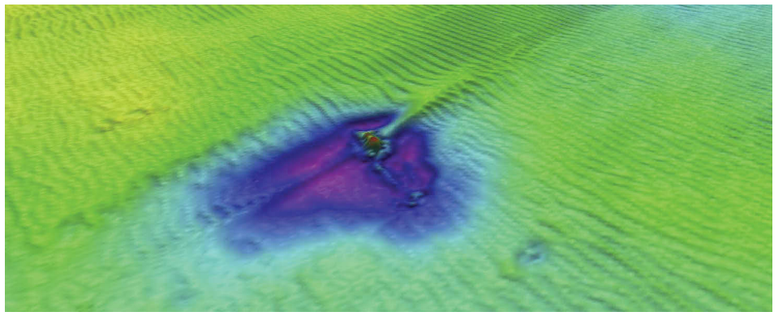
WA ID 7073 *Warrenpoint* UKHO 14738

Location		421705 E, 5760391 N (UTM31N)	Area 507/6 Buffer
Archaeological Importance		High	
Geophysical survey dimensions and notes		Dimensions: 45.7m x 17.8m x 2.9m. Relatively poorly defined wreck identified orientated NW-SE within a distinct NNE-SSW elongated depression/scour. Wreck exhibits some height and structure. But is relatively low lying and likely broken up and partially buried, especially towards the SE.	
Build	**Type**	British steam ship	
	Construction	Steel hull	
	Dimensions	Unknown	
	Shipyard	Owner: R Rix & Son, Hull	
Loss	**Cause**	Lost 28th February 1908 following a collision with the German vessel SS *Schwalbe*; en-route Boston to Dunkirk in poor weather.	
Extent of Survival		Previously observed with dimensions of 35m x 12m x 0.8m, and reported as partially buried but upright. Reported that most of the superstructure collapsed with the bow separate from the wreck by diver in 2003, and confirmed as the *Warrenpoint*. Highest point recorded as being the boiler. Recorded dimensions and description would match with current observation with any changes most likely caused by seabed fluctuations and break-up of the wreck. Wreck is previously recorded as having old fishing nets attached.	

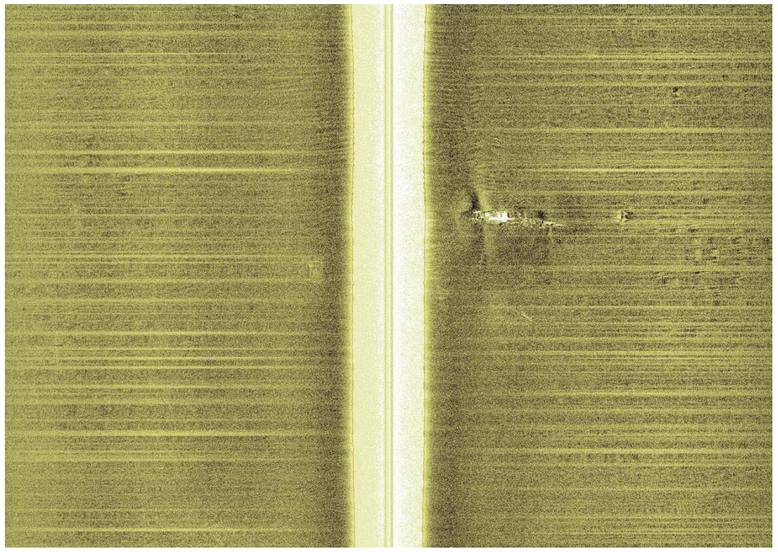




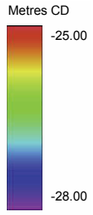
Multibeam bathymetry (looking SSE, vertical exaggeration x1)



Multibeam bathymetry (looking NW, vertical exaggeration x1)



Sidescan sonar waterfall image



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