



NEMOLink

Temporary Exclusion Zone:
Archaeological Investigation of UXO Anomaly 4959



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Archaeological Investigation of UXO Anomaly 4959**

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Summary

Wessex Archaeology was commissioned by J-Power Systems Corporation to undertake an archaeological assessment of geophysical survey data over a section of the NEMO Link route where possible remains of aircraft wreckage were identified by a working remotely operated vehicle (ROV) clearing the proposed route for unexploded ordnance (UXO). At the location of magnetic anomaly 4959, four pieces of metallic debris were relocated during clearance operations. In doing so the possibility that aircraft debris was present was noted and Wessex Archaeology informed. As a precaution and because military aircraft wreckage is automatically protected under the Protection of Military Remains Act 1986, a temporary Archaeological Exclusion Zone (TEZ) of 100m radius was emplaced. After an initial review of ROV images and in discussion with Historic England (HE) and the Ministry of Defence (MoD) it was agreed to review geophysical data, ROV footage and also to recover the four items of metallic debris for identification.

The geophysical data consisted of sidescan sonar, magnetometer and multibeam bathymetry acquired in 2016 by Gardline with pulse induction (TSS-in) and multibeam bathymetry data acquired by Deep Ocean in 2017 via ROV. The review included an assessment of the current data in addition to the target investigation reports and the results of the previous archaeological assessments undertaken by Wessex Archaeology and Sea Change Heritage Consultants. Using the geophysical data (Gardline 2016a; Deep Ocean 2017b) within a 150 m radius of the final location of magnetic anomaly 4959, three other areas were identified as being high archaeological potential: 7401 (MAG_4944), 7426 (MAG_4979) and 7425. Both datasets, where applicable, (Gardline, 2016a; Deep Ocean, 2017b) indicate ferrous/conductive content (metal), buried (7401; 7425) or with associated debris on the seabed (7426). A total of 23 further items were identified as uncertain origin, but of possible archaeological interest. None of the anomalies investigated by ROV have indicated that are aircraft related.

Of the four pieces of metallic material recovered, only one small fragment of confirmed aircraft debris (MAG_4959 (3)) has been identified and has been interpreted as probably from a Second World War military aircraft. The other three larger pieces have been identified as fishing gear. MAG_4959 (3) appears to be a rib from either the rudder, elevator, aileron, or tailplane of a multi-engined aircraft. If it were from a single engine aircraft, it may be an outer wing rib. Neither the origin or nationality of the aircraft is identifiable from this piece.

Though the fishing gear and aircraft fragment were found in close proximity, there is no evidence of the two being associated beyond location. However, the nature of aircraft debris and modern trawling methods does not rule out an association due to net snagging and damage to fishing gear and the aircraft remains, through an encounter with a larger heavier fragment of aircraft.

The assessment has shown no specific debris area indicative of an aircraft crash site at the location of anomaly 4959. There are debris items and buried ferrous debris identified across the immediate area however none of these have been identified as aircraft related material or considered substantial enough to represent an aircraft crash site.



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This assessment was commissioned by J-Power Systems Corporation. The data were provided by Martin Ffitch, SHEQS Manager, J Power Systems Corporation and Neil Evans, JPS Surveyor, whose assistance is acknowledged in this respect.

Sam Strutton and Megan Metcalfe carried out the geophysical assessment and Alistair Byford-Bates assessed the ROV footage and compiled the report, with quality control provided by Dr Louise Tizzard and Jack Russell. Kitty Foster and Karen Nichols prepared the illustrations and the project was managed for Wessex Archaeology by Jack Russell.



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1 INTRODUCTION

1.1 Project Background

- 1.1.1 Wessex Archaeology (WA) was commissioned by J-Power Systems Corporation to undertake an archaeological review of potential archaeological material and geophysical data acquired during an unexploded ordnance (UXO) survey of the NEMO Link route.
- 1.1.2 As part of ongoing works all working remotely operated vehicle (ROV) data collected for the UXO Clearance and Disposal survey are subject to archaeological assessment. This approach enables a representative sample of archaeological anomalies identified as part of the archaeological assessment of geophysical survey data to be subject to ground-truthing exercises. The aim of this assessment was to contribute towards a greater understanding of the nature, character and extent of the marine archaeological environment to inform appropriate mitigation strategies adopted for the scheme. This assessment of data is currently ongoing; however, this report covers a specific reported target and the surrounding area.
- 1.1.3 On the 3 March 2017, magnetic anomaly (MAG_4959), previously identified by Gardline Geosurvey Ltd (Gardline), was investigated by Deep Ocean. Four objects were identified and relocated outside the cable lay corridor in position: E: 427359.38 / N: 5686562.42. Subsequent to their relocation the possibility that the objects may have been of archaeological interest was raised and ROV images and survey reports of the objects were sent to WA for review. WA considered that one of the objects, was aircraft debris, with the other three being of uncertain origin. A temporary Archaeological Exclusion Zone (TEZ) of 100 m around the original location of the objects, was put in place.
- 1.1.4 After discussions with Historic England (HE), J-Power Systems and the Ministry of Defence (MoD) it was concluded that the four objects that had been relocated should be recovered and that a review of data (geophysical and ROV) from the area should be undertaken.
- 1.1.5 Deep Ocean carried out the survey and relocation of the objects, their current findings have been reported on in the two reports listed below (Appendix 1).
- *Nemo - Target Investigation Report No MAG_4959_030317 (Deep Ocean; 2017a)*
 - *Target Investigation Report No MAG_4959_190317_Additional (Deep Ocean; 2017b)*
- 1.1.6 A review was conducted of the finds using images and video from the ROV both *in situ* and once recovered. Additionally, a review of the 2016 geophysical survey data over a section of the NEMOLink route where a metal aircraft fragment was identified was also completed. This was compared to the ROV geophysical data acquired in 2017. The ROV was operated by Deep Ocean and the 2016 geophysical data were acquired by Gardline.



1.1.7 The four objects were recovered on 18th March 2017 and transferred to Wessex Archaeology, Salisbury for identification

1.2 Aim

1.2.1 The aim of this document is to describe the location and archaeological nature of the targets which may be subject to impact as a result of the development in the surrounding area of MAG_4959.



2 METHODOLOGY

2.1 Data sources

2.1.1 A number of data sources and additional information were utilised during this assessment. These included:

- *geophysical data acquired during geophysical and UXO survey operations by Gardline in 2016, with associated reports (Gardline 2016a; 2016 b);*
- *the results of previous geophysical interpretations undertaken by WA (EIA / DBA: WA 2016);*
- *the WSI for the NEMO Link project 'NEMO-TUVSUD-CB-PRO-1000 WSI Rev2' (SeaChange 2016);*
- *ROV multibeam echosounder (MBES), pulse induction (TSS-in) and video data acquired by Deep Ocean in 2017;*
- *Target investigation reports (Deep Ocean 2017a; 2017b); and*
- *MBES and magnetometer data acquired by Deep Ocean in 2017.*

2.1.2 The focus of the geophysical assessment is within 150 m of the original location of the original position of MAG_4959, Object 3 (Table 1).

Table 1: MAG_4959 location

Object 3/ MAG_4959	Easting (WGS84 UTM 31 N)	Northing (WGS84 UTM 31 N)
Original position	427358.59	5686517.93
New position	427359.38	5686562.42

2.2 Geophysical Data Assessment Methodology

Geophysical Data – Technical Specifications

2.2.1 Geophysical data were acquired by Gardline during 2016, and comprised sidescan sonar (SSS), multibeam echosounder (MBES), sub-bottom profiler (SBP) and marine magnetometer datasets. The data utilised for the investigation were acquired by MV *Ivero* between 18 April to 27 June 2016. The SBP data were not used in this review as were deemed outside of the investigations requirements for this investigation.

2.2.2 No accompanying technical specifications were provided with the geophysical data; however, the following information has been taken from the Gardline Operations and Interpretive reports (Gardline 2016a; 2016b). Variable line spacing was seen across the different sensors.

2.2.3 The SSS data were acquired utilising an Edgetech 4200-FS 300/600 kHz system at a range of 20 - 30 m per channel, and were provided to WA as .*xtf* files. The magnetic data were acquired in a towed array of four Geometrics G-882 magnetometers spaced either 5 m apart (4-MAG array) or 1.65 m apart (GMP-4 array) and were provided as .*xyz* files in nanotesla (nT) (NB. Online logs suggest during some survey operations this was reduced to a three magnetometer array due to technical difficulties with the fourth magnetometer). The MBES



data were acquired utilising a Kongsberg Simrad EM3002D system, processed data were provided as 0.5 m gridded .xyz files reduced to lowest astronomical tide (LAT).

- 2.2.4 Additional geophysical data were acquired by Deep Ocean in 2017, during UXO investigations by an ROV. A TSS440 (pulse induction technology system) (TSS-in) was used to detect any conductive material over selected magnetic anomaly locations and areas, the line spacing was approximately 2 m (three sensors spaced 1 m apart) with an altitude maintained at approximately 0.5 m. Data were provided in .csv format. The MBES data were acquired using a single head Reson Seabat 8125-H system, processed data were provided as gridded .xyz files with no tidal adjustment applied. Further details on the survey are detailed in the ROV Methodology, Para.2.2.24 to 2.2.33.
- 2.2.5 All positions were recorded and expressed in WGS 1984 UTM Zone 31N coordinates.

Geophysical Data - Quality

- 2.2.6 The geophysical data used for this report were assessed for quality and were rated as good using the following criteria (Table 2):

Table 2: Criteria for assigning data quality rating

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.

- 2.2.7 The 2016 data, had over all good data quality for the SSS, magnetometer and MBES data. Only minor artefacts were present and positioning was within 10 m for objects identified. The resolution of the data was sufficient to identify any potential archaeology.
- 2.2.8 The 2017 data, had good quality data for MBES. Although no tides were applied, there were no further artefacts seen in the data. The TSS-in data, although very different values to the magnetometer data from 2016 due to the equipment used, the data correlated well with the 2016 data.

Geophysical Data – Processing

- 2.2.9 Three different datasets were used to assess the study area: SSS (Gardline 2016), magnetometer/conductivity (Gardline 2016, Deep Ocean 2017) and MBES (Gardline 2016, Deep Ocean 2017) data. Each dataset were processed separately using the following software (Table 3).



Table 3: Software used for geophysical assessment

Dataset	Processing Software	Interpretation and rationalisation
SSS	CODA Geosurvey v6.2.0	ArcMap v10.2.2
Magnetometer	MagPick v3.25	
MBES	Fledermaus v7.7.4	
TSS-in	ArcMap v10.2.2	

- 2.2.10 The SSS data files were processed by WA using Coda Geosurvey software. This allowed the data to be replayed with various gain settings in order to optimise the quality of the images. The data were 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.
- 2.2.11 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 positioning to be further refined if necessary.
- 2.2.12 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.
- 2.2.13 The magnetometer data were processed by WA using Geometrics MagPick software in order to identify any discreet magnetic contacts which could represent buried metallic debris or structures such as wrecks.
- 2.2.14 The software enables both the visualisation of individual lines of data and gridding of data to produce a magnetic anomaly map. The data were first smoothed to try and eliminate any spiking. A trend was then fitted to the resulting data, and the trend values subtracted from the smoothed values. This was carried out in an attempt to remove natural variations in the data (such as diurnal variation in magnetic field strength and changes in geology). The processed data were then gridded to produce a map of magnetic anomalies, and individual anomalies tagged and images taken in a similar process to that undertaken for the SSS data.
- 2.2.15 The MBES data were analysed to identify any unusual seabed structures that could be shipwrecks or other anthropogenic debris. The data were viewed and analysed using Fledermaus software, which enables 3-D visualisation of the acquired data and geo-picking of seabed anomalies.

Geophysical Data – Anomaly Grouping and Discrimination

- 2.2.16 The previous section describes the initial interpretation of all available geophysical datasets 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 datasets and apparently overstating the number of archaeological features in the study areas.
- 2.2.17 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 magnetic anomaly and multiple SSS anomalies. At this stage, gazetteers of anomalies created during

previous phases of work undertaken by NEMOLink site were reviewed and if present were grouped with the data interpretation.

- 2.2.18 Once all the geophysical anomalies and desk-based information have been grouped, a discrimination flag is added to each record in order to discriminate against those not thought to be of archaeological potential. These flags are ascribed as follows (Table 4).

Table 4: Criteria discriminating relevance of anomalies to the proposed scheme

Non-archaeological	U1	Not of anthropogenic origin
	U2	Known non-archaeological feature / Feature of non-archaeological interest
	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
	O3	Area subsequently cleared after data acquired

- 2.2.19 The grouping and discrimination of information 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, enabling further evaluation should more information become available.
- 2.2.20 Any sites located outside of the defined study areas, either previously recorded in known databases (e.g. UKHO) or identified during this geophysical assessment, are deemed beyond the scope of the current project and are subsequently not included in this report.
- 2.2.21 During grouping of the interpretation results with the results of previous phases of work, any identified anomaly that matches a previously identified feature retains the original anomaly number assigned for previous WA reports. However, positions and dimensions are updated to reflect the more recent data.
- 2.2.22 The results of ROV surveys of individual anomalies were also taken into account during the geophysical interpretation. Any identified anomalies initially interpreted but then removed have been given a new discrimination class (O3).
- 2.2.23 For the final results, the non-archaeological anomalies are removed from the gazetteer. The results from the assessment of the study area have been provided in Appendix 3 and are discussed in this report (**Figures 2 – 6**). Recommendations have been made for mitigation measures should the anomalies be directly impacted by the proposed scheme.

ROV Methodology

- 2.2.24 As part of the UXO survey, initial investigations were undertaken by Deep Ocean (contracted by J-Power Systems Corporation to undertake the UXO ROV survey) using a working ROV. The UXO ROV survey identified four targets of metal debris (MAG_4949). The archaeological review of the UXO survey data began with an assessment of the Deep Ocean Target Investigation Report (Deep Ocean 2017a). From this review, a Data Sheet was created on-board, comprising information about the location of the site, a brief



description of the material visible on the site, and images from the Target Investigation Report (Deep Ocean 2017a). When the initial archaeological assessment suggested that some of the material was potentially aircraft related, the ROV video was requested for a more detailed assessment (Deep Ocean 2017b), followed by the recovery of the material for archaeological assessment.

- 2.2.25 Prior to the TSS-in survey, a sonar sweep survey was conducted by the ROV over the MAG_4949 location. During this survey, no anomalies were visible on the Blueview sonar. The ROV conducted a 10 x 15 m grid survey with 2.2 m line spacing and a flying height of 0.51 m average above seabed utilizing the TSS440, cameras and sonar. Three position fixes were taken and dredging operations were commenced with the use of the ROV.
- 2.2.26 The ROV located Object 1 in fix area 2, and having been identified as metal debris was relocated outside the cable lay corridor in position. E: 427357.47 / N: 5686560.93. The ROV commenced dredging operations at fix number 1. One main object was located at this fix area and was identified as metal debris / steel frame. This object was assigned as Object 2. Two other small pieces of debris were located during dredging operations in this area.
- 2.2.27 In order to cover the As-Found positions of all previous found objects, the ROV conducted a customized 5 x 15 m As-Left Survey grid with 2.20 m line spacing and a flying height of 0.42 m average above seabed. Due to the current conditions the grid was rotated which caused an additional area surveyed outside the original grid which was not surveyed before. During this survey, an anomaly was visible, once again, at the same position as the As-Found three fix. Due to the rotated grid a new anomaly became visible outside of the original grid area. This new anomaly was not investigated as this is not part of the original 10 x 15 m grid survey.
- 2.2.28 The ROV commenced dredging operations at fix number 3. One object was located at this fix area and is identified as metal debris. This object was assigned as Object 3.
- 2.2.29 All four debris items have been relocated outside the cable lay corridor in position. E: 427359.38 / N: 5686562.42. **(Figure 1)**.
- 2.2.30 In order to cover the As-Found positions of all previous found objects, the ROV re-performed a customized 5 x 15 m grid As-Left Survey with 2.20 m line spacing and a flying height of 0.51 m average above seabed. Due to the current conditions the grid was rotated which caused an additional area surveyed outside the original grid which was not surveyed before. The positions illustrated (Fig. 2) are for the ROV central reference point at 1 second intervals. The exact location of the camera on the ROV was not recorded during the survey, as there are different cameras mounted on the ROV, all of which are moveable and rotatable, however the distance from the front of the ROV to the central reference point is only approximately 0.4 m, and this slight discrepancy is not considered to greatly affect the results of the archaeological assessment. The video data for the initial ROV survey and for the target investigation surveys were archaeologically reviewed before the decision to recover the objects was made.
- 2.2.31 Table 6 (Section 3) below provides a list of the anomalies and the recording method.
- 2.2.32 Selected images from the objects recovered were forwarded to Ewen Cameron, Curator of the Royal Air Force Museum Stafford for further analysis.
- 2.2.33 Positional information for each anomaly encountered during the UXO ROV survey operation was obtained from the ROV coordinates as displayed in the ROV video monitor screen



assessed for each target. The ROV position is the reference point on the ROV which is based on an offset from the centre coil, relative to that position and is considered to be the most accurate position with respect to mapping targets inspected by the ROV, and when the ROV is positioned immediately adjacent to the material, the position is likely to be accurate to within 1 - 2 m. However, the ROV was not always immediately adjacent to the material being recorded, and therefore in these cases, the position only provides an estimate of the location and is not conclusive.



3 THE SITE

3.1 Surficial Geology

- 3.1.1 The study area lies to the north of the Sandettie Bank, in the southern North Sea.
- 3.1.2 The broad geological sequence across the route, between the UK and Belgium, are summarised in Table 5, taken from the archaeological environmental impact assessment (EIA) (WA 2016).

Table 5: General geological sequence for the NEMOLink route (WA 2016)

Unit	Description
1	Recent (Holocene) seabed sediments, gravelly shelly sand
2	Post-Devensian terrestrial (UK sector) and estuarine (Belgian sector) clay, silt and fine sand with organic inclusions and peat layers
3	Eocene clay (London Clay Formation)
4	Palaeocene sand and sandy clay (Thanet Formation)
5	Campanian (Upper Cretaceous) chalk

- 3.1.3 Within the study area, the surficial sediment comprises shelly gravelly sands and sandy gravel identified as recent (Holocene) seabed sediments. This was confirmed with visual ground-truthing in the images taken by Deep Ocean, whilst recovering the items of debris with the ROV (Deep Ocean 2017b).
- 3.1.4 Underlying the surficial sediments, the geology for the study area is Campanian (Upper Cretaceous) chalk (Unit 5), the various units of clay noted in Table 5 (Unit 2 to 4) do not appear in the geology until further offshore along the route. This is confirmed by the British Geological Survey (BGS) Solid Geology charts of the area (BGS 1989).
- 3.1.5 The geophysical data indicates that there are mobile bedforms throughout the study area, which highlights the possibility of possible buried debris.

3.2 ROV Target Anomalies

- 3.2.1 The results of the archaeological analysis of the ROV video and the recovered artefacts have been used to inform the following account. Four contacts were identified within an area approximately 10 x 15 m of the location of MAG_4949, these are summarised in Table 6, below, and the locations are shown on Figure 1.
- 3.2.2 Further details regarding their archaeological nature, and images of the features, can be found in the Data Sheets, Appendix 2 (**Plates 1-14**).

Table 6: Archaeological Anomalies identified in the ROV video data

UXO Target ID (Object)	Description	UTM31N Easting	UTM 31N Northing	Data assessed
MAG_4949 (1)	Metal wire debris	427359.38	5686562.42	Item recorded by archaeologist.
MAG_4949 (2.1)	Metal	427359.38	5686562.42	Item recorded by archaeologist.
MAG_4949 (2.2)	Metal wire debris	427359.38	5686562.42	Item recorded by archaeologist.



UXO Target ID (Object)	Description	UTM31N Easting	UTM 31N Northing	Data assessed
MAG_4949 (3)	Metal aircraft debris	427359.38	5686562.42	Item drawn and recorded by archaeologist.

Geophysical Assessment Results

- 3.2.3 The study area, 150 m radius from the original location of the aircraft debris (MAG_4949, Object 1 - 3), was assessed using the data from the 2016 UXO survey (Gardline 2016) for the potential for further debris items.
- 3.2.4 A total of 27 anomalies were identified within the study area; Table 7 summarises the location and anomaly types. Further information has been provided in the gazetteer (Appendix 3) and Figure 2 (Appendix 3).

Table 7: Anomaly summary from the geophysical data acquired in 2016 (Gardline 2016)

Criteria classes	Interpretation	Total	Original MAG_4949 location		
			Within 50 m	Within 100 m	Within 150 m
A1	Anthropogenic origin of archaeological interest	3	0	0	3
A2	Uncertain origin of possible archaeological interest	23	6	11	6
A3	Historic record of possible archaeological interest with no corresponding geophysical anomaly	0	0	0	0
O3	Area subsequently cleared after data acquired	1	1	0	0
Total		27			

- 3.2.5 Furthermore, the 27 anomalies of archaeological potential can be classified by probable type, which can further aid in the assigning of archaeological potential and importance (Table 8).

Table 8: Classification of anomalies of archaeological potential from the geophysical data acquired in 2016 (Gardline 2016)

Anomaly classification	Number of anomalies
Debris field	1
Debris	4
Dark reflector	1
Magnetic	21
Total	27

- 3.2.6 Of the 27 anomalies, three of the investigated targets documented in the ROV investigation reports (Deep Ocean 2017a; 2017b) correlate. These targets have been listed in **Table 9** **Error! Reference source not found..**



Table 9: Anomaly correlation

Investigation report (Deep Ocean, 2017a)	Investigation report (Deep Ocean, 2017b)	WA ID
MAG_4959 Object 1	MAG_4959_A	7413
MAG_4959 Object 2.1 and 2.2	MAG_4959_A	7413
MAG_4959 Object 3	MAG_4959_A	7413
-	MAG_4944 (AF-4)	7401
-	MAG_4979 (AF-5 & AF-6) SSS_5218 (AF-7)	7426

- 3.2.7 The magnetic anomaly, 7413, was identified at the location of the fishing and aircraft debris (MAG_4959_A; Object 1, 2 and 3). The magnetic anomaly was recorded as 86.5 nT, which is a medium sized amplitude indicating ferrous material (location linked to MAG_4959, Object 1 and 2).. A small anomaly (<5 nT) was seen in the data within the bounds of this magnetic anomaly (to the north, within 5 m) (location linked to MAG_4959, Object 3). Mobile bedforms were visible in the SSS and MBES data, but no surface representation of the magnetic anomaly was observed in the data (**Figure 3**), indicating that the anomaly was buried. This was confirmed upon investigation by Deep Ocean (Deep Ocean 2017a; 2017b).
- 3.2.8 After the extraction of the metal debris, 7413, the area of the seabed, approximately 30 x 25 m, was resurveyed using the ROV MBES system (Deep Ocean 2017a). The data indicates two clear depressions amongst mobile bedforms where the metal debris (Object 1 – 3; 7413) were removed. As the material associated with anomaly 7413 has been removed, this anomaly was classified as O3.
- 3.2.9 Three items were classified as A1, indicating that they are likely of anthropogenic origin and of archaeological interest. Two were large magnetic anomalies (7401: 341 nT; 7426: 229 nT), one was a medium magnetic anomaly (7425: 134 nT), with associated anomalies on more than one line. Two had no surface signature, indicating potential buried ferrous debris (7401 (**Figure 4**); 7425 (**Figure 6**)); one had a surface signature and was interpreted as a debris field identified by a large magnetic anomaly (229 nT) and objects with height seen in the SSS data (7426 (**Figure 5**)). All three were located outside of the 100 m radius of the aircraft debris, but within 150 m radius. Further information on these can be found in the gazetteer in Appendices 3 to 4.
- 3.2.10 As part of the UXO survey, additional survey utilising the TSS-in was completed by Deep Ocean over two of these anomalies in 2017: 7401 (MAG_4944) and 7426 (MAG_4979; SSS_5218). Both datasets (Gardline, 2016a; Deep Ocean, 2017b) indicate ferrous/conductive content (metal), buried (7401) or with associated debris on the seabed (7426).
- 3.2.11 A total of 23 items were classified as A2, indicating that they are of uncertain origin, but of possible archaeological interest. Four were interpreted as debris, identified in both the magnetic and SSS data (7406, 7407, 7415 and 7416) all within 100 m radius. One was classified as a dark reflector of possible archaeological interest (7427), identified in the SSS data only and located on the outer 150 m boundary limit. The remaining 18 were magnetic



anomalies interpreted as possible buried ferrous debris, ranging from 10.3 to 86.5 nT, located throughout the 150 m radius study area.

- 3.2.12 There is potential for these identified geophysical anomalies to be linked to the aircraft debris. There is no specific debris area indicating a concentration of material, but there are several debris items and buried ferrous debris identified across the immediate area. Further ROV investigation would be required to ascertain the nature of the material. Due to the low ferrous content of plane wreckage and the mobile bedforms in the area, not all debris may be identified by the geophysical equipment.

4 DISCUSSION

Assessment of the Material

- 4.1.1 The archaeological assessment included a review of the ROV video footage taken during the initial assessment of target MAG_4959, the subsequent target investigation survey of the four UXO targets highlighted by Deep Ocean and the material recovered.
- 4.1.2 The ROV surveys revealed aluminium debris, with other metal debris, wire and rope (**Figure 3**).
- 4.1.3 MAG_4959 (1, 2.1, 2.2) (**Plates 1-7**) were identified as the concreted remains of part of a beam head trawl and associated rope and cables. The use of a mix of hemp rope, wire and polypropylene point to this item being lost after 1957 when polypropylene was first commercial produced on a large scale.
- 4.1.4 MAG_4959 (3) (**Plates 8-14**) appears to be a rib from either the rudder, elevator, aileron, or tailplane of a multi-engined aircraft. If it were from a single engine aircraft, it may be an outer wing rib. It shows the typical formed and folded construction of these items, with a tooling hole evident for the press block. This method of producing ribs was widely used throughout the world from the 1930s onwards. The lack of identifying marks means that the type and origin of the aircraft cannot be identified from this recovered section. Unfortunately, due to the corrosion and the very close variations in measurement between both metric and imperial measurements, *i.e.* millimetres (mm), standard wire gauge (swg) or thousands of an inch (thou), used by aircraft designers during this period, the use of the spacing and diameter of rivets, bolt holes and other spacings combined with any drilling/stamping errors means that these do not help in identifying the country of origin of this item.
- 4.1.5 Assessment of the additional targets outside the TEZ by Wessex Archaeology, with advice from aviation experts Steve Vizard and Ewen Cameron of the RAF Museum, concluded that the items do not appear to be obviously aircraft related, due to their predominantly ferrous construction MAG_4979 (AF-5 & AF-6). The possible aircraft wheel is more likely to be from a maritime or terrestrial source as aircraft wheels were generally constructed of magnesium alloy rather than steel. MAG_4944 (AF-4) is possibly the remains of a coir or other natural material ships fender with a chain or steel wire running through it. SSS_5218 (AF-7; close to MAG_4979) appears to be aluminium but its origin or function is unknown.
- 4.1.6 During the Second World War, the skies above the southern North Sea witnessed significant aircraft activity, with numerous aircraft lost through accidents and military action. *Aircraft Crash Sites at Sea: A scoping study: Archaeological Desk-based Assessment* (Wessex Archaeology 2008) indicates that although the National Monument Record (Now the National Record for the Historic Environment) and the local Historic Environment Records for Essex and Suffolk contain a limited number of known aircraft crash sites and records of loss (Wessex Archaeology 2008, Figure 2), the distribution of Second World War British Air/Sea Rescue Operations (Wessex Archaeology 2008: Figure 3) indicates a significant concentration off this coast. This suggests that there are a considerable number of Second World War aircraft crash sites in the wider area, many of which have not yet been discovered.
- 4.1.7 The magnetometer and ROV surveys undertaken did show up large pieces of ferrous debris that were present in the wider area – though not aircraft in origin. It does not rule out the possibility that there are pieces of aircraft present in the areas surveyed, either on the seabed or buried. It would, however, be unusual for items such as the engine(s), wheels,



and cockpit not to have shown up, as they would likely have had sufficient ferrous composition to be revealed through magnetometer survey.

- 4.1.8 In addition, the depth of the site and the seabed composition must be considered. The site is at 39 m below LAT, and it is unlikely that aircraft material, having fallen 39 m through the water column, would have had the momentum to penetrate deeply through the mobile bedforms or into the Chalk bedrock. Therefore, the size of any material relating to an aircraft is likely to be limited to the variable depth layers of sand, silt and gravel that overlays the bedrock, and would likely be fragmentary and limited in size, as demonstrated by the material already uncovered during ROV dredging. Only where there are the deeper mobile bedforms will there be the potential for the burial of larger items, this may occur further to the east, outside the site amongst the large dunes that are present in that area.

4.2 Archaeological Value

- 4.2.1 In order for the impacts of any given development to be explored, archaeological sites and finds (i.e. receptors) are assigned a sensitivity, typically assessed via four factors: adaptability, tolerance, recoverability and value. Since archaeological receptors cannot adapt, tolerate or recover from impacts caused by a proposed development, the sensitivity of archaeological receptors can be quantified only by their value. This section discusses the archaeological value of MAG_4949 (3).
- 4.2.2 Based on the information available, MAG_4949 (3), is of low value and therefore low sensitivity. The nationality of the potential aircraft material has not been identified although the likelihood is that it relates to the Second World War. However, the item is fragmentary and appears isolated, and may therefore only have low potential to contribute to knowledge and understanding.
- 4.2.3 Beyond the 12 nm limit, British aircraft that crashed while in military service are automatically protected under the Protection of Military Remains Act 1986 and their unlicensed disturbance is prohibited. Therefore, on a precautionary basis, advice is being sought on the application of the Act to the area from the Ministry of Defence (MoD).

4.3 Vulnerability

- 4.3.1 The area in which MAG_4949 (3) was located is considered to be vulnerable to the development. Material is exposed on the seabed and therefore has likely been vulnerable to natural forces (such as wave and tide regimes) and man-made forces (such as beam trawling and other fishing methods).

5 CONCLUSION

- 5.1.1 The assessment of the objects recovered from the area and the data (ROV and geophysical) has been interpreted as a collection of predominantly modern material including fishing gear. One small aircraft fragment probably from a Second World War military aircraft was also recovered. As a precaution and as aircraft remains are automatically protected under the Protection of Military Remains Act 1986, a temporary Archaeological Exclusion Zone (TEZ) of 100m radius from the original location of the aircraft fragment has been imposed. Survey data has been acquired and reviewed up to 150m from the original location in order to better understand the area.
- 5.1.2 The Protection of Military Remains Act 1986 applies to the fabric and contents of the aircraft – including cargo and crew. Given the identification of the fragment as likely Second World War military aircraft material, the Ministry of Defence (MoD) has been consulted.
- 5.1.3 Using the geophysical data (Gardline 2016a; Deep Ocean 2017b) within the 150 m radius, three other areas were identified as being high archaeological potential based on their geophysical response: 7401 (MAG_4944), 7426 (MAG_4979) and 7425. Both datasets, where applicable, (Gardline, 2016a; Deep Ocean, 2017b) indicate ferrous/conductive content (metal), buried (7401; 7425) or with associated debris on the seabed (7426). The review of data in conjunction with the ROV footage (**Figures 4, 5 and 6**) however indicates these are likely not related to aircraft remains and are more recent terrestrial and maritime debris.
- 5.1.4 A total of 23 further items were identified as uncertain origin, but of possible archaeological interest. Whilst there is potential for these identified geophysical anomalies to be linked to the aircraft debris, there is no specific debris area indicating a concentration of material. There are several debris items and buried ferrous debris identified across the immediate area which have not as been subject to ROV investigation.
- 5.1.5 Due to the low ferrous content of plane wreckage and the mobile bedforms in the area, not all debris may be identified by the geophysical equipment.
- 5.1.6 The majority of the remaining material encountered during the ROV survey were either relatively flat on the seabed or covered by a thin layer of sediment. The surveys have ruled out the presence of substantial, ferrous remains in the area, suggesting that any material in the area that has not already been located would be low-ferrous or fragmentary.
- 5.1.7 Though the fishing gear and aircraft fragment were found in close proximity, there is no evidence of the two being associated beyond location. However, the nature of aircraft debris and modern trawling methods does not rule out an association due to net snagging and damage to fishing gear and the aircraft remains, through an encounter with a larger heavier fragment of aircraft.
- 5.1.8 The general area appears to be comprised of mobile bedforms over chalk, with the objects recovered exhibiting evidence of corrosion or other deterioration and damage. This, along with the limited seabed movement in the area, suggests that parts of the material have been exposed for some time, rather than recently exposed. However, the material that was shallowly buried and uncovered by the ROV is also fragmentary in nature and corroded, suggesting that the deterioration of the material is not solely due to natural processes, but likely also reflects other factors such as a wrecking event, disturbance by fishing, subsequent depositional processes and relatively poor preservation in sand and gravel.



6 REFERENCES

British Geological Survey (BGS) 1989 Solid Geology 1:250000 Series

Deep Ocean 2017a Nemo - Target Investigation Report No MAG_4959_030317, Reference No. 6131_NEMO_DEEPOCEAN UXO

Deep Ocean 2017b Target Investigation Report No MAG_4959_190317_Additional, Reference No. 6131_NEMO_DEEPOCEAN UXO

Gardline Geoservices Limited (Gardline) 2016a FIELD/OPERATIONS REPORT for New Subsea Cable Survey:- Nemo Link Pre-Engineering and UXO Survey. Report Reference: 2016 14-233-SUB-REP-008

Gardline Geoservices Limited (Gardline) 2016b FINAL INTEGRATED INTERPRETATIVE REPORT for New Subsea Cable Survey:- Nemo Link Pre-Engineering and UXO Survey. Report Reference: J14-233-SUB-REP-012

Seachange Heritage Consultants (Seachange) 2017 Archaeological Written Scheme of Investigation. Rev 2. Document Reference: NEMO-TUVSUD-CB-PRO-1000 WSI Rev2

Wessex Archaeology (WA) 2008 Aircraft Crash Sites at Sea: A Scoping Study: Archaeological Desk-based Assessment. Unpubl. report ref: 66641.02

Wessex Archaeology (WA) 2016 Project Nemo UK-Belgium Electrical Interconnector Richborough to West Zeebrugge Archaeological Environmental Impact Assessment Volume I: Report; Report reference: 73390.03



APPENDIX 1: DEEP OCEAN TARGET INVESTIGATION REPORTS

Nemo - Target Investigation Report No MAG_4959_030317

EXISTING SURVEY INFORMATION			
Target ID	MAG_4959	Route	KPDetailed Rev A
Target Type	MAG	Target Category (A/D/Mag Mask)	A
SSS Target Dimensions (m)	Length: NA	Target Value (nT)	45.22
	Height: NA	KP	86.779
	Width: NA	DCC (m)	6.9
Expected Position (WGS84 UTM31N)	E: 427359.50	Cable Target Burial Depth (m)	1.3
	N: 5686515.50	Water Depth LAT (m)	39.6
Survey Equipment Used	Geometrics 882	Associated Target	None

INVESTIGATION INFORMATION			
Vessel	Havila Phoenix	TSS altitude during As Found	Average of 0.53
		TSS altitude during As Left (m)	1 st Average of 0.42
			2 nd Average of 0.51
Target Investigation Report Number	MAG_4959_030317	Dredged depth Fix 1 and 2 (m)	~ 0.53 – 0.60
		Dredged depth Fix 3 (m)	~ 0.51 – 0.79
Investigation Date	03-03-2017	Weather Conditions	Within Procedure Limits
Investigation Time (UTC)	03-03-2017 Completed 13:07	Visibility (m)	~ 3.00
Seabed Geology	Sand, shells	Current during As-Found (kts)	0.6
		Current during As-Left (kts)	0.6
Target Investigation Equipment Used:	<p>UHD 56 (Stbd Side) – Main Survey WROV TSS440, ROVINS with DVL, Single Head MBES (ResonSeabat 8125-H), Mini-SVS, Blueview Imaging Sonar, Trittech 704 bathy/altimeter, Inspection Laser, Valeport 803 Current Meter (TMS Mounted).</p> <p>UHD 54 (Port Side) – Main Dredging WROV 8" Dredge Pump, ROVINS with DVL, Single Head MBES (ResonSeabat 8125-H), Blueview Sonar, Trittech 704 bathy/altimeter, Inspection Laser, Valeport 803 Current Meter (TMS Mounted).</p>		
Methodology as per J14-233-ENG-PRO-016:	<p>Target grid survey of buried MAG pUXO target</p> <p>Dredging by WROV</p> <p>Target Investigation</p> <p>Target Removal</p> <p>Target TSS440 As Left Survey and MBES As Left Survey</p>		

AS-FOUND TARGET DETAILS			
Target Found:	Yes	Classification:	Debris
Target Found μ V:	Object 1: 1199	Type Object 1:	Metal Debris
	Object 2: 2184	Type Object 2:	Metal Debris (Frame)
	Object 3: 46	Type Object 3:	Metal Debris
TSS440 As-Found Position Object 1: WGS84 UTM31N	E: 427356.51	Dimensions Object 1 (m)	Length ~ 0.40 Width ~ 0.03 \emptyset
	N: 5686512.83		
TSS440 As-Found Position Object 2: WGS84 UTM31N	E: 427356.04	Dimensions Object 2 (m)	Length ~ 2.50 Width ~ 1.50 Height ~ 0.20
	N: 5686514.11		
TSS440 As-Found Position Object 3: WGS84 UTM31N	E: 427358.59	Dimensions Object 3 (m)	Length ~ 0.80 Width ~ 0.40 Height ~ 0.01
	N: 5686517.93		
Burial Object 1 (m):	0.53 – 0.60	Approx. Weight Object 1 (kg):	~ 4
Burial Object 2 (m):	0.53 – 0.60	Approx. Weight Object 2 (kg):	~ 30
Burial Object 3 (m):	~ 0.51 – 0.79	Approx. Weight Object 3 (kg):	~ 5
Period:	NA	Material:	NA
Nationality of Origin:	NA	Potential Risk:	None
Type of Fuse(s):	NA	Type of Explosives:	NA
Arming Condition:	NA	Explosives Weight (kg):	NA

INVESTIGATION SUMMARY

Prior to the TSS-in survey a sonar sweep survey was conducted by WROV. During this survey, no anomalies were visible on the Blueview sonar.

WROV conducted a 10 x 15m grid survey with 2.20m line spacing and a flying height of 0.51m average above seabed utilizing TSS440, cameras and sonar. 3 position fixes were taken.

Dredging operations were commenced with the use of the WROV.

One object was located at fix area 2 and is identified as metal debris.

This object is assigned as object 1.

The object was located 4.01m at a relative bearing of 228 degrees from the as given position.

This object has been relocated outside the cable lay corridor in position. E: 427357.47 / N: 5686560.93.

WROV commenced dredging operations at position fix number 1.

One main object was located at this fix area and is identified as metal debris / steel frame.

This object is assigned as object 2.

The object was located 3.73m at a relative bearing of 248 degrees from the as given position.

Two other small pieces of debris were located during dredging operations in this area. This is believed to be component parts of the steel frame. These objects are not specified in this TIR. Images of these objects are implemented and assigned as 2.1 and 2.2.

WROV commenced dredging operations at fix position number 3. Nothing was found during dredging operations. The decision was made to perform an As-Left Survey.

In order to cover the As-Found positions of all previous found objects, the WROV conducted a customized 5 x 15m As-Left Survey grid with 2.20m line spacing and a flying height of 0.42m average above seabed. Due to the current conditions the grid was rotated which caused an additional area surveyed outside the original grid which was not surveyed before.

During this survey, an anomaly was visible, once again, at the same position as the As-Found three fix. Due to the rotated grid a new anomaly (fix 4) became visible outside of the original grid area. As per DeepOcean instructions, this new anomaly (fix 4) was not investigated as this is not part of the original 10 x 15m grid survey and not part of the procedure.

WROV commenced dredging operations at fix number 3 position.

One object was located at this fix area and is identified as metal debris.

This object is assigned as object 3.

The object was located 2.59m at a relative bearing of 340 degrees from the as given position

All four debris items have been relocated outside the cable lay corridor in position. E: 427359.38 / N: 5686562.42.

In order to cover the As-Found positions of all previous found objects, the WROV re-performed a customized 5 x 15m grid As-Left Survey with 2.20m line spacing and a flying height of 0.51m average above seabed.

Due to the current conditions the grid was rotated which caused an additional area surveyed outside the original grid which was not surveyed before. Again, the new anomaly (fix 4) was visible but not investigated as Per DeepOcean instructions and for the reasons given above.

No other anomalies were detected within the original grid.

An MBES survey was conducted to gain an overview of the area and dredged depth.

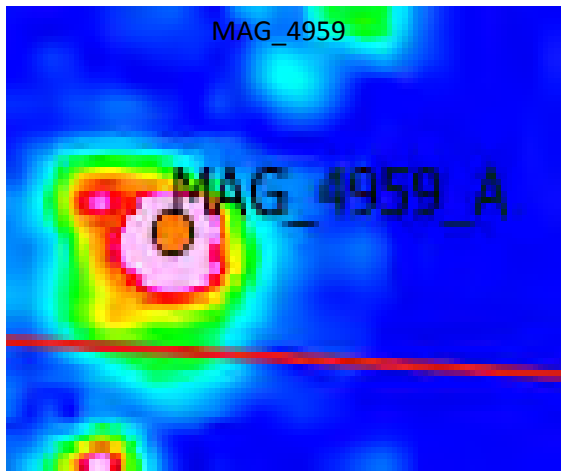
No images of the Blueview sonar are implemented in this TIR since there were no anomalies visible.

Taking into account the TSS440 data and actual findings on location, the target area within the reach of TSS440 is considered clear.

DeepOcean recommends that this TIR be reviewed by the Archaeology consultants due to the unusual shaped, machined pieces of metallic debris recovered. The size and shape of some of the items could represent aviation wreckage.

ATTACHMENTS

Existing Survey Magnetometer Data



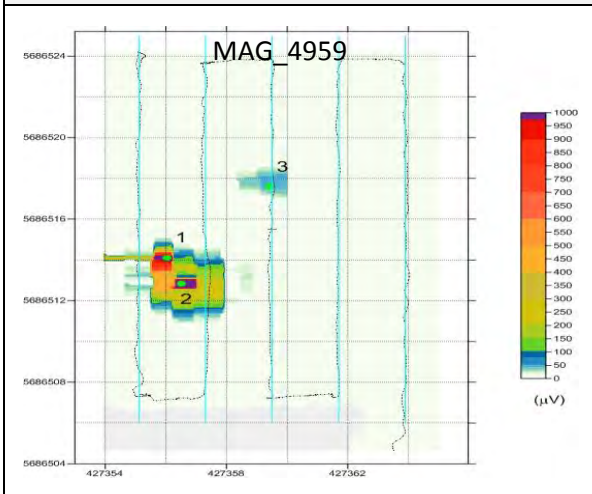
Background Compensation Screen Grab (4968 out used)

Port		MAG_4959		Starboard	
Early	Std	Early	Std	Early	Std
2078	0259	1983	0248	2140	0254
2078	0259	1985	0248	2140	0256
2076	0259	1982	0248	2139	0254
2076	0259	1982	0248	2140	0254
2076	0260	1982	0248	2140	0256
2075	0260	1983	0250	2139	0254
2073	0260	1982	0248	2139	0254
2075	0260	1980	0248	2137	0254
2075	0260	1979	0248	2136	0254
2072	0260	1980	0250	2136	0254

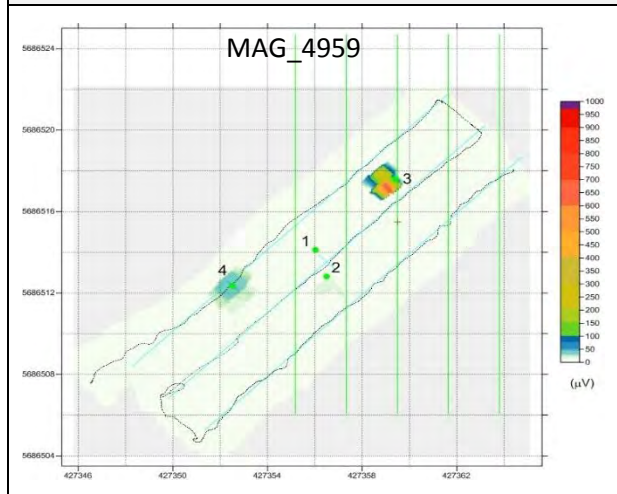
Background Compensation Stopped

Port GOOD	Centre GOOD	Starboard GOOD
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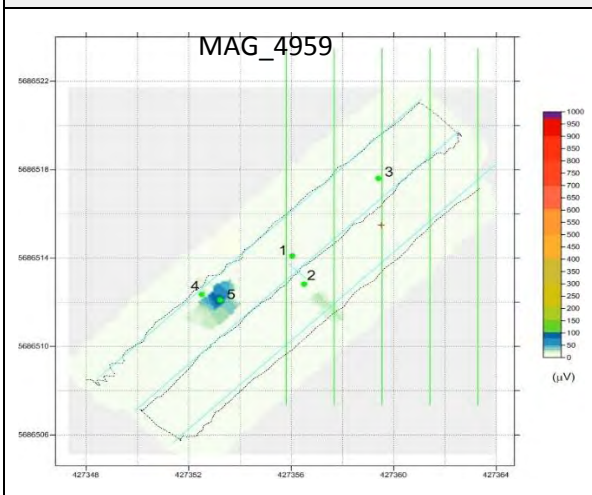
As-Found TSS440 Signal (μV) including ROV Track Plot



1st As-Left TSS440 Signal (μV) including ROV Track Plot



2nd As-Left TSS440 Signal (μV) including ROV Track Plot



Target Image Object 1 Upon As Found (Fix 2 position)



ATTACHMENTS

Target Image Object 1



Target Image Object 1 Relocated Outside Cable Corridor



Target Image Object 2 Upon Dredging (Fix 1 position)



Target Image Object 2 (Fix 1 position)



Target Image Object 2



Target Image Object 2 Relocated Outside Cable Corridor



ATTACHMENTS

Target Image Object 2.1



Target Image Object 2.2



Target Image Object 2.1 and 2.1 In Manipulator



Objects 2.1 and 2.1 Relocated Outside Cable Corridor



Target Image Object 3



Target Image Object 3

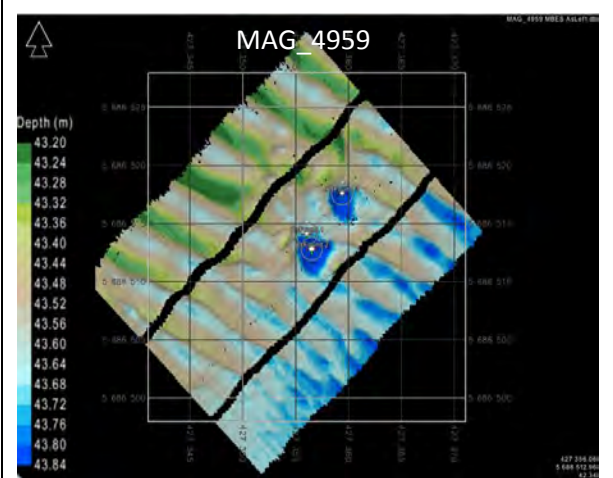


ATTACHMENTS

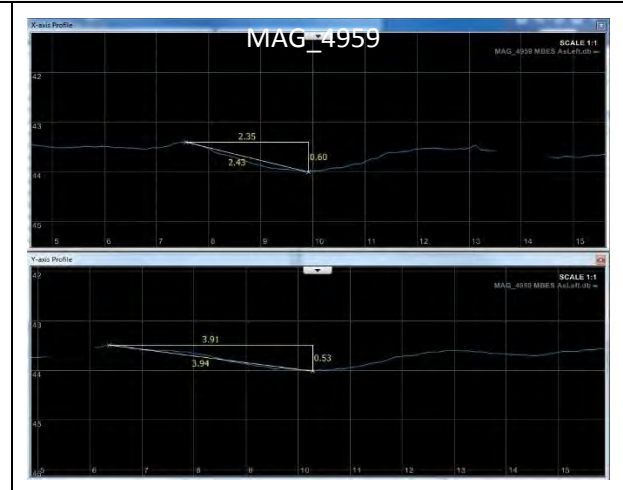
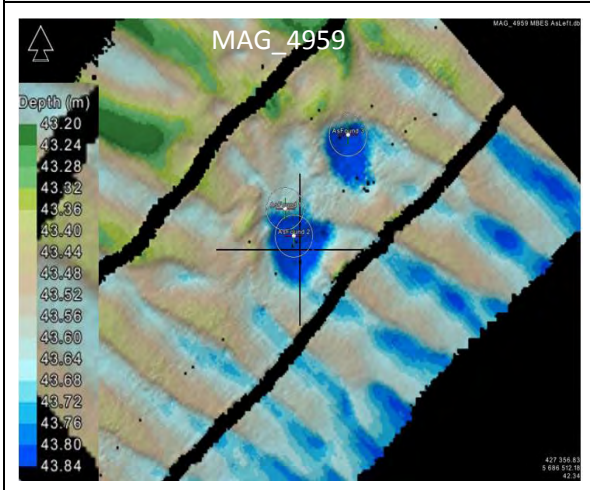
Target Image Object 3 Relocated Outside Cable Corridor



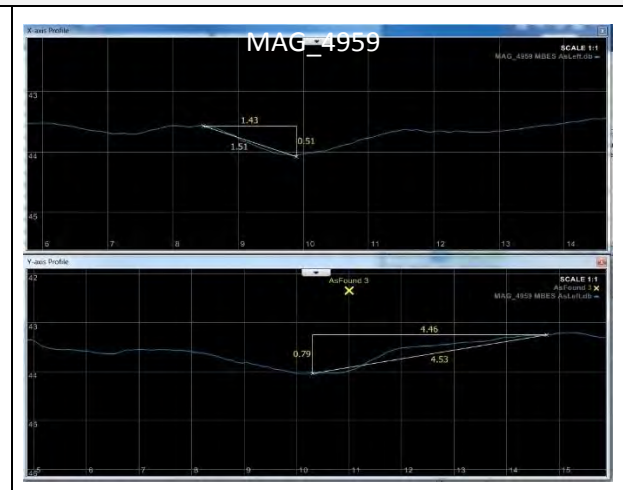
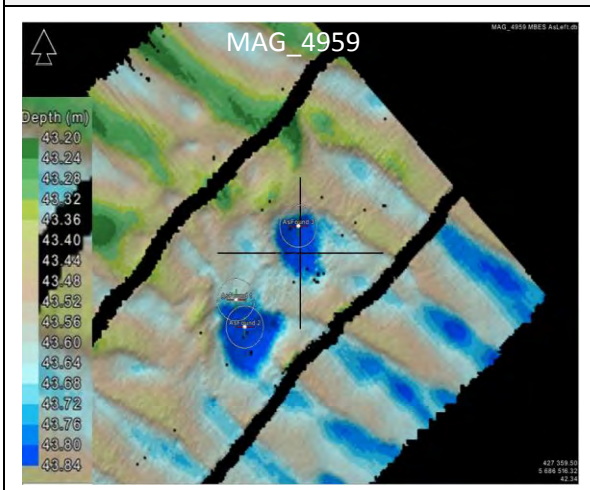
As-Left Multibeam Survey



As-Left Multibeam Survey Dredge Profile and Slope Angle AS-Found 1 and AS-Found 2 Fix Positions



As-Left Multibeam Survey Dredge Profile and Slope Angle AS-Found 3 Fix Position



Related Data Files	
As Found TSS Coils	MAG_4959_AsFound_TSS_Coils Grid
As Left TSS Coils	MAG_4959 AsLeft_1_TSS_Coils Grid 5x15
As Left TSS Coils	MAG_4959 AsLeft_2_TSS_Coils Grid

TARGET SIGN OFF			
Explosive Ordnance Supervisor (Bodac)	Jay Hogg	Date: 04-03-2017	Signature: 

END OF REPORT

Nemo - Target Investigation Report No MAG_4959_190317_Additional

EXISTING SURVEY INFORMATION			
Target ID	MAG_4959	Route	KPDetailed Rev A
Target Type	MAG	Target Category (A/D/Mag Mask)	A
SSS Target Dimensions (m)	Length: NA	Target Value (nT)	45.22
	Height: NA	KP	86.779
	Width: NA	DCC (m)	6.9
Expected Position (WGS84 UTM31N)	E: 427359.50	Cable Target Burial Depth (m)	1.3
	N: 5686515.50	Water Depth LAT (m)	39.6
Survey Equipment Used	Geometrics 882	Associated Target	None

INVESTIGATION INFORMATION				
Vessel	Havila Phoenix	TSS altitude during As Found	MAG_4944: Avg of 0.51	
			MAG_4979: Avg of 0.54	
			MAG_4940: Avg of 0.54	
		TSS altitude during As Left (m)	MAG_4944: NA	
			MAG_4979: NA	
			MAG_4940: NA	
Target Investigation Report Number	MAG_4959_190317_Additional	Dredged depth Fix MAG_4944 (m)	NA	
		Dredged depth Fix MAG_4979 (m)	~ 0.20 - 0.45	
		Dredged depth Fix MAG_4940 (m)	NA	
Investigation Date	18-03-2017	Weather Conditions	Within Procedure Limits	
Investigation Time (UTC)	19-03-2017 Completed at 21:26	Visibility (m)	~ 3.00	
Seabed Geology	MAG_4944	Sand	Current during As-Found (kts)	MAG_4944: 0.8
				MAG_4979: 1.3
	MAG_4940: 0.4			
	MAG_4979	Sand, Silt, Pebbles	Current during As-Left (kts)	MAG_4944: NA
				MAG_4979: NA
	MAG_4940: NA			
MAG_4940	Sand		MAG_4940: NA	

Target Investigation Equipment Used:	<p>UHD 56 (Stbd Side) – Main Survey WROV TSS440, ROVINS with DVL, Single Head MBES (ResonSeabat 8125-H), Mini-SVS, Blueview Imaging Sonar, Tritech 704 bathy/altimeter, Inspection Laser, Valeport 803 Current Meter (TMS Mounted).</p> <p>UHD 54 (Port Side) – Main Dredging WROV 8" Dredge Pump, ROVINS with DVL, Single Head MBES (ResonSeabat 8125-H), Blueview Sonar, Tritech 704 bathy/altimeter, Inspection Laser, Valeport 803 Current Meter (TMS Mounted), Aris Explorer 3000.</p>
Methodology as per J14-233-ENG-PRO-016:	<p>Target grid survey for buried MAG pUXO target</p> <p>Dredging by WROV</p> <p>Target Investigation / Target Removal</p> <p>MBES As Left Survey</p>

AS-FOUND TARGET DETAILS				
Target Found:	Yes	Classification:	Debris / Boulder	
Target Found μ V:	AF-1	NA	Type AF-1:	Boulder
	AF-2	NA	Type AF-2:	Boulder
	AF-3	NA	Type AF-3:	Boulder
	AF-4	201	Type AF-4:	Metal Debris
	AF-5	7637	Type AF-5:	Metal Debris
	AF-6	30399	Type AF-6:	Metal Debris
	AF-7	NA	Type AF-7:	Boulder
	AF-8	NA	Type AF-8:	Boulder
	AF-9	NA	Type AF-9:	Boulder
TSS440 As-Found Position AF-4: WGS84 UTM31N	E: 427223.06 N: 5686565.47	Dimensions AF-4 (m)	Length Width Height	Length ~ 0.50 Width ~ 0.10 Height ~ 0.10
TSS440 As-Found Position AF-5: WGS84 UTM31N	E: 427498.82 N: 5686558.74		Dimensions AF-5 (m)	Length Width Height
TSS440 As-Found Position AF-6: WGS84 UTM31N	E: 427492.92 N: 5686549.11	Dimensions AF-6 (m)	Length Width Height	Length ~ 1.20 Width ~ 1.20 Height ~ 0.60
Burial AF-4 (m):	100% exposed	Approx. Weight AF-4 (kg):	~ 5	
Burial AF-5 (m):	100% exposed	Approx. Weight AF-5 (kg):	~ 10	
Burial AF-6 (m):	~ 50% buried at 0.30	Approx. Weight AF-6 (kg):	~ 100	
Period:	NA	Material:	NA	
Nationality of Origin:	NA	Potential Risk:	None	
Type of Fuse(s):	NA	Type of Explosives:	NA	
Arming Condition:	NA	Explosives Weight (kg):	NA	

INVESTIGATION SUMMARY

On the 3rd of March, MAG_4959 was investigated and as per report "MAG_4959_030317" four objects were relocated outside the cable lay corridor in position. E: 427359.38 / N: 5686562.42.

Wessex Archeology considers these finds may be part of an aircraft wreckage and a 100m radius Temporary Exclusion Zone was placed around MAG_4959.

MAG_4959_180317_Additional document will report the results of a non-intrusive (visual/sonar) survey within this TEZ and pUXO surveys carried out outside the TEZ. The non-intrusive survey has been allowed by Wessex Archeology and Historic England who granted a temporary suspension of the TEZ to perform further analysis.

The scope of this survey is to determine whether or not this is an aircraft crash site and the survey operations consisted of:

- Recover to deck the 4 objects already relocated during the previous survey.
- Perform visual investigation using sonar sweeps on 6 as-given targets (SSS_5218 to SSS_5223)
- Perform pUXO surveys using WROV in 3 as-given MAG targets (MAG_4940, MAG_4944 and MAG_4979). In these areas dredging operations are allowed as minimal as required to give a positive identification of the potential aircraft wreckage.

Survey operations started at 17:05 of 18/03/2017 and continued until 21:26 of 19/03/2017. At this time operations were considered complete.

The operations in the area were interrupted multiple times due to current during the entire period of survey.

For report purpose the results will be listed mainly by target and not by time as often both WROVs were involved at the same time in the operations.

- **TARGET RECOVERY**

Three of the four objects were located at the drop box coordinates but the 4th was found to have been covered by a layer of silt. This was subsequently located in proximity to the other items, by means of the WROV TSS and recovered separately.

- **VISUAL INVESTIGATION**

- **SSS_5223:**

WROV conducted a sonar sweep survey. During the sonar sweep survey, an anomaly was visible. The anomaly was approached directly and identified as a boulder.

This object is assigned as AF-1. Fix taken on location E: 427233.95 / N: 5686505.42.

- **SSS_5222:**

WROV conducted a sonar sweep survey. During the sonar sweep survey, an anomaly was visible. The anomaly was approached directly and identified as a boulder.

This object is assigned as AF-2. Fix taken on location E: 427364.85 / N: 5686493.38.

- **SSS_5221:**

WROV conducted a sonar sweep survey. During the sonar sweep survey, an anomaly was visible. The anomaly was approached directly and identified as a boulder.

This object is assigned as AF-3. Fix taken on location E: 427377.93 / N: 5686467.51.

- **SSS_5218:**

WROV conducted a sonar sweep survey. During the sonar sweep survey, an anomaly was visible. The anomaly was approached directly and identified as a boulder. The object was found outside the corridor.

This object is assigned as AF-7. Fix taken on location E: 427507.21 / N: 5686552.47.

- **SSS_5219:**

WROV conducted a sonar sweep survey. During the sonar sweep survey, an anomaly was visible. The anomaly was approached directly and identified as a boulder.

This object is assigned as AF-8. Fix taken on location E: 427476.50 / N: 5686494.71.

- **SSS_5220:**

WROV conducted a sonar sweep survey. During the sonar sweep survey, an anomaly was visible. The anomaly was approached directly and identified as a boulder.

This object is assigned as AF-9. Fix taken on location E: 427452.68 / N: 5686458.50.

The objects found during these visual surveys were left in-situ. No relocation operations were carried out.

- **pUXO SURVEY**

- **MAG_4979:**

Prior to the TSS-in survey a sonar sweep survey was conducted by WROV. During this survey, different anomalies were visible. WROV performed a pin point to confirm the targets.

WROV conducted a customized 13x20m grid survey with 2.20m line spacing and a flying height of 0.54m average above seabed utilizing TSS440, cameras and sonar. Multiple fixes were taken. Post-processing confirmed 4 areas of high values record (HV-1, HV-2, HV3, HV-4).

Dredging operation were commenced focusing on HV-1 and HV-2.

On HV-1 (30399 μ V) area a metal debris was found. This object is assigned as AF-6. The object has features of possible wheel, being round in shape and consisting of rubber and metal parts. The size of the object is 1.20x1.20x0.6 meters.

The object was located 3.74m at a relative bearing of 326.2 degrees from the as given position.

On HV-2 (7637 μ V) a metal debris was found. This object is assigned as AF-5. The object has features of possible back section of a wheel/brake cover. It can be related with the object AF-6. The size of the object is 1.50x1.50x0.05 meters.

The object was located 13.30m at a relative bearing of 016.7 degrees from the as given position.

Further investigation of the area confirmed HV-3 and HV-4 being boulder debris.

A MBES As-Left survey was commenced to achieve more information about the nature of the objects and the status of the dredging.

The objects were left in-situ.

- **MAG_4944:**

Prior to the TSS-in survey a sonar sweep survey was conducted by WROV. During this survey, no anomalies were visible on the Blueview sonar.

WROV conducted a 35x27m grid survey with 2.20m line spacing and a flying height of 0.51m average above seabed utilizing TSS440, cameras and sonar. 2 position fixes were taken. Post-processing confirmed the two areas of high values record (HV-1, HV-2 and confirmed another fix (HV-3) above the threshold (17 μ V).

Dredging operations were commenced focusing on these areas.

Only one object near HV-1 (201 μ V) area was found. This object was classified as metal debris and is assigned as AF-4. The object has features of possible spring/coil. The size of the object is 0.50x0.10x0.10 meters.

The object was located 16.30m at a relative bearing of 042.7 degrees from the as given position.

The object was left in-situ.

- **MAG_4940:**

WROV conducted a 10 x 15m grid survey with 2.20m line spacing and a flying height of 0.54m average above seabed utilizing TSS440, cameras and sonar. Nothing was found during the initial 10 x 15m grid survey.

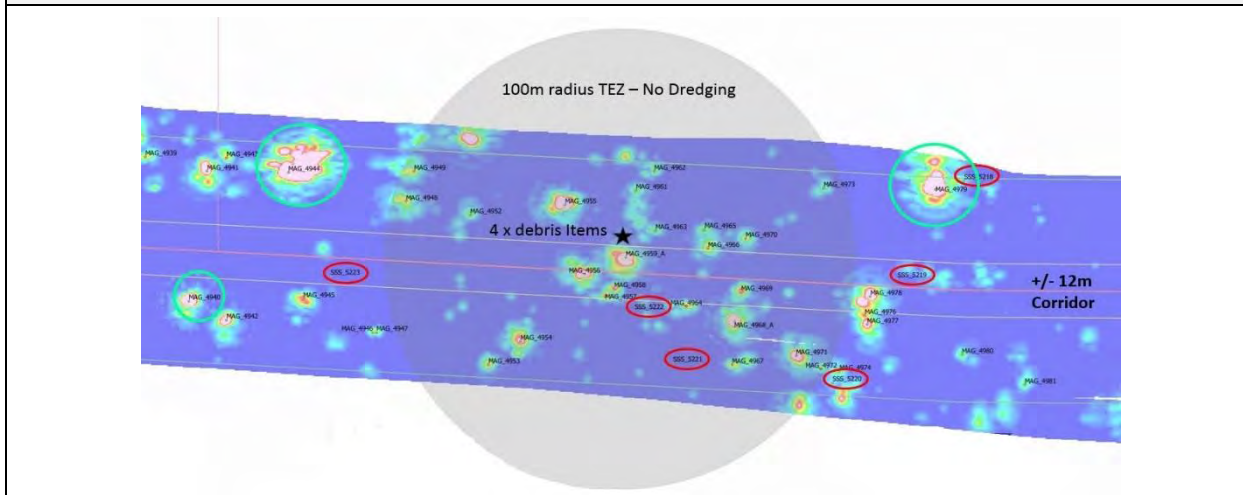
Two extra lines, one either side were added to the original grid, covering a grid area of 15 x 15m. No anomalies were detected in these extra lines.

Due to the scope of work no intrusive dredging operations were carried out using the ROA.

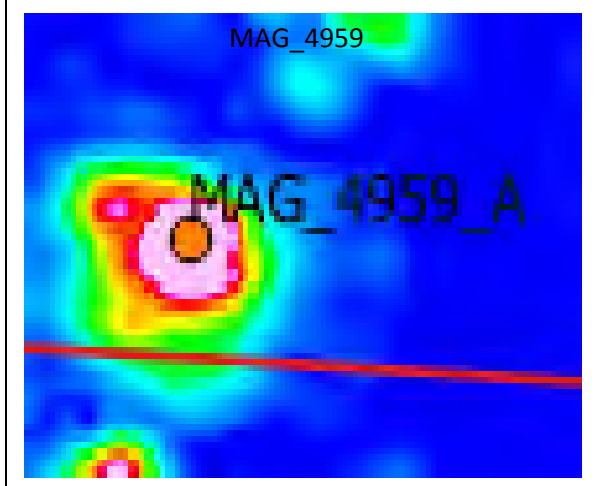
This TIR need to be reviewed by the Archaeology consultants due to the unusual shaped, machined pieces of metallic debris recovered.

ATTACHMENTS

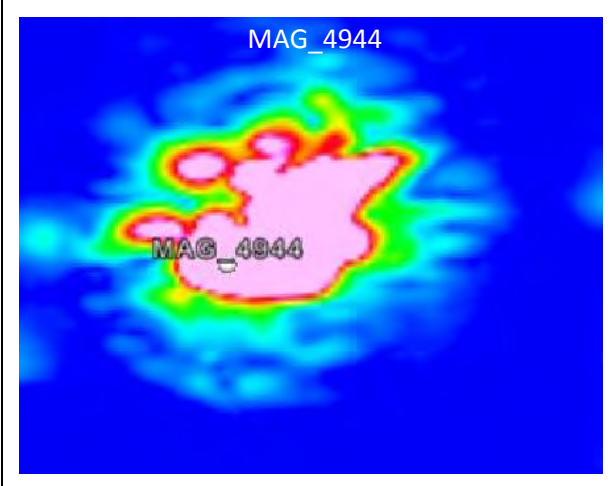
Survey Area Overview



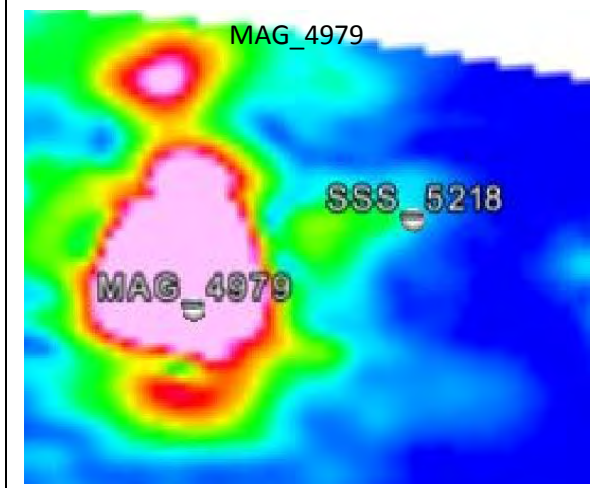
Existing Survey Magnetometer Data (MAG_4959)



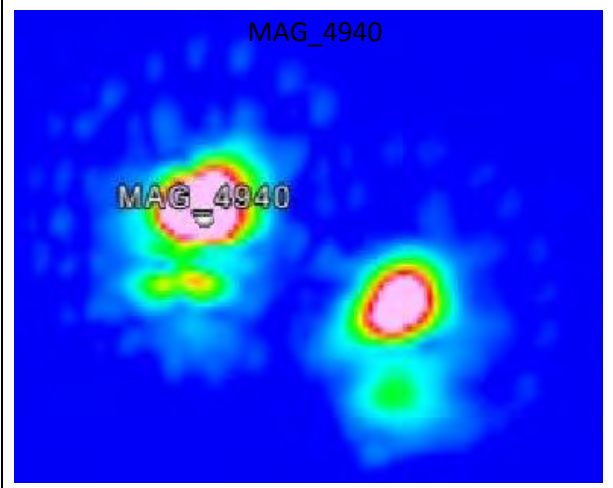
Existing Survey Magnetometer Data (MAG_4944)



Existing Survey Magnetometer Data (MAG_4979)



Existing Survey Magnetometer Data (MAG_4940)



ATTACHMENTS

Background Compensation Screen Grab (MAG_4944)

Port		MAG_4944		Starboard	
Early	Std	Early	Std	Early	Std
2250	0292	2252	0331	2333	0299
2250	0292	2252	0331	2336	0299
2250	0292	2253	0331	2331	0297
2250	0292	2252	0329	2331	0297
2250	0292	2252	0329	2331	0297
2247	0292	2250	0331	2330	0297
2252	0292	2250	0331	2331	0297
2250	0292	2250	0329	2331	0297
2250	0292	2250	0329	2331	0297
2249	0292	2252	0329	2331	0297

Background Compensation Stopped

Port GOOD Centre GOOD Starboard GOOD

Background Compensation Screen Grab (MAG_4979)

Port		MAG_4979		Starboard	
Early	Std	Early	Std	Early	Std
2114	0271	2058	0282	2157	0263
2116	0270	2059	0280	2159	0265
2113	0270	2059	0282	2157	0263
2111	0270	2058	0282	2156	0263
2113	0270	2058	0282	2154	0263
2113	0270	2058	0280	2156	0265
2113	0270	2056	0280	2156	0265
2111	0270	2056	0282	2156	0265
2113	0270	2056	0282	2156	0263
2111	0270	2056	0282	2156	0265

Background Compensation Stopped

Port GOOD Centre GOOD Starboard GOOD

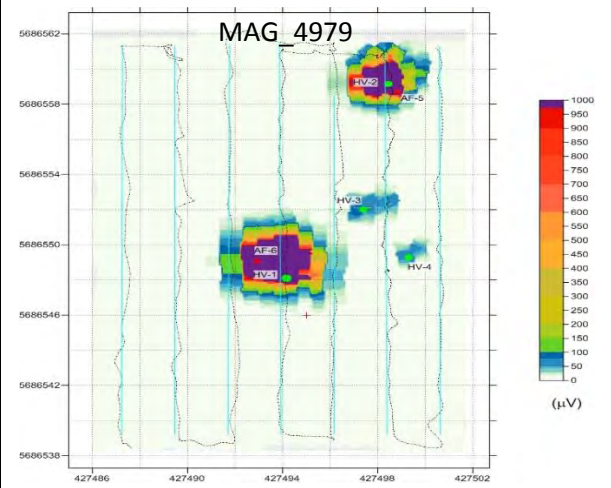
Background Compensation Screen Grab (MAG_4940)

Port		MAG_4940		Starboard	
Early	Std	Early	Std	Early	Std
2099	0268	2067	0285	2183	0267
2101	0268	2072	0285	2185	0267
2101	0267	2067	0285	2185	0267
2101	0267	2069	0285	2185	0267
2101	0268	2070	0286	2186	0268
2099	0268	2069	0285	2186	0267
2099	0268	2070	0286	2185	0267
2099	0268	2072	0286	2186	0267
2101	0268	2070	0286	2183	0267
2101	0268	2072	0286	2183	0267

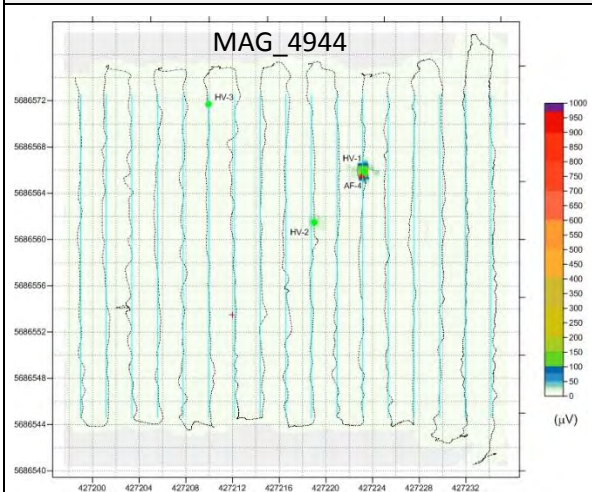
Background Compensation Stopped

Port GOOD Centre GOOD Starboard GOOD

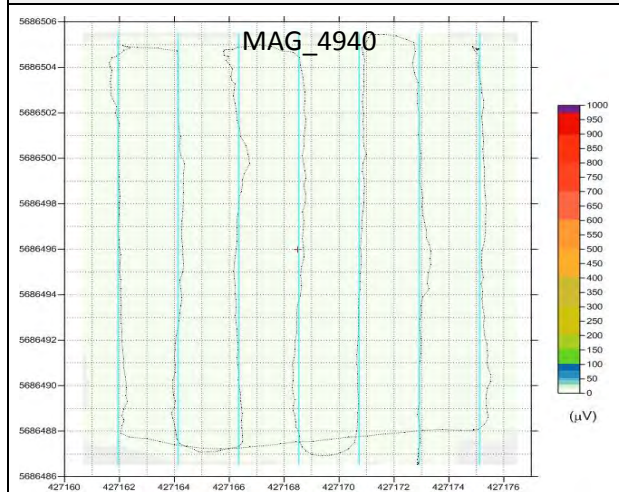
As-Found TSS440 Signal (μ V) including ROV Track Plot (MAG_4979)



As-Found TSS440 Signal (μ V) including ROV Track Plot (MAG_4944)



As-Found TSS440 Signal (μ V) including ROV Track Plot (MAG_4940)



ATTACHMENTS

Target Image Targets recovery from MAG_4959 As-Drop Location



Target Image AF-1 Sonar Sweep on SSS_5223



Target Image AF-2 Sonar Sweep on SSS_5222



Target Image AF-3 Sonar Sweep on SSS_5221



Target Image AF-4 TSS As-Found on MAG_4944



Target Image AF-5 TSS As-Found on MAG_4979



ATTACHMENTS

Target Image AF-6 TSS As-Found on MAG_4979



Target Image AF-7 Sonar Sweep on SSS_5218



Target Image AF-8 Sonar Sweep on SSS_5219



Target Image AF-9 Sonar Sweep on SSS_5220



Target Image Steel Frame (4th object) As-Found from MAG_4959

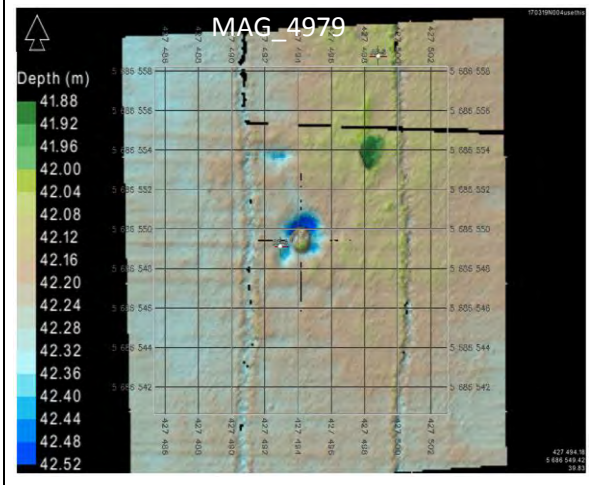


Target Image Steel Frame (4th object) drop box location

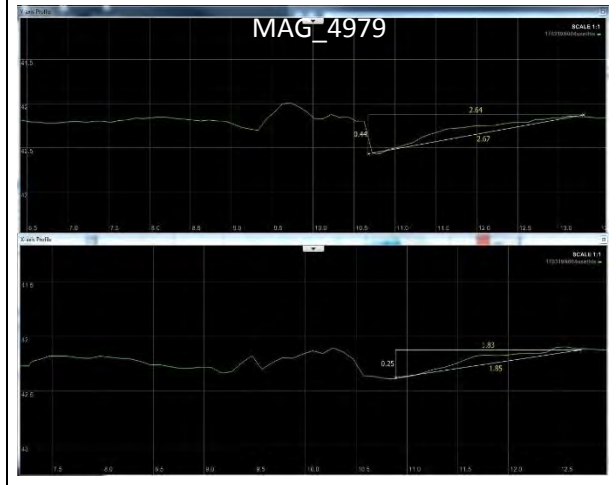


ATTACHMENTS

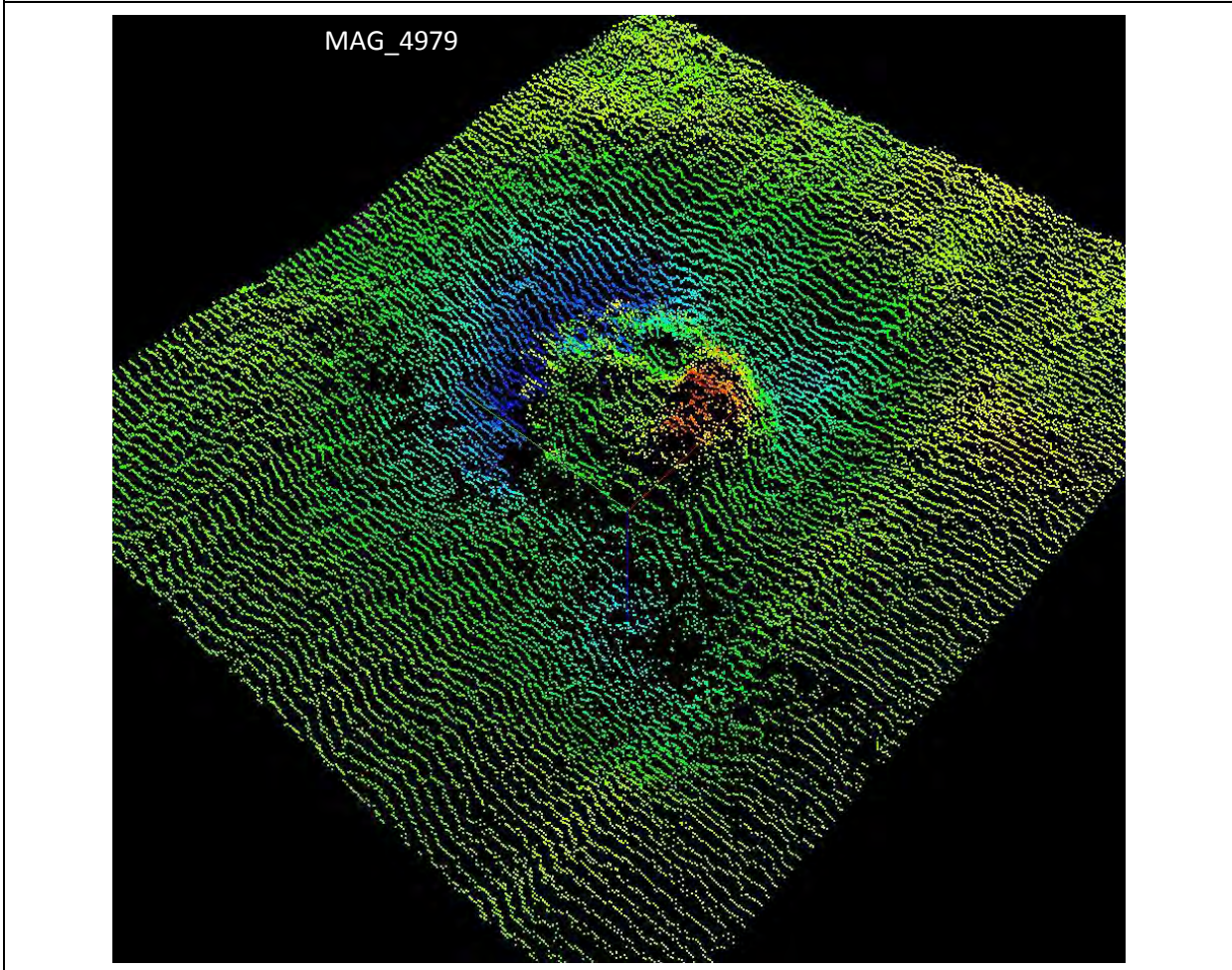
MBES Survey Dredge Profile above AF-6 on MAG_4979



MBES Survey Dredge Slope Angle above AF-6 on MAG_4979



MBES Survey Detail Target Image AF-6 TSS As-Found on MAG_4979



Related Data Files	
TIR MAG_4959 RevA	MAG_4959_030317.pdf
As Found TSS Coils	MAG_4979_AsFound_TSS_Coils_Grid
As Found TSS Coils	MAG_4944_AsFound_TSS_Coils_Grid
As Found TSS Coils	MAG_4940_AsFound_TSS_Coils_Grid

TARGET SIGN OFF			
Explosive Ordnance Supervisor (Bodac)	Jay Hogg	Date: 19-03-2017	Signature: 

END OF REPORT



APPENDIX 2: DATA SHEETS

Archaeological Assessment		Area:	UXO Target ID: MAG_4949_030317(4)	WA ID: 115580
Assessor	Wessex Archaeology		Survey Date	03/ 2017
Assessment Date	March 2017		Survey Company	DeepOcean
As Found Position (UTM31N): MAG_4949_030317(1)		427356.51		5686512.83
As Found Position (UTM31N): MAG_4949_030317(2)		427356.04		5686514.11
As Found Position (UTM31N): MAG_4949_030317(3)		427356.04?		5686514.11?
As Found Position (UTM31N): MAG_4949_030317(4)		427358.59		5686517.93
Description		<p>MAG_4949_030317(1): Fishing gear debris (object 1) comprising a concreted cable that was part of MAG_4949_030317(2).</p> <p>MAG_4949_030317(2): Fishing gear (object 2.1) comprising part of a beam head trawl 1040mm long and 960mm wide constructed of a 92mm wide steel band with a spring and mountings for the end of the trawl beam and tow cable.</p> <p>MAG_4949_030317(3): Fishing gear debris (object 2.2) comprising a concreted cable that was part of MAG_4949_030317(2).</p> <p>MAG_4949_030317(4): (object 3) appears to be an isolated rib from either the rudder, elevator, aileron, or tail plane of a multi-engine aircraft. If it is from a single engine aircraft, it may be an outer wing rib.</p> <p>Overview of Site The material recovered is a mix of fishing gear and an aircraft fragment.</p>		
Category	Archaeological interest	Archaeological Value	Low	Confidence Rating High
Action	tbc.			
Assessment Method	Archaeological recording of recovered debris			
References	Nemo - Target Investigation Report No MAG_4959_030317			
Images: See Below				



APPENDIX 3: GEOPHYSICAL GAZETTEER



WA ID	Class	Easting_ (UTM31N)	Northing (UTM31N)	Arch Discrimination	Length (m)	Width (m)	Height (m)	Magnetic Amplitude (nT)	Description	External References
7401	Magnetic	427217	5686558	A1	0.0	0.0	0.0	341.0	Large well-defined dipole seen in the magnetic data. Not seen in the other geophysical datasets (MBES, SSS). Mobile sediments with bedforms present at the anomaly location, indicating potential to be buried ferrous debris.	MAG_4944; Deep Ocean 2017b (Target Investigation Report No MAG_4959_190317_Additional)
7402	Magnetic	427217	5686498	A2	0.0	0.0	0.0	22.9	Small dipole seen in the magnetic data. Not seen in the other geophysical datasets (MBES, SSS). Mobile sediments with bedforms present at the anomaly location, indicating potential to be buried ferrous debris.	-
7403	Magnetic	427250	5686482	A2	0.0	0.0	0.0	14.3	Small dipole seen in the magnetic data. Not seen in the other geophysical datasets (MBES, SSS). Near to an area of mobile sediments and bedforms, indicating potential to be buried ferrous debris.	-
7404	Magnetic	427262	5686541	A2	0.0	0.0	0.0	16.3	Small dipole seen in the magnetic data. Not seen in the other geophysical datasets (MBES, SSS). Mobile sediments with bedforms present at the anomaly location, indicating potential to be buried ferrous debris.	-
7405	Magnetic	427265	5686554	A2	0.0	0.0	0.0	23.5	Small slightly asymmetric dipole seen in the magnetic data. Not seen in the other geophysical datasets (MBES, SSS). Mobile sediments with bedforms present at the anomaly location	-



									indicating potential to be buried ferrous debris.	
7406	Debris	427301	5686563	A2	3.0	0.4	0.0	11.5	Seen in both the magnetic and SSS data, within a 10.5 m radius. Identified as a small monopole in the magnetic data that has been associated with a narrow dark reflector in the SSS. The anomaly is likely to be ferrous debris, partially buried in an area of mobile sediment. It was not able to be identified in the bathymetry data due to the low height of the anomaly and presence of dunes.	-
7407	Debris	427290	5686534	A2	1.8	1.1	0.1	0.0	An irregular dark reflector was identified in the SSS data in an area of mobile bedforms. The anomaly has a slight shadow indicating minor height, indicating potential debris. There also appears to be some disturbed seabed nearby, that may be associated. This along with mobile bedforms present at the location indicate potential for this debris to be partially buried. It was not able to be identified in the bathymetry data due to low height. Only a very minor change in the magnetic data, no noticeable anomaly present indicating very low to no ferrous content.	-
7408	Magnetic	427313	5686475	A2	0.0	0.0	0.0	28.2	A small asymmetric dipole was seen in the magnetic data. Not seen in the other geophysical datasets (MBES, SSS). Near to an area of mobile sediments and bedforms, indicating potential to be buried ferrous debris.	-
7409	Magnetic	427300	5686468	A2	0.0	0.0	0.0	12.0	A small asymmetric dipole was seen in the magnetic data. Not seen in the other	-



									geophysical datasets (MBES, SSS). Near to an area of mobile sediments and bedforms, indicating potential to be buried ferrous debris.	
7410	Magnetic	427332	5686539	A2	0.0	0.0	0.0	68.5	A medium dipole was seen in the magnetic data. Not seen in the other geophysical datasets (MBES, SSS). Mobile sediments with bedforms present at the anomaly location, indicating potential to be buried ferrous debris.	-
7411	Magnetic	427341	5686508	A2	0.0	0.0	0.0	58.3	A medium dipole was seen in the magnetic data. Not seen in the other geophysical datasets (MBES, SSS). Mobile sediments present, with bedforms at the anomaly location, indicating potential to be buried ferrous debris.	-
7412	Magnetic	427351	5686500	A2	0.0	0.0	0.0	22.5	A small asymmetric dipole was seen in the magnetic data. Not seen in the other geophysical datasets (MBES, SSS). Near to an area of mobile sediments and bedforms, indicating potential to be buried ferrous debris.	-
7413	Magnetic	427358	5686513	O3	0.0	0.0	0.0	86.5	A medium asymmetric dipole was seen in the magnetic data, with a small monopole associated to the north of the identified location (seperate line). Not seen in the other geophysical datasets (MBES, SSS). Mobile sediments with bedforms present at the anomaly location, indicating potential to be buried. This is the original location where Object 1, 2 and 3 (MAG_4959_A) were located	MAG_4959: Target Investigation Reports: Deep Ocean 2017a (Target Investigation Report No MAG_4959_030317); Deep Ocean 2017b (Target Investigation Report No MAG_4959_190317_Additional)



										by the Deep Ocean ROV and subsequently moved.	
7414	Magnetic	427363	5686560	A2	0.0	0.0	0.0	12.3		An irregular dark reflector was identified in the sidescan data in an area of mobile bedforms. The anomaly has a slight shadow indicating minor height, indicating potential debris. There also appears to be some disturbed seabed nearby, that may or may not	-
7415	Debris	427392	5686490	A2	1.7	0.1	0.1	17.5		Seen in both the magnetic and SSS data, within a 5.7 m radius. Identified as a small dipole in magnetic data associated with an elongated dark reflector with a distinct shadow in the SSS. Associated scour. Some objects were identifiable in the SSS data and have been assessed as boulders, located in the surrounding area of the anomaly, within a 10 m radius. No anomaly was able to be defined in the bathymetry data.	-
7416	Debris	427411	5686524	A2	2.4	0.3	0.0	9.0		Seen in both the magnetic and SSS data, within a 2.2 m radius. Identified as a small asymmetric dipole in the magnetic data and associated with an elongated, slightly curved, narrow bright reflector. Identified in an area of, and in the same orientation as, mobile bedforms. Mobile bedforms present in the bathymetry data, but due to low height the anomaly is not able to be identified.	-
7417	Magnetic	427397	5686519	A2	0.0	0.0	0.0	10.3		Small monopole seen in the magnetic data, amongst an area of mobile sediment. Not seen in the other geophysical datasets (MBES, SSS). Mobile sediments with bedforms	-



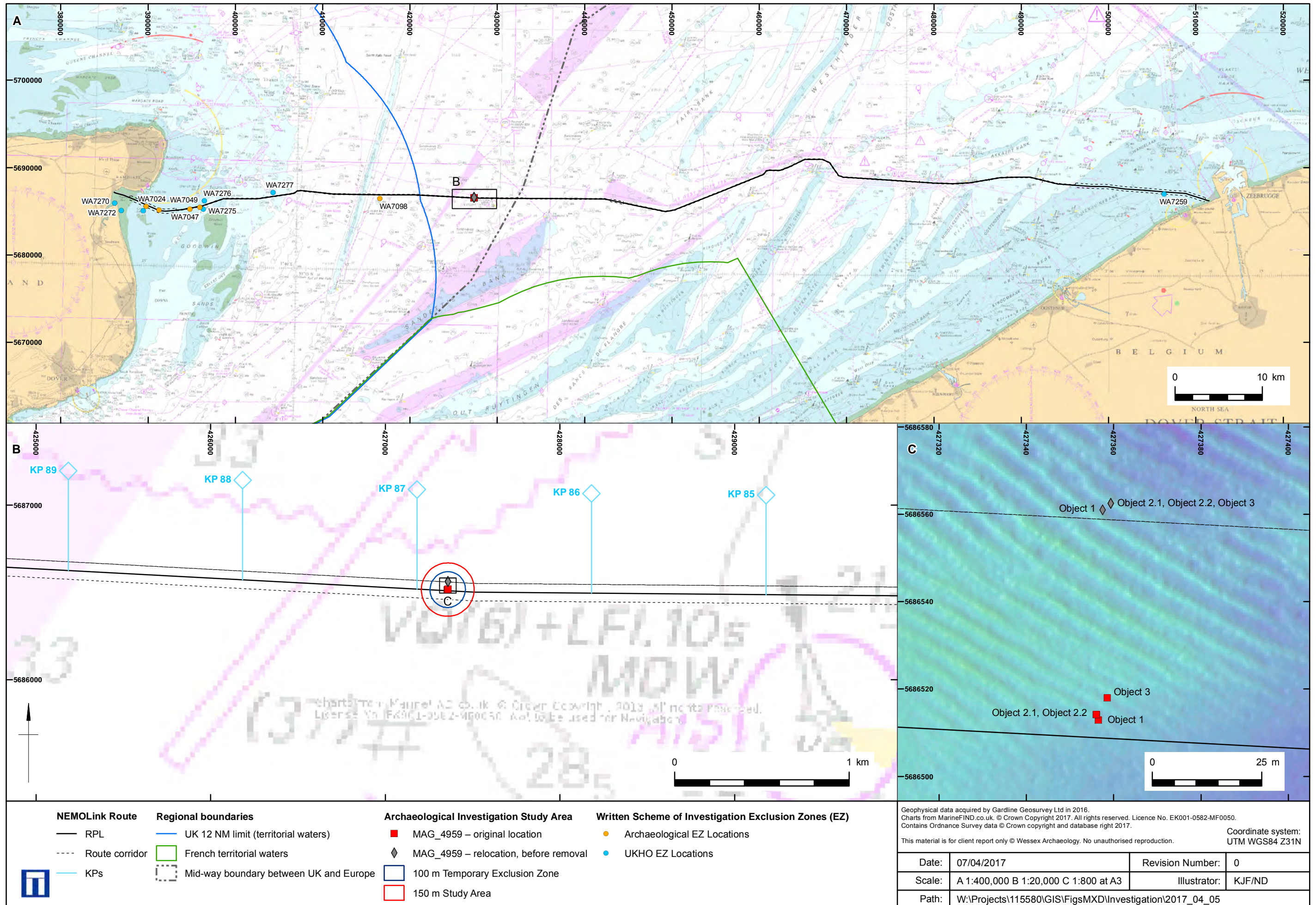
									present at the anomaly location, indicating potential to be buried.	
7418	Magnetic	427409	5686500	A2	0.0	0.0	0.0	17.7	A small asymmetric dipole was seen in the magnetic data. Not seen in the other geophysical datasets (MBES, SSS). Mobile sediments with bedforms present at the anomaly location, indicating potential to be buried ferrous debris.	-
7419	Magnetic	427405	5686487	A2	0.0	0.0	0.0	83.7	A medium asymmetric dipole was seen in the magnetic data. Not seen in the other geophysical datasets (MBES, SSS). Mobile sediments with bedforms present at the anomaly location, indicating potential to be buried ferrous debris.	-
7420	Magnetic	427407	5686467	A2	0.0	0.0	0.0	17.3	A small dipole was seen in the magnetic data. Not seen in the other geophysical datasets (MBES, SSS). Near to an area of mobile sediments and bedforms, indicating potential to be buried ferrous debris.	-
7421	Magnetic	427436	5686472	A2	0.0	0.0	0.0	42.7	A small asymmetric dipole was seen in the magnetic data. Not seen in the other geophysical datasets (MBES, SSS). Near to an area of mobile sediments and bedforms, indicating potential to be buried ferrous debris.	-
7422	Magnetic	427438	5686449	A2	0.0	0.0	0.0	18.8	A small monopole was seen in the magnetic data. Not seen in the other geophysical datasets (MBES, SSS). Near to an area of mobile sediments and bedforms, indicating potential to be buried. Some objects were seen in the	-



										SSS data, assessed as boulders, within a 10 m radius of the anomaly position.	
7423	Magnetic	427454	5686454	A2	0.0	0.0	0.0	29.9		A small dipole was seen in the magnetic data. Not seen in the other geophysical datasets (MBES, SSS). Near to an area of mobile sediments and bedforms, indicating potential to be buried. Some objects were seen in the SSS data, assessed as boulders, within a 10 m radius of the anomaly position.	-
7424	Magnetic	427452	5686465	A2	0.0	0.0	0.0	10.7		A small dipole was seen in the magnetic data. Not seen in the other geophysical datasets. Near to an area of mobile sediments and bedforms, indicating potential to be buried. Some objects were seen in the SSS data, assessed as boulders, within a 10 m radius of the anomaly position.	-
7425	Magnetic	427465	5686490	A1	0.0	0.0	0.0	134.1		Two asymmetric dipoles, medium and small, were identified in the magnetic data over an area of approximately 12 m. There appears to be a number of magnetic anomalies which have been associated together. Not seen in the other geophysical datasets (MBES, SSS). There does appear to be a change in sediment type, identified as a higher acoustic return in the SSS, indicating coarser sediment. Also located near to an area of mobile sediments and bedforms, indicating potential to be buried ferrous debris.	-
7426	Debris field	427497	5686550	A1	12.5	4.6	2.3	229.1		Two dipoles, one large and one medium, were identified in the magnetic data over an area of approximately 6 m,	MAG_4979; Deep Ocean 2017b (Target Investigation Report No MAG_4959_190317_Additional)

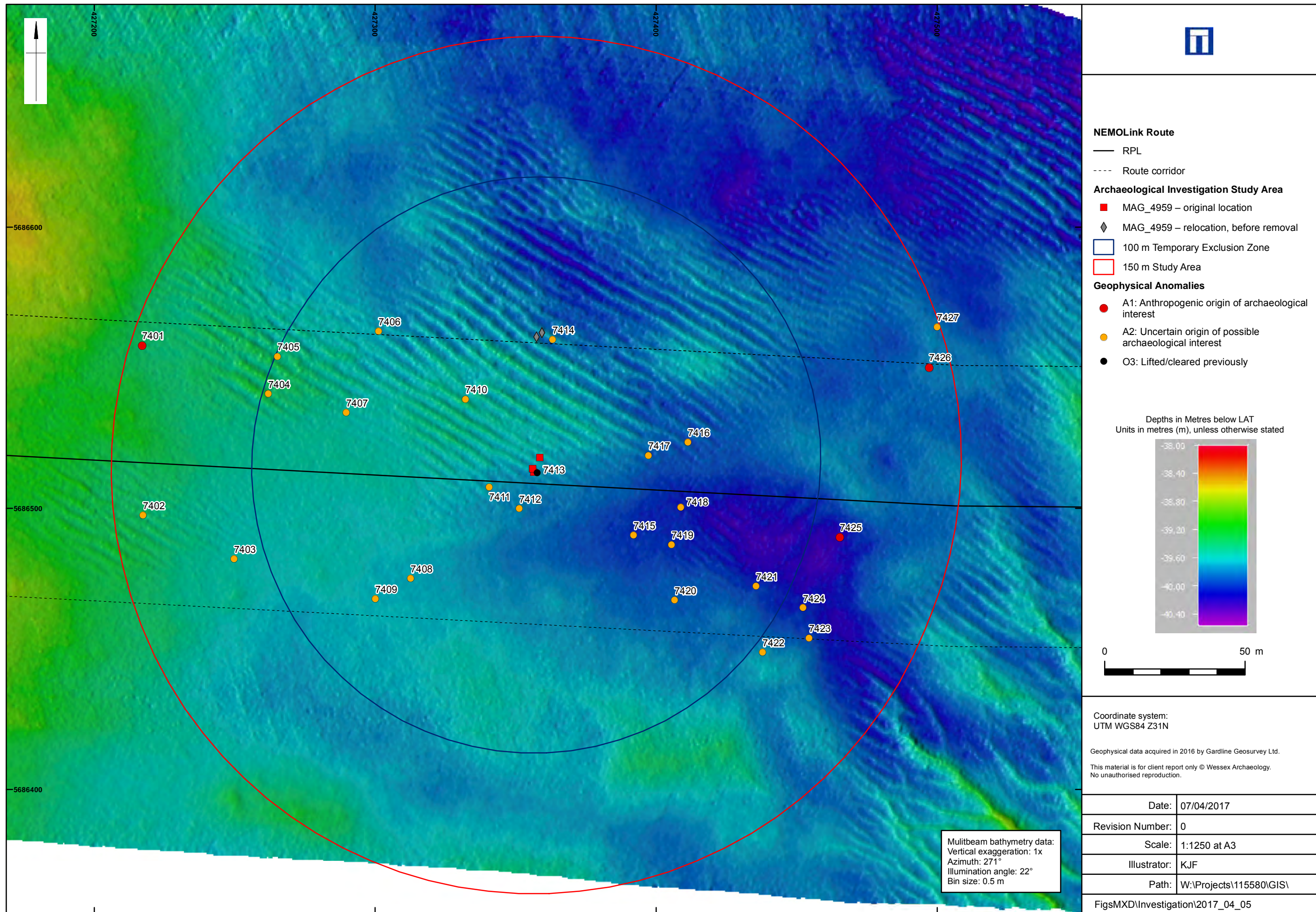


										associated with three main contacts identified in the SSS data covering an area of approximately 12 m. These anomalies have been classified as a debris field, all debris appears to have height. The anomalies were not clearly identifiable in the bathymetry data, however some slight depressions were present.	
7427	Dark reflector	427500	5686564	A2	1.8	0.7	1.3	0.0		An elongated dark reflector was identified in the SSS data with a slight shadow, located close to an area of mobile sediment indicating potential for partial burial. Not seen in the other bathymetry data and outside the range of the magnetic data. It could be of interest, but it could also be natural.	-



Location map

Figure 1



Anomalies of archaeological potential identified in the 2016 geophysical data

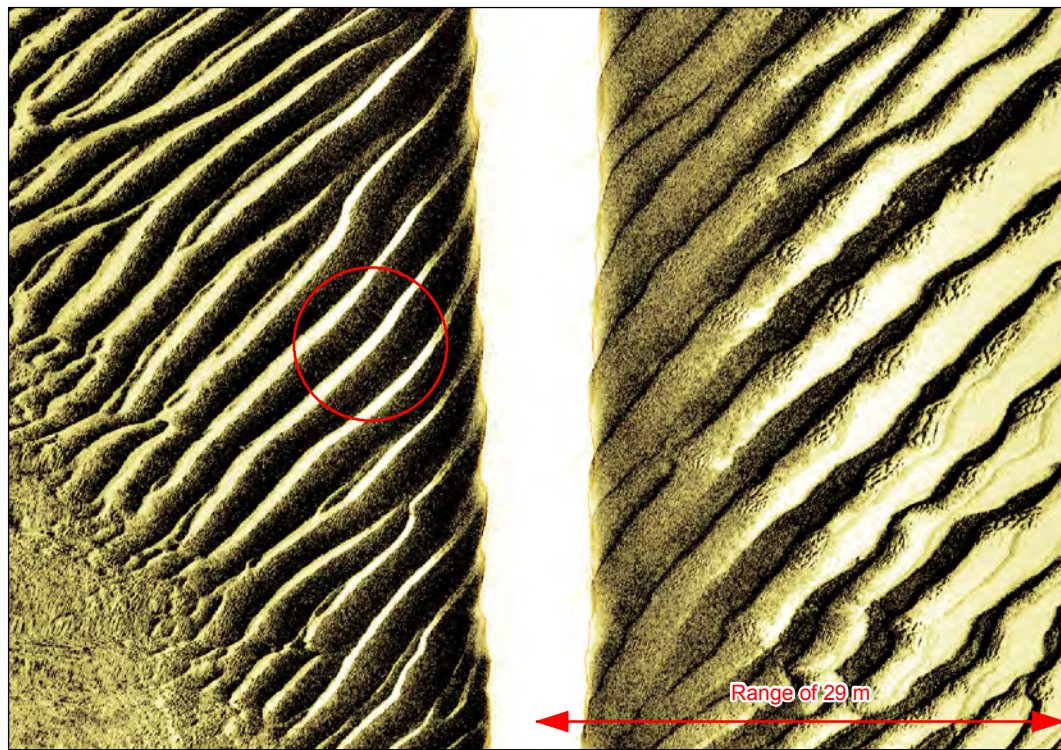
Figure 2



ROV video still of metal debris found at 7413 (MAG_4959; Object 2.1 and 2.2)



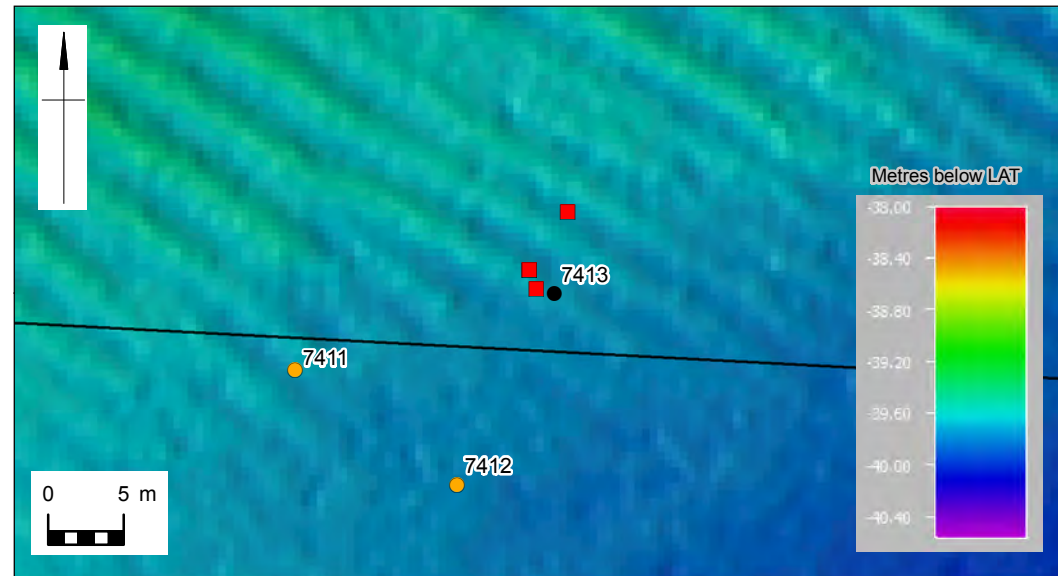
ROV video still of metal debris found at 7413 (MAG_4959; Object 3)



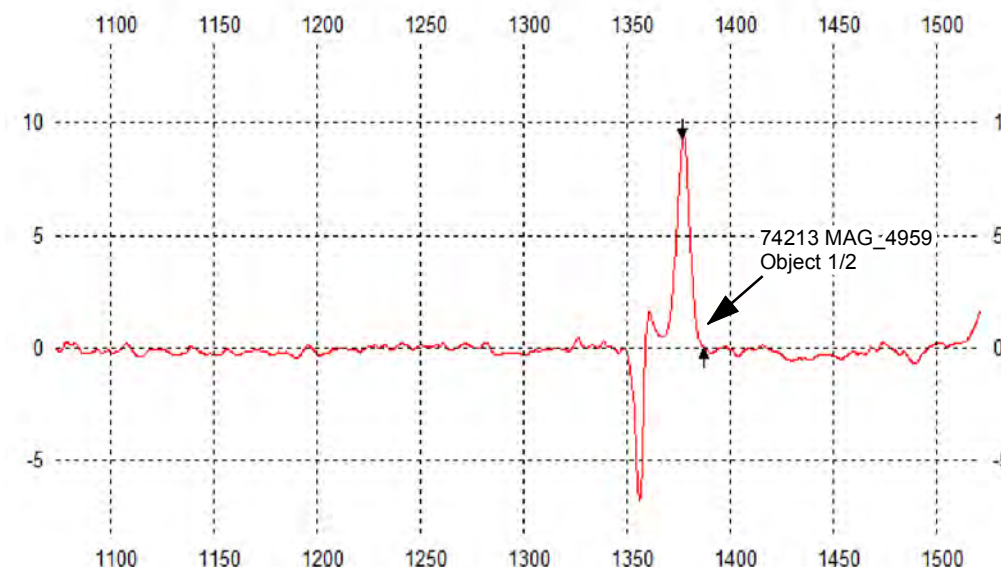
Sidescan sonar image of buried ferrous debris 7413 (MAG_4959)



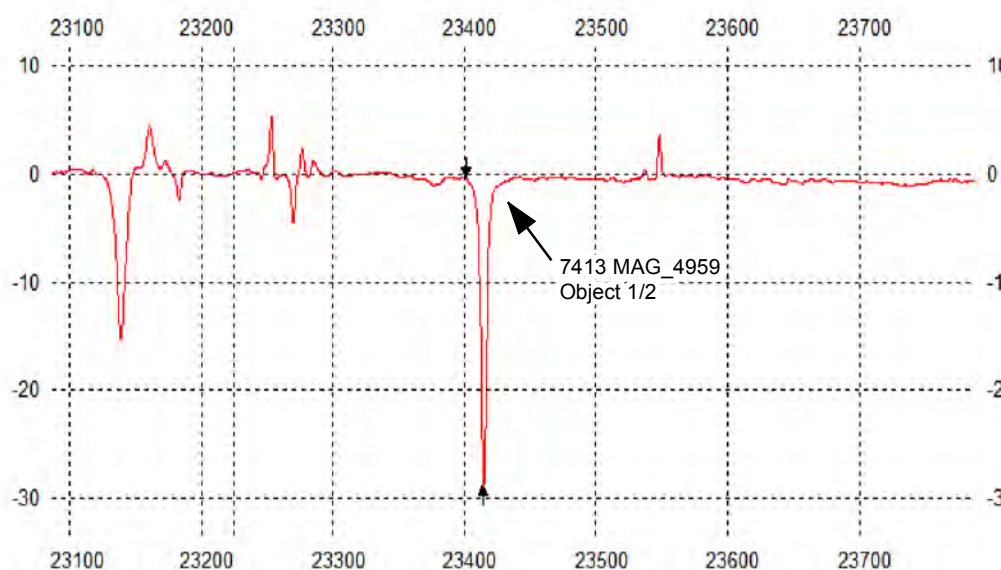
Magnetometer profile associated with 7413 (MAG_4959, Object 3)



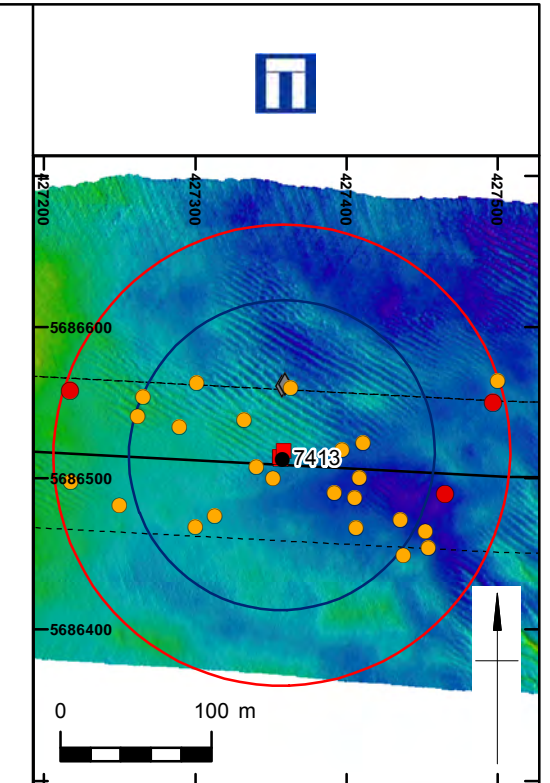
Multibeam bathymetry image of buried ferrous debris 7413



Magnetometer profile (positive peak) of 7413 (MAG_4959, Object 1-2) measuring 87 nT in total



Magnetometer profile (negative peak) of 7413 (MAG_4959, Object 1-2) measuring 87 nT in total



NEMOLink Route

- RPL
- - - Route corridor

Archaeological Investigation Study Area

- MAG_4959 – original location
- ◆ MAG_4959 – relocation, before removal
- 100 m Temporary Exclusion Zone
- 150 m Study Area

Geophysical Anomalies

- A1: Anthropogenic origin of archaeological interest
- A2: Uncertain origin of possible archaeological interest
- O3: Lifted/cleared previously

Depths in Metres below LAT
Units in metres (m), unless otherwise stated
Magnetic data measured in nanotesla (nT)

Coordinate system:
UTM WGS84 Z31N

Geophysical data acquired in 2016 by Gardline Geosurvey Ltd.
ROV images acquired in 2017 by Deep Ocean.

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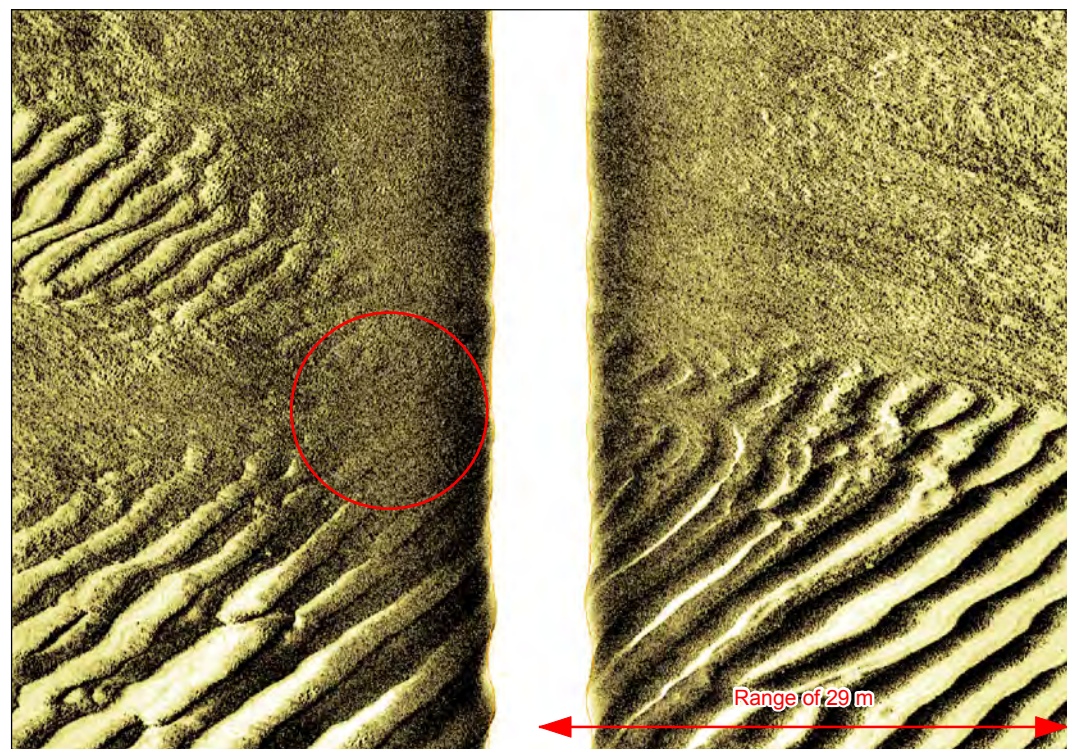
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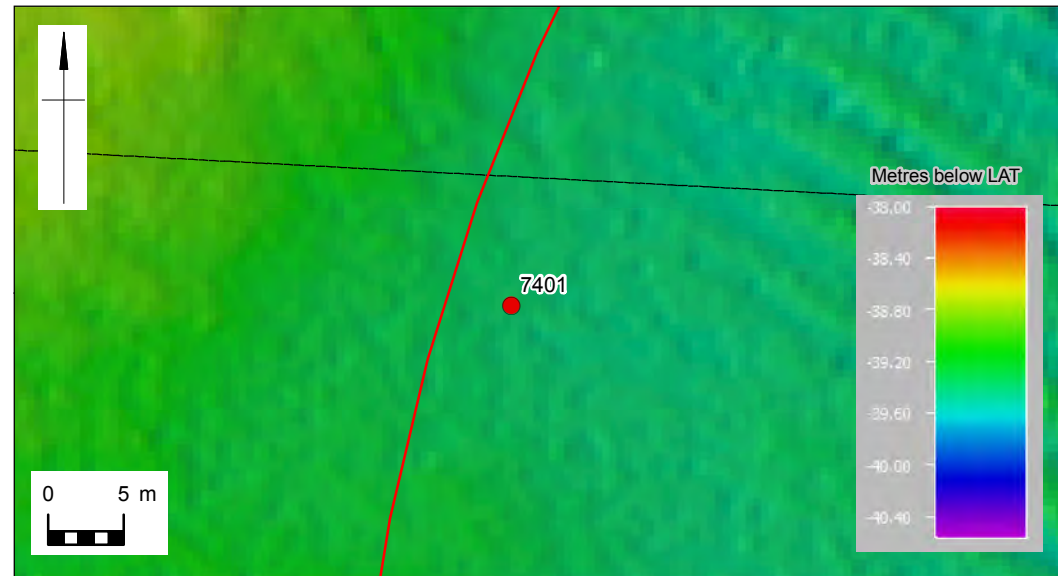
ROV video still of metal debris found at 7401 (MAG_4944) (top down view)



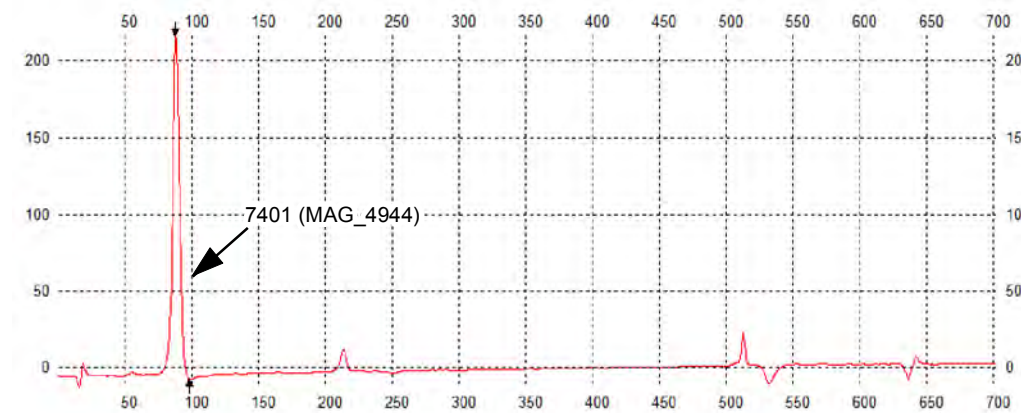
ROV video still of metal debris found at 7401 (MAG_4944) (side on view)



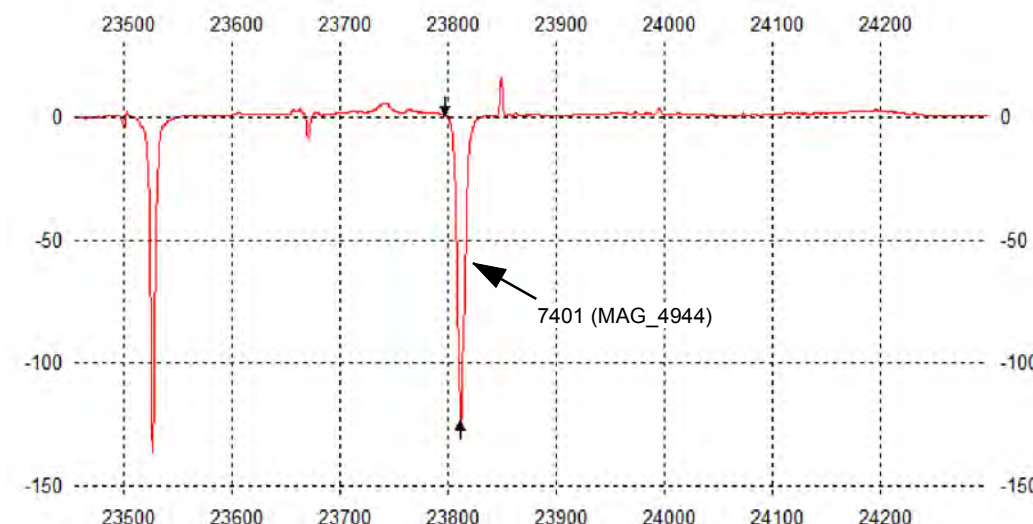
Sidescan sonar image of partially buried ferrous debris 7401 (MAG_4944)



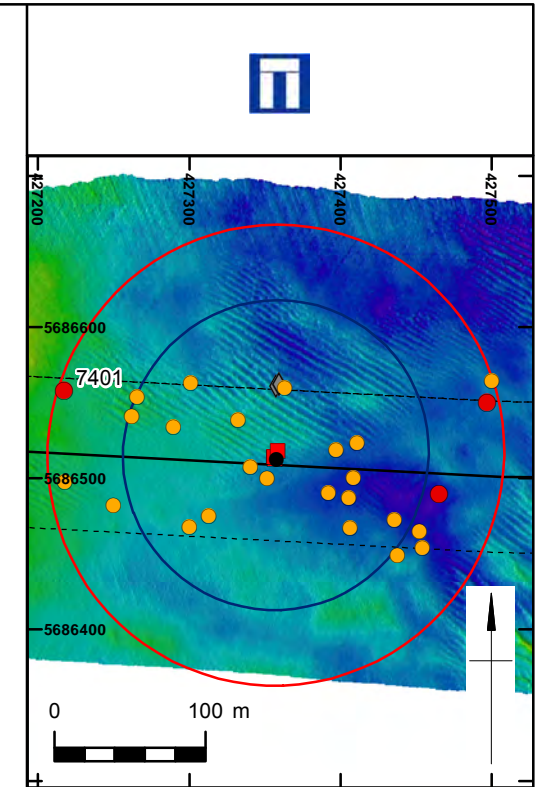
Multibeam bathymetry image of buried ferrous debris 7401 (MAG_4944)



Magnetometer profile (positive peak) of 7401 (MAG_4944) measuring 341 nT in total



Magnetometer profile (negative peak) of 7401 (MAG_4944) measuring 341 nT in total



NEMOLink Route

- RPL
- - - Route corridor

Archaeological Investigation Study Area

- MAG_4959 – original location
- ◆ MAG_4959 – relocation, before removal
- 100 m Temporary Exclusion Zone
- 150 m Study Area

Geophysical Anomalies

- A1: Anthropogenic origin of archaeological interest
- A2: Uncertain origin of possible archaeological interest
- O3: Lifted/cleared previously

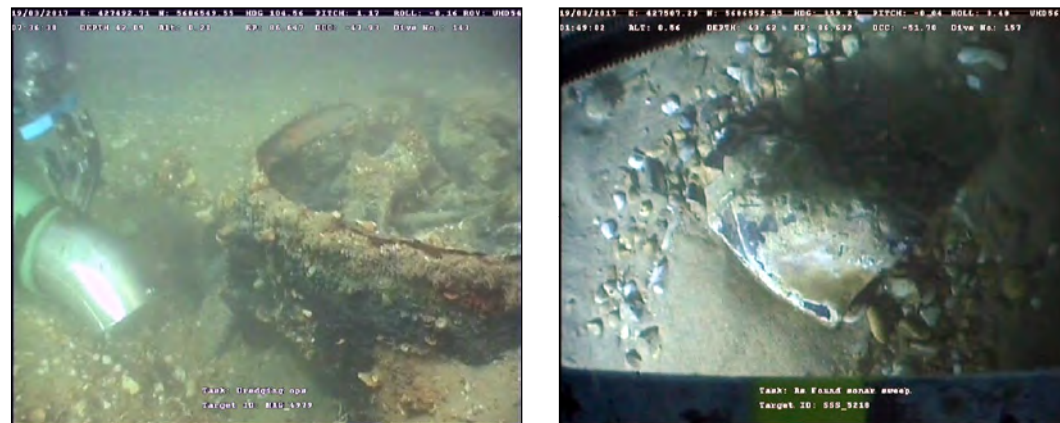
Depths in Metres below LAT
Units in metres (m), unless otherwise stated
Magnetic data measured in nanotesla (nT)

Coordinate system:
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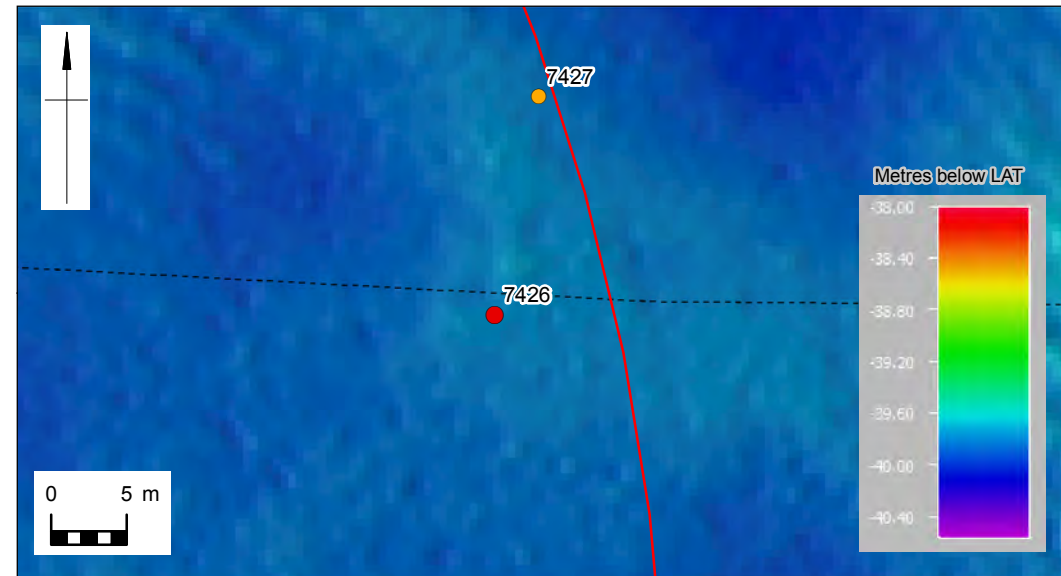
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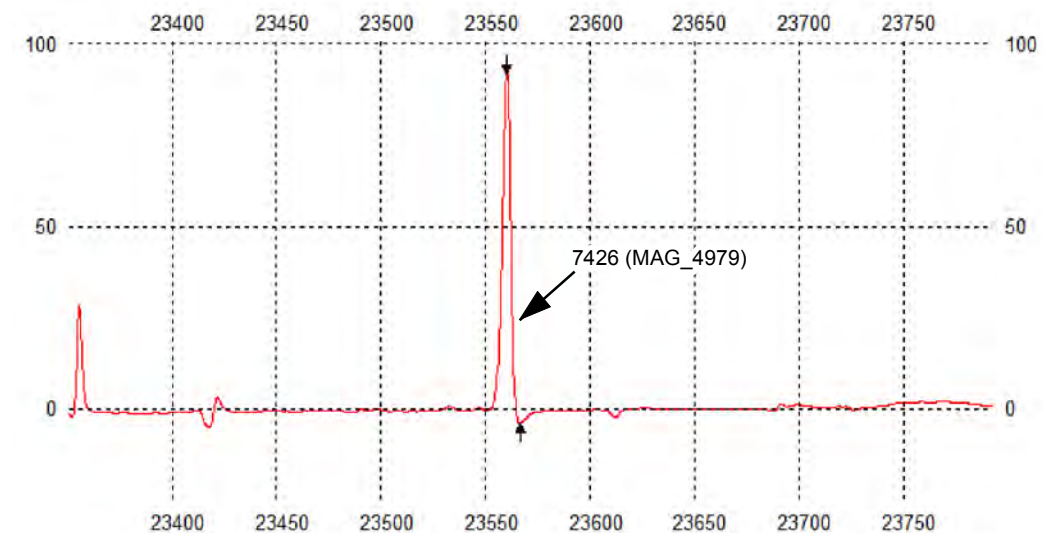
ROV video stills of metal debris found at 7426 (MAG_4979)



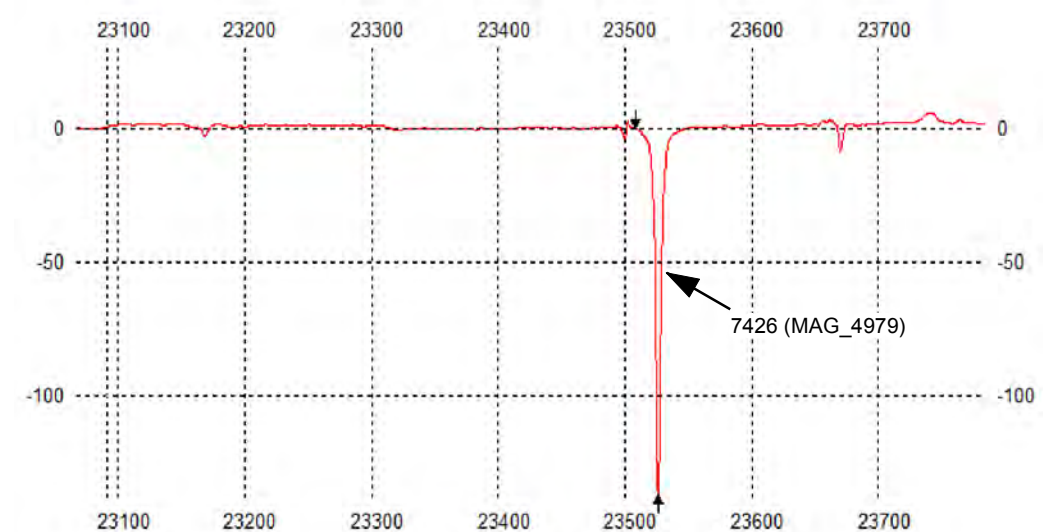
Sidescan sonar image of debris field 7426 (MAG_4979): 12.5 m x 4.6 m 2.3 m



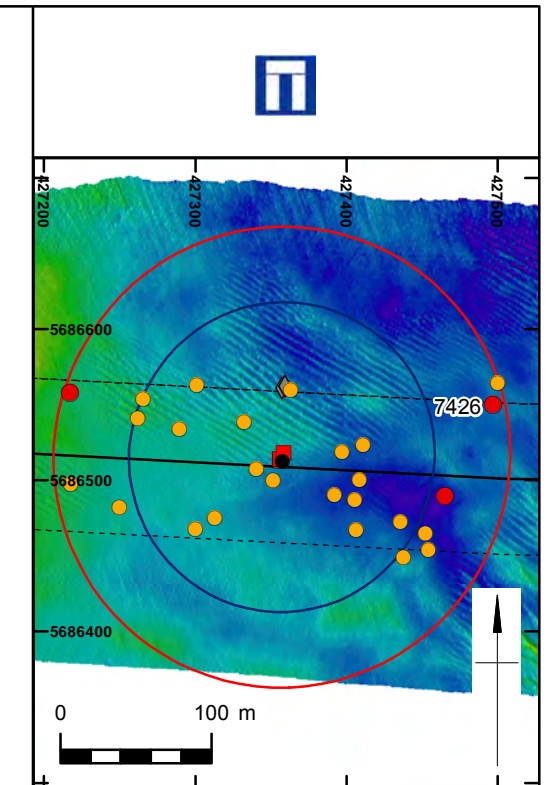
Multibeam bathymetry image of debris field 7426 (MAG_4979)



Magnetometer profile (positive peak) of 7426 (MAG_4979) measuring 229 nT in total



Magnetometer profile (negative peak) of 7426 (MAG_4979) measuring 229 nT in total



NEMOLink Route

- RPL
- - - Route corridor

Archaeological Investigation Study Area

- MAG_4959 – original location
- ◆ MAG_4959 – relocation, before removal
- 100 m Temporary Exclusion Zone
- 150 m Study Area

Geophysical Anomalies

- A1: Anthropogenic origin of archaeological interest
- A2: Uncertain origin of possible archaeological interest
- O3: Lifted/cleared previously

Depths in Metres below LAT
Units in metres (m), unless otherwise stated
Magnetic data measured in nanotesla (nT)

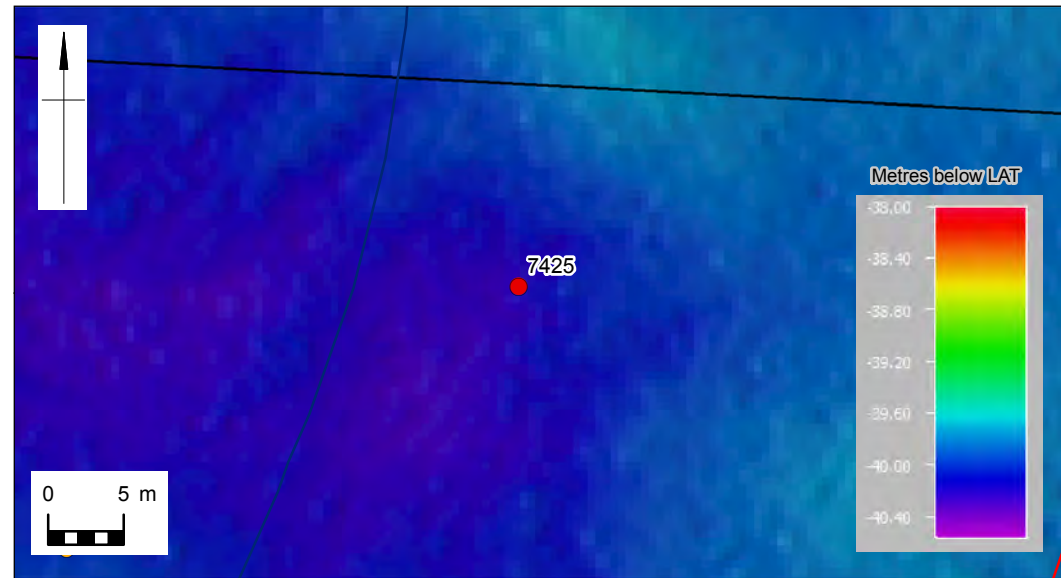
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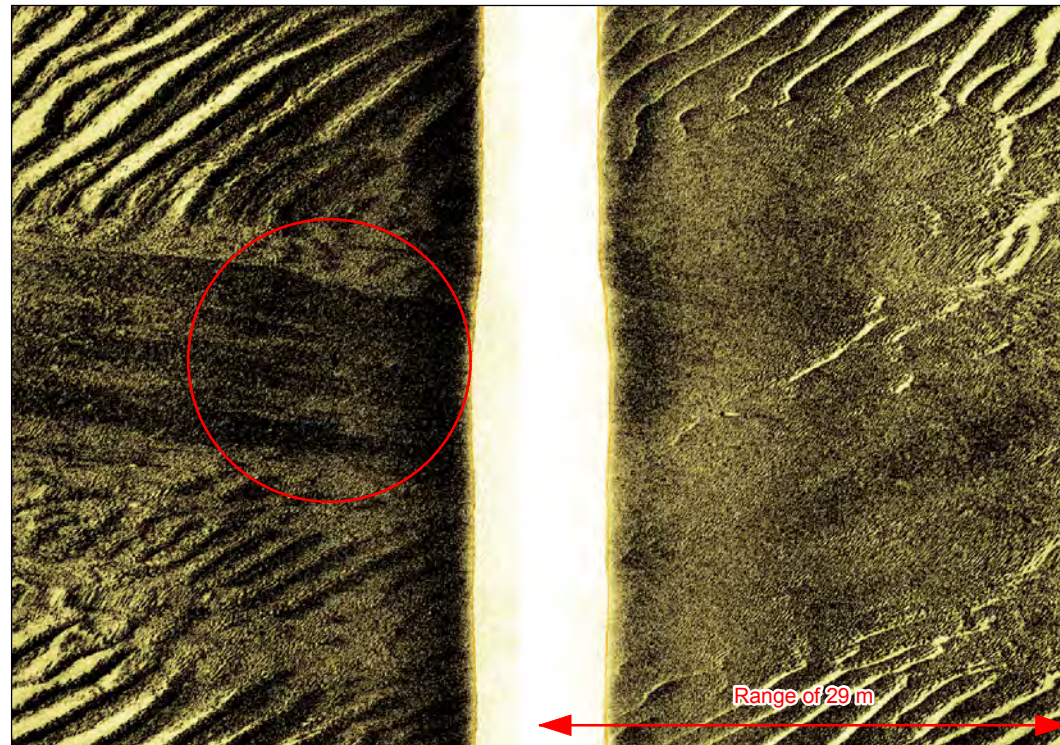
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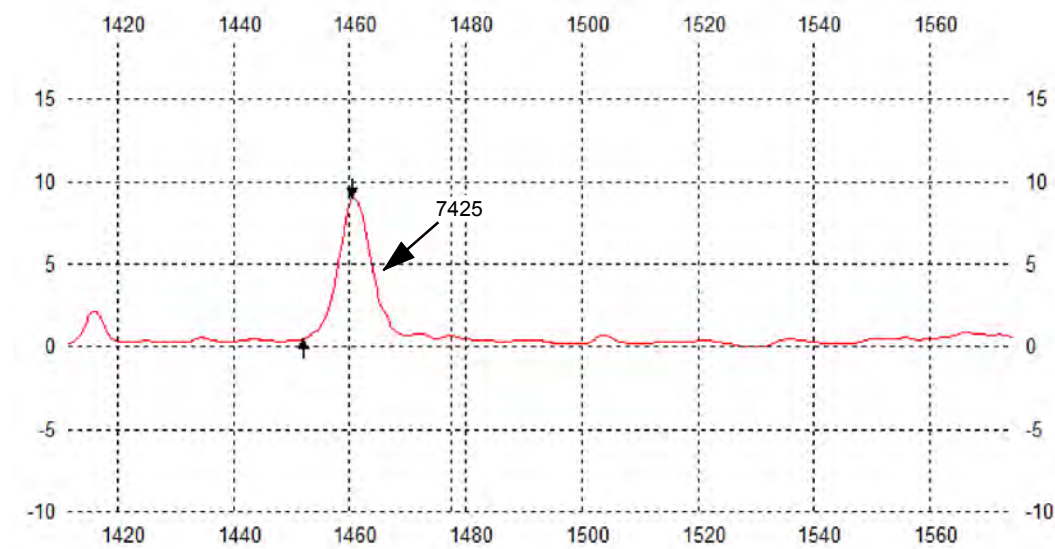
No ROV video images available for this location



Multibeam bathymetry image of buried ferrous debris 7425



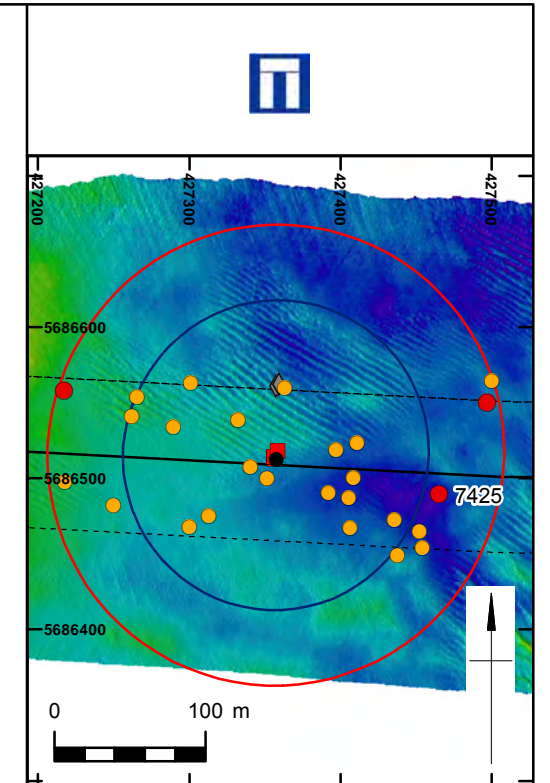
Sidescan sonar image of buried ferrous debris 7425



Magnetometer profile (positive peak) of 7425 measuring 134 nT in total



Magnetometer profile (negative peak) of 7425 measuring 134 nT in total



- NEMOLink Route**
- RPL
 - - - Route corridor
- Archaeological Investigation Study Area**
- MAG_4959 – original location
 - ◆ MAG_4959 – relocation, before removal
 - 100 m Temporary Exclusion Zone
 - 150 m Study Area
- Geophysical Anomalies**
- A1: Anthropogenic origin of archaeological interest
 - A2: Uncertain origin of possible archaeological interest
 - O3: Lifted/cleared previously

Depths in Metres below LAT
Units in metres (m), unless otherwise stated
Magnetic data measured in nanotesla (nT)

Coordinate system:
UTM WGS84 Z31N

Geophysical data acquired in 2016 by Gardline Geosurvey Ltd.
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Plate 1



Plate 2



Plate 3


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Plate 4



Plate 5


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Plate 6



Plate 7


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Plate 8



Plate 9


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Plate 10



Plate 11



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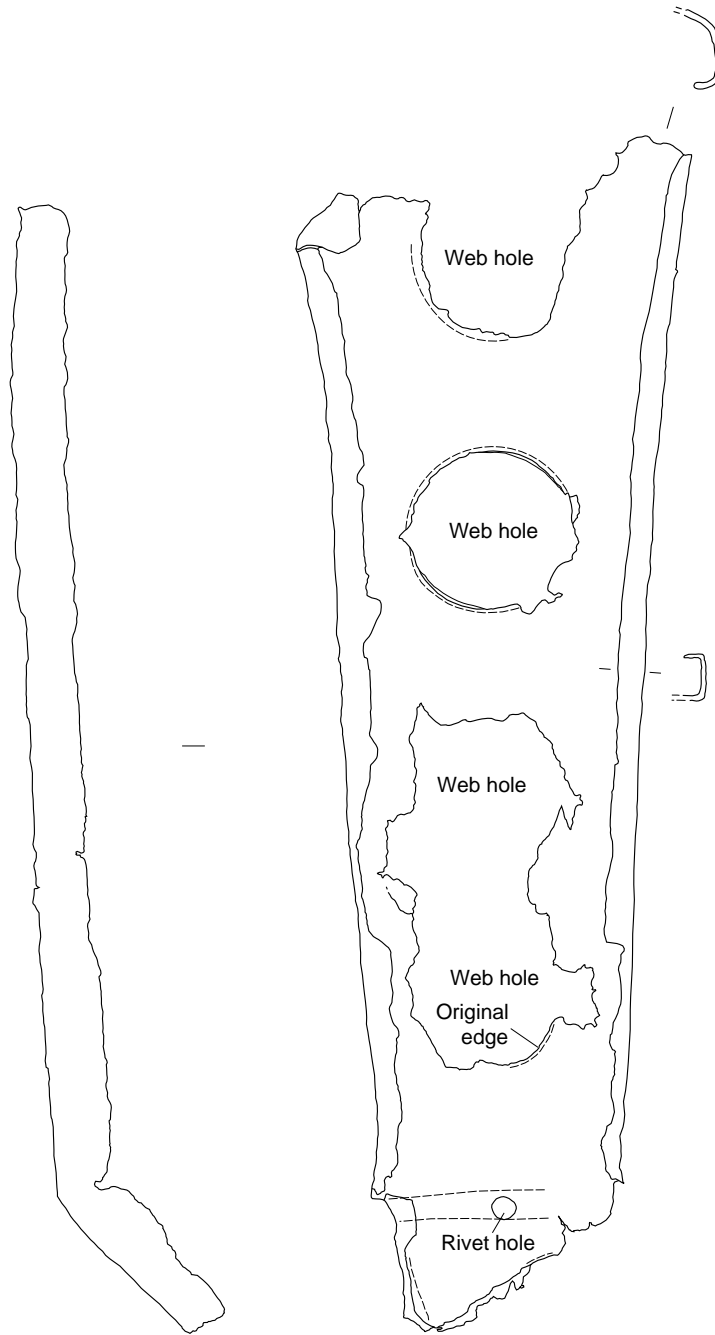


Plate 12



Plate 13

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0 100 mm

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