



Aggregate Area 478 Year 8 Annual Monitoring Report

Archaeological Assessment of Geophysical Data



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February 2017



Aggregate Area 478

Year 8 Annual Monitoring Report Archaeological Assessment of Geophysical Data

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Summary

Wessex Archaeology was commissioned by Fugro EMU Limited to undertake an archaeological assessment of geophysical survey data as part of the heritage annual monitoring process for aggregate extraction Area 478. The data comprised sidescan sonar and multibeam bathymetry data acquired by Fugro EMU Limited during November and December 2016.

The overall aim of this report is to provide an archaeological review of the effects of dredging upon known archaeological sites and previously identified geophysical anomalies that may potentially be of archaeological interest; and to assess the areas for any new anomalies that may be of potential archaeological interest.

A total of six anomalies have been identified across Area 478. One of the anomalies (**7004**) has been classified as A1 - Anthropogenic origin of archaeological interest. Anomaly **7004** has been identified as a wreck within all previous archaeological assessments of the area. This anomaly has an existing 100 m Archaeological Exclusion Zone and it is recommended that this is maintained.

A further five anomalies (**7000**, **7001**, **7002**, **7003** and **7005**) were identified within Area 478 and were classified as A2 - Uncertain origin of possible archaeological interest. No AEZs are recommended for these anomalies at this time.

It is recommended that if any objects of possible archaeological interest are recovered during dredging operations from Area 478, that they should be reported using the established Marine Aggregate Industry *Protocol for reporting finds of archaeological interest* (BMAPA and English Heritage 2005).



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This assessment was commissioned by Fugro EMU Limited, and the assistance of Mike Smith and Samantha Strutton is acknowledged in this respect.

Laura Andrews carried out the geophysical assessment and compiled the report, with quality control provided by Dr Louise Tizzard. Kitty Foster prepared the illustrations and the project was managed for Wessex Archaeology by Dr Louise Tizzard.



Aggregate Area 478

Year 8 Annual Monitoring Report Archaeological Assessment of Geophysical Data

1 INTRODUCTION

1.1 Project background

- 1.1.1 Wessex Archaeology (WA) was commissioned by Fugro EMU Limited (Fugro) to undertake an archaeological assessment of geophysical survey data as part of the heritage impact annual monitoring process implemented for aggregate extraction in Area 478, located in the English Channel, 40 km south of Beachy Head, East Sussex (**Figure 1**).
- 1.1.2 The Study Area for the Licence Area, as provided by Fugro, are delimited by the following coordinates (WGS 84 UTM Zone 31N) (**Figure 1**):

Table 1 Delimiting coordinates for Area 478 Study Area

Easting	Northing
309912	5585641
307846	5584514
294082	5581153
295505	5582149
296155	5582377
307417	5585127
309250	5585555
309914	5585694

- 1.1.3 The data comprised sidescan sonar (SSS) and multibeam echosounder (MBES) data acquired by Fugro during 2016. The geophysical survey data assessed for this report cover the Study Area for Area 478 as provided by the client (**Figure 1**). The survey extents are based on the overlap of SSS and MBES data coverage.
- 1.1.4 As required by the licence conditions for the dredging area, geophysical monitoring surveys are undertaken in order to ascertain any changes to the archaeological baseline. This report presents the archaeological assessment of the most recently acquired geophysical survey data for the area (year 8).
- #### 1.2 Previous work
- 1.2.1 In 2007 Maritime Archaeology Limited (MA) undertook a pre-dredge archaeological assessment of geophysical data in support of a licence application for Area 478 (Maritime Archaeology Limited 2007). This included an assessment of known, suspected and potential archaeological sites.
- 1.2.2 Subsequently, Year 1 (EMU 2010), Year 2 (EMU 2011) and Year 3 (EMU 2012) archaeological monitoring assessments were undertaken by EMU.



- 1.2.3 In 2013 the Year 4 archaeological monitoring assessment and a Year 5 substantive review were undertaken by Sea Change Heritage Consultants Limited (Sea Change 2013a; 2013b) on behalf of EMU (EMU 2013). No new geophysical assessment was undertaken in the Year 5 substantive review.
- 1.2.4 Most recently in 2015 a Year 6 archaeological monitoring assessment was undertaken by Sea Change Heritage Consultants Limited (Sea Change 2015).
- 1.2.5 There have been no reported British Marine Aggregate Producers Association (BMAPA) *Protocol for Reporting Finds of Archaeological Interest* records within the Study Area for Area 478 since the inception of the protocol in 2005.

1.3 Seabed geology

- 1.3.1 According to the British Geological Survey (BGS) the seabed sediments within the Study Areas consist of sandy gravel and muddy sandy gravel (BGS Sheet Sea Bed Sediments, 50°N-00°E). The underlying Tertiary sediments are the Middle Eocene Barton formation (Hamblin *et al.* 1992). The overall nature of the seabed was relatively flat with the edge of a channel running along the south-west extents.

1.4 Aim

- 1.4.1 The aim of this report is to:
- Confirm the presence of known or previously located marine sites of archaeological potential and to comment on their apparent character;
 - Identify, locate and characterise hitherto unrecorded marine sites of archaeological potential;
 - Comment on the effects of dredging on known archaeological sites; and
 - Provide recommendations for archaeological mitigation.

2 METHODOLOGY

2.1 Introduction

- 2.1.1 The methodology adopted for this assessment conforms to the Standard and Guidance for Archaeological Desk-based Assessment published by the Chartered Institute for Archaeologists (CIfA 2014) and the BMAPA and English Heritage (2003) Marine Aggregate Dredging and the Historic Environment guidance note.

2.2 Data sources

- 2.2.1 The primary data set was the geophysical data acquired by Fugro. The data comprised SSS and MBES data acquired by Fugro between 29 November and 2 December 2016 at 95 m line spacing with cross lines every 2 km.
- 2.2.2 The SSS data were provided as high and low frequencies in *.xtf* format and the MBES data were provided as a single *.txt* file. Only the high frequency SSS data were assessed by WA.
- 2.2.3 Further background information was obtained from previous archaeological investigations as detailed in Section 1.2.



2.2.4 A United Kingdom Hydrographic Office (UKHO) search for wrecks and obstructions was also undertaken as part of this assessment.

2.3 Technical specifications

2.3.1 The geophysical data were acquired by Fugro on board survey vessel RV *Discovery* between 29 November and 2 December 2016. The data were acquired with a line spacing of 95 m and cross lines approximately 2 km apart.

2.3.2 The SSS data were acquired using an Edgetech 4200 dual frequency sidescan sonar towfish and transceiver, operated at both high (600 kHz) and low (300 kHz) frequencies simultaneously, at a range of 114 m. Positioning for the SSS towfish was with an USBL system. The SSS data were provided as high and low frequencies in *.xtf* format.

2.3.3 The MBES data were acquired using a Kongsberg EM 2040 MBES system operated at 400 kHz. The data were processed in QINSy and reduced to Chart Datum (CD), Newhaven. The data were digitally recorded, gridded to 1 m cell size and provided to WA in a single /txt file.

2.3.4 A Fugro Starfix system with G2+/HP/XP corrections was used to provide primary positioning for the survey. The secondary positioning system used was an Applanix POS MV DGNS.

2.3.5 For this survey all positions were recorded and expressed in WGS 1984, UTM Zone 31N.

2.4 Data Quality

2.4.1 The geophysical data used for this report were assessed for quality and their suitability for archaeological purposes, and rated using the following criteria:

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

2.4.2 The high frequency SSS data have been rated as 'Average' using the above criteria. The data were acquired at a range of 114 m and was subject to some weather interference. The positioning of some lines has also been affected. Visibility did not extend to the end of the 114m range. Large and upstanding objects were visible however smaller objects were difficult to identify. Overall the data were considered suitable for archaeological interpretation.

2.4.3 The MBES data were rated as "Good" using the above criteria. The 1 m gridding ensured relatively small features were visible, and relatively few weather and tidal artefacts were



present within the data. The dataset was considered suitable for archaeological interpretation.

2.5 Processing

- 2.5.1 The high frequency SSS data were processed by WA using Coda GeoSurvey software. This allowed the data to be replayed with various gain settings in order to optimise the quality of the images. The data were initially scanned to give an understanding of the geological nature of the area and were then interpreted for any objects of possible anthropogenic origin. This involves creating a database of anomalies within Coda by tagging individual features of possible archaeological potential, recording their positions and dimensions, and acquiring an image of each anomaly for future reference.
- 2.5.2 A mosaic of the SSS data is produced during this process to assess the quality of the sonar towfish positioning. Corrected navigation had been applied to the raw data using the USBL system and was left unaltered by WA.
- 2.5.3 The form, size, and/or extent of an anomaly is a guide to its potential to be an anthropogenic feature, and therefore of its potential 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 of a feature as a result of past impacts from, for example, dredging or fishing.
- 2.5.4 The MBES data were analysed to identify any unusual seabed structures that could be shipwrecks or other anthropogenic debris. The results were correlated with the SSS data interpretation. The data were analysed using Fledermaus software, which enables 3-D visualisation of the acquired data and geo-picking of seabed anomalies.

2.6 Anomaly grouping and discrimination

- 2.6.1 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.
- 2.6.2 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, multiple SSS anomalies and a MBES anomaly.
- 2.6.3 All geophysical anomalies that were identified in previous monitoring reports were also grouped at this stage.
- 2.6.4 Once all the geophysical anomalies have been grouped, a discrimination flag is added to the record in order to discriminate against those which are not thought to be of an archaeological concern. These flags are ascribed as follows:

Table 3 Criteria for discriminating archaeological importance of features

Non-Archaeological	U1	Not of anthropogenic origin
	U2	Known non-archaeological feature
	U3	Recorded Loss
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



2.6.5 In order to provide direct comparison with previous monitoring reports (MA 2007, EMU 2010; 2011; 2012, Sea Change 2013a; 2013b; 2015) the A1 classification can be considered to be High Potential (defined as an anomaly representing an object or site of anthropogenic origin and of likely archaeological interest); A2 classification can be considered to be low potential (defined as an anomaly representing an object or site of likely anthropogenic origin that would require further investigation in order to clarify its origin and establish its archaeological potential) and the A3 classification can be considered to be low potential (defined as an anomaly representing an object or site of possible anthropogenic origin and unknown archaeological interest that does not require further investigation). Discrimination, potential and descriptions of the anomalies are provided in **Appendix I**.

2.6.6 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.

3 RESULTS

3.1.1 The results of this assessment are collated in gazetteer format and detailed in **Appendix I** and are illustrated in **Figure 2**. All identified anomalies have been issued with a unique WA identifier number starting with 7000.

3.1.2 Six anomalies of archaeological potential have been interpreted within Area 478 (**Figure 2**). These anomalies are discriminated as follows:

Table 4 Anomalies of archaeological potential in Area 478

Archaeological Discrimination	Number of anomalies	Interpretation
A1	1	Anthropogenic origin of archaeological interest
A2	5	Uncertain origin of possible archaeological interest
Total	6	

3.1.3 These anomalies of potential archaeological interest have been classified by probable type, which can further aid in assigning archaeological potential and importance:

Table 5 Types of anomalies identified in Area 478

Anomaly Classification	Total Number of Anomalies
Wreck	1
Dark Reflector	5
Total	6

3.1.4 In previous monitoring assessments (MA 2007; EMU 2010; 2011; 2012; Sea Change 2013a; 2015) 21 geophysical anomalies representing 13 features of possible archaeological potential were identified within the Study Area. Six of these previous anomalies were grouped with one feature identified by in the current dataset by WA, and a further previous anomaly was grouped with a feature identified in the current dataset by WA, which was has subsequently been re-interpreted as natural. The remaining fourteen previously identified anomalies were not observed in the most recent dataset by WA and have been interpreted as natural features. All previous anomalies are presented in **Figure 2**.



- 3.1.5 The six anomalies identified by WA during the year 8 assessment have all been located within the Active Dredge Zone and are described below.
- 3.1.6 One anomaly (**7004**) has been classified as A1 - Anthropogenic origin of archaeological interest, and was previously identified within earlier monitoring reports (MA 2007; EMU 2010; 2011; 2012; Sea Change 2013a; 2013b; 2015) as having high potential.
- 3.1.7 From this most recent dataset anomaly **7004** has been identified as an elliptical area of dark and bright reflectors with some structure visible in the SSS data, measuring 48.7 x 10 x 4.2 m. The anomaly was observed in the MBES data as a discrete elliptical mound with some structure visible, on a NNW to SSE alignment, in a general depth of 43 m CD. The wreck is upright and relatively intact though appears broken-up at the NNW end. There is scour observed directly along the south-west side and a large amount at the south-east end of the wreck. A significant sediment build-up along the north-east side of the wreck was observed in the MBES data which could obscure observation of further attached structure or surrounding debris (**Figure 3**).
- 3.1.8 In the Year 6 archaeological monitoring assessment (Sea Change 2015) this anomaly was observed as an upright and broken-up wreck with surrounding debris and scour, measuring 61.7 x 9.2 x 3.4 m.
- 3.1.9 The wreck was identified previously as being broken-up and this may have become more pronounced which would account for the apparent decrease in the observed length or that the northern end of wreck has been buried since the last survey, or a combination of both.
- 3.1.10 The significantly shorter length and the slight increase in the width and height of the wreck, as identified in the most recent dataset, may also suggest that there are complex processes of sediment accretion and erosion occurring across the site.
- 3.1.11 This anomaly is associated with the location of a UKHO record (UKHO 20714) and reported as an intact, upright unknown wreck.
- 3.1.12 This anomaly does have an associated 100 m Archaeological Exclusion Zone (AEZ) around the centre-point of the wreck (**Figure 2**). From the MBES data it can be seen that seabed scarring has occurred up to 45 m to the SWW the wreck. The cause of this scarring is unknown but the Year 5 substantive review states that it was first identified as an historical scar in the Year 1 monitoring report (Sea Change 2013b).
- 3.1.13 The remaining five anomalies (**7000 - 7003** and **7005**) within this area have been classified as A2 - Uncertain origin of possible archaeological interest. None of these anomalies have been previously identified. All of these anomalies are classified as dark reflectors; objects of uncertain origin (**Figure 2**).
- 3.1.14 The anomalies range in size from 1.8 x 1.3 x 0.5 m (**7002**) up to 5.2 x 2.7 x 0.4 m (**7000**) and are all interpreted to be possible debris of low archaeological potential or natural features. Full details are provided in **Appendix I**.
- 3.1.15 Fourteen anomalies were identified from the previous assessments within the Study Area that have not been observed within this dataset (MA 2007; EMU 2010; 2011; 2012; Sea Change 2013a; 2015). This could be due to anomalies being re-interpreted as natural features within this dataset or burial in the surrounding sediment.



4 MITIGATION

- 4.1.1 With regards to mitigation of archaeology the marine planning authority, working with the relevant regulator and advisors, take account of the desirability of sustaining and enhancing the significance of heritage assets and adopt a general presumption in favour of the conservation of designated heritage assets within an appropriate setting (HM Government 2011; DCALG 2012).
- 4.1.2 A total of six anomalies have been identified across Area 478, all of which are located within the Active Dredge Zone. One of the anomalies (**7004**) has been classified as A1 - Anthropogenic origin of archaeological interest. Anomaly **7004** has been identified as a wreck within all previous archaeological assessments of the area. This anomaly has an existing 100 m Archaeological Exclusion Zone and it is recommended that this is maintained in accordance with the current licence.
- 4.1.3 A further five anomalies were identified within Area 478 and were classified as A2 - Uncertain origin of possible archaeological interest. No AEZs are recommended for these anomalies at this time. Anomalies **7000**, **7002** and **7005** are currently situated outside the main area of dredging and, as such, are unlikely to be impacted. However, if this were to change avoidance would be recommended where feasible.
- 4.1.4 Anomalies **7001** and **7003** are situated within the area dredged. It is recommended that operational vigilance is undertaken in the vicinity of these anomalies.
- 4.1.5 It is recommended that if any objects of possible archaeological interest are recovered during dredging operations from Area 478, that they should be reported using the established Marine Aggregate Industry *Protocol for reporting finds of archaeological interest* (BMAPA and English Heritage 2005).



5 REFERENCES

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APPENDIX I: ANOMALIES OF POSSIBLE ARCHAEOLOGICAL POTENTIAL – AREA 478

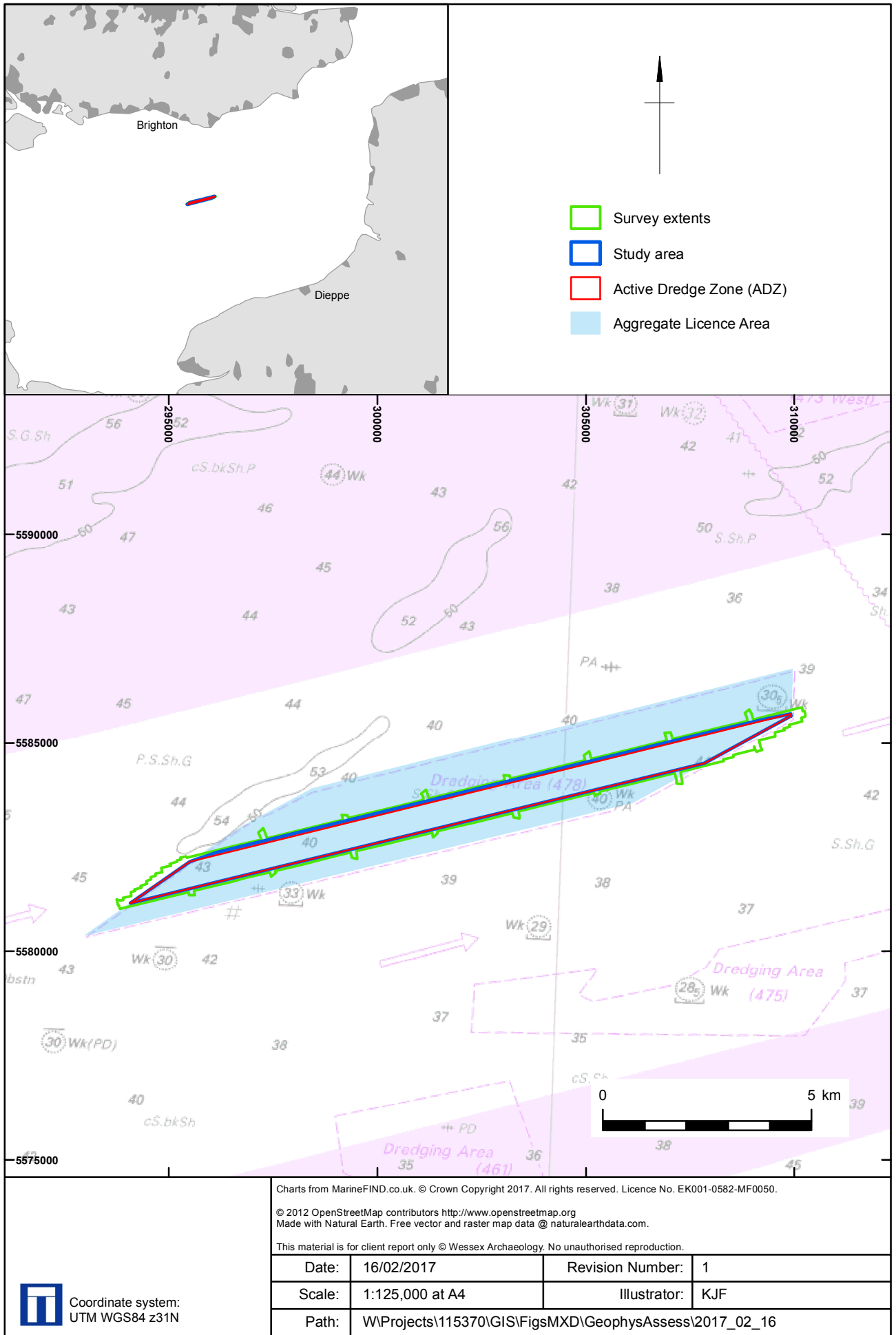
WA ID	Classification	Easting	Northing	Archaeological Discrimination	Length (m)	Width (m)	Height (m)	Notes	Potential Rating	External Refs
7000	Dark reflector	294406	5581310	A2	5.2	2.7	0.4	Curvilinear object with slight bright shadow in an area of seabed disturbance. Disturbance observed in the MBES data. Could be debris but could be natural.	Low	
7001	Dark reflector	296973	5582055	A2	2.9	0.4	0.4	Thin edge of an object with bright shadow. Could be anthropogenic but may be natural.	Low	
7002	Dark reflector	303956	5583689	A2	1.8	1.3	0.5	Rounded edge of an object with an angular bright shadow	Low	
7003	Dark reflector	305275	5584200	A2	4.6	3.2	0.5	Straight edge of an object with some bright angular shadow. Also observed in the MBES data. Could be debris but may be natural.	Low	
7004	Wreck	305406	5584018	A1	48.7	10	4.2	Distinct elliptical mound with some structure visible in the MBES data aligned NNW-SSE at the location of UKHO 20714 (unknown wreck). Appears upright with possible boilers aligned in the SSE end and appears broken up at NNW end. Sediment build-up visible along the north and NE side with slight scour immediately at SW and south extents though within overall sediment build-up of 3.5 m. Observed in the SSS data as indistinct areas of disturbance with dark reflectors and shadow visible. Observed in all previous surveys as broken-up and upright. Observed in Year 6 as 51.9 x 9.2 x 3.4 m with scour to south and accumulation to west. Retain existing 100 m AEZ.	High	SW2 (MA 2007); Contact0002_Wreck_0002 (EMU 2010); Emu_ADZ0167 (EMU 2011); EMU0238 (EMU 2012); SC_0002 (SC 2013a); SC_14_0001 (SC 2015); UKHO 20714



WA ID	Classification	Easting	Northing	Archaeological Discrimination	Length (m)	Width (m)	Height (m)	Notes	Potential Rating	External Refs
7005	Dark reflector	308088	5584797	A2	1.8	1.3	0.9	Rounded object with angular sloped shadow and some scour. Also observed in the MBES data. Could be debris but may be natural.	Low	

Notes:

1. All coordinates are in WGS84 UTM Zone 31N
2. Positions are considered accurate to within approximately ± 10 m
3. Potential ratings based on definitions in Sea Change Heritage Consultants (2013)



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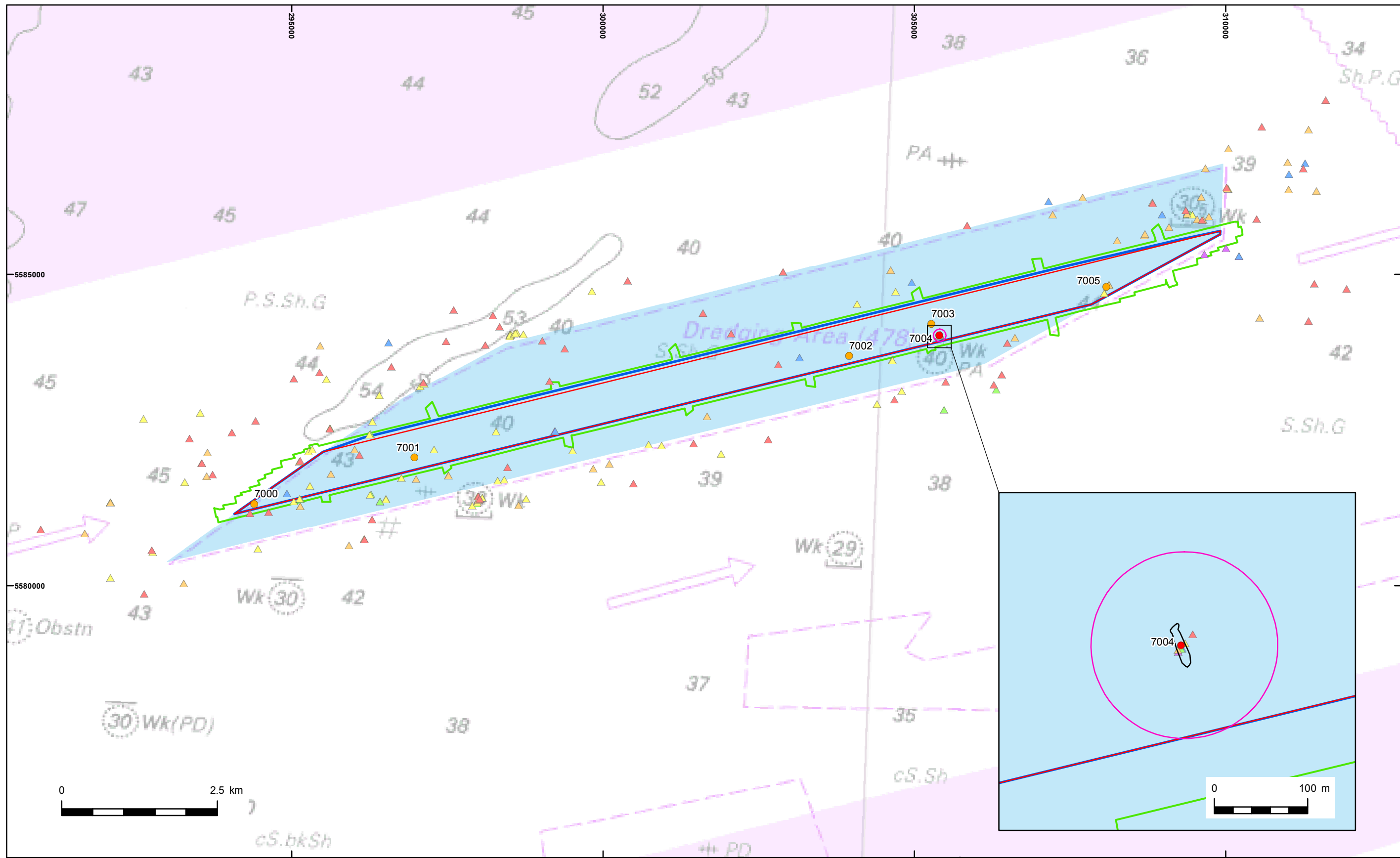
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 Coordinate system:
UTM WGS84 z31N

Location map

Figure 1



Survey extents	Archaeological Exclusion Zone (100 m)	2007 MA Anomaly (Pre-dredge)	2012 EMU Anomaly (Year 3)
Study area	2017 WA Wreck boundary (Year 8)	2010 EMU Anomaly (Year 1)	2013 SC Anomaly (Year 4)
Active Dredge Zone (ADZ)	2017 WA Anomaly (Year 8)	2011 EMU Anomaly (Year 2)	2015 SC Archaeological anomaly (Year 6)
Aggregate Licence Area	A1 - Anthropogenic origin of archaeological interest		
	A2 - Uncertain origin of possible archaeological interest		

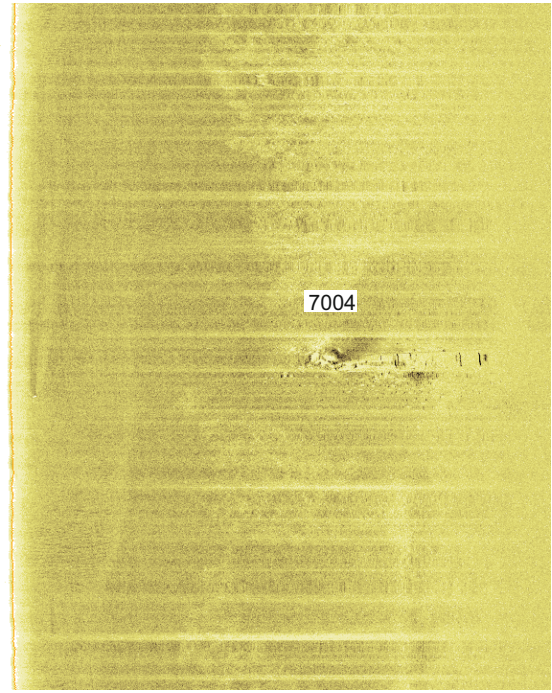
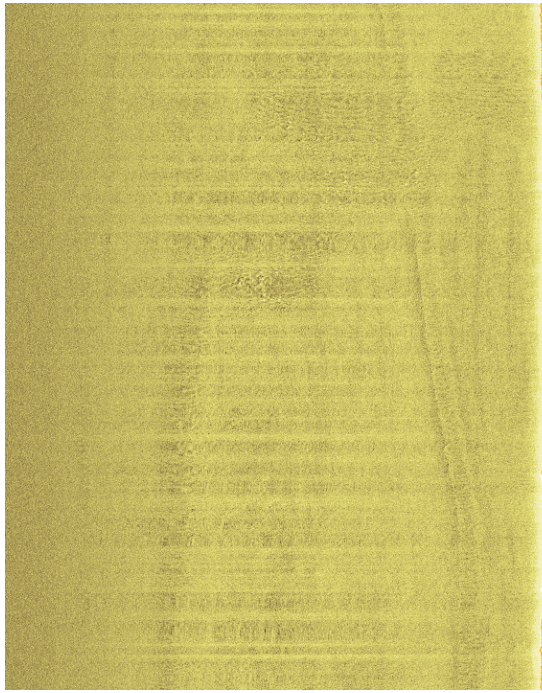
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Anomalies of archaeological potential and exclusion zone


Figure 2



Sidescan sonar waterfall image of wreck 7004, facing north-east, 48.7 x 10.0 x 4.2 m



Multibeam echosounder image of wreck 7004 (x1 vertical exaggeration), facing north

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