



Area 472  
Marine Aggregate Extraction

Archaeological Assessment of 2011 Geophysical Data  
Archaeological Monitoring Report

**AREA 472**  
**MARINE AGGREGATE EXTRACTION**  
**Archaeological Assessment of 2011 Geophysical Data**  
**Archaeological Monitoring Report**

Final

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MARINE AGGREGATE EXTRACTION**

**Archaeological Assessment of 2011 Geophysical Data  
Archaeological Monitoring Report**

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**Summary**

Wessex Archaeology was commissioned by MarineSpace Ltd on behalf of Cemex UK Marine Ltd., Hanson Aggregate Marine Ltd. and Tarmac Marine Dredging Ltd. to undertake an archaeological assessment of geophysical survey data as part of the heritage impact monitoring process implemented for aggregate extraction Area 472. The data consisted of sidescan sonar and multibeam data acquired by Gardline Ltd in September and October 2011 (Gardline 2011). The review was to include an assessment of these data in conjunction with the results of the previous desk-based assessment (WA 2003) and monitoring reports (EMU 2010 and 2011).

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 new sites and anomalies of potential archaeological interest.

In total one geophysical anomaly was identified within dredging Area 472, and a further three geophysical anomalies were identified within the 500m buffer zone. Two of the anomalies corresponded with anomalies identified in previous monitoring reports (EMU 2010 and 2011), while the other two were in the vicinity of such anomalies (EMU 2011).

No mitigation strategies have been recommended for the area; though it is recommended that any artefacts recovered during dredging activities are reported using the established BMAPA Protocol for Reporting Finds of Archaeological Interest (BMAPA & English Heritage 2003).

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**Acknowledgements**

This investigation was commissioned by MarineSpace Ltd. on behalf of Cemex UK Marine Ltd., Hanson Aggregate Marine Ltd. and Tarmac Marine Dredging Ltd. The data were provided by Gardline Ltd, and their assistance is acknowledged in this respect. Wessex Archaeology would like to acknowledge the assistance of Rob Langman.

Sophie Thorogood carried out the assessment and compiled the report, with quality control provided by Dr Paul Baggaley. Kitty Foster prepared the illustrations and the project was managed for Wessex Archaeology by Dr Paul Baggaley.

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## AREA 472 MARINE AGGREGATE EXTRACTION

### Archaeological Assessment of 2011 Geophysical Data Archaeological Monitoring Report

Ref: 85590.02

## 1. INTRODUCTION

### 1.1 PROJECT BACKGROUND

1.1.1 Wessex Archaeology (WA) was commissioned by MarineSpace Ltd. on behalf of Cemex UK Marine Ltd., Hanson Aggregate Marine Ltd. and Tarmac Marine Dredging Ltd. to undertake an archaeological assessment of geophysical survey data as part of the heritage impact monitoring process implemented for aggregate extraction Area 472, situated in the Bristol Channel (**Figure 1**).

1.1.2 The licenced area (hereafter the Study Area) is delimited by the following co-ordinates (WGS 84, UTM Zone 30N):

Easting	Northing
474694	5680700
478015	5681802
479160	5681278
479169	5680540
474703	5680416

**Table 1: Delimiting co-ordinates of Area 472 (Gardline 2011: 1)**

1.1.3 This assessment consists of a review of sidescan sonar and multibeam data acquired by Gardline in September and October 2011 (Gardline 2011).

1.1.4 As part of the Government View Schedule of Conditions for the dredging area, geophysical monitoring surveys should be reviewed annually in years 1-5 of dredging for changes to the archaeological baseline (condition 9.3.9). This report details the most recent archaeological baseline investigation using geophysical data, similar investigations having been undertaken in 2010 and 2011 (EMU 2010 and 2011).

1.1.5 The survey coverage for the data used in this report has been dictated by condition 9.3.2 of the Government View for this extraction area which states "*The survey shall cover the whole of Area 472, and extend over the main bank and 500m beyond*".

1.1.6 The sidescan survey lines assessed for this monitoring report were restricted to a 500m buffer of the Study Area, as depicted in **Figure 1**. The bathymetry data for the whole survey area was assessed, with particular emphasis placed on the main survey area.

### 1.2 PREVIOUS WORK

1.2.1 In 2003 WA undertook a desk-based assessment (DBA) in support of a licence application for Area 472 (WA 2003). The DBA included an assessment of known, suspected and potential archaeological sites within the Study Area and the assessment of marine geophysical data for sites of archaeological interest.

1.2.2 The DBA (WA 2003) compiled and reviewed documentary records of known archaeological sites and assessed the potential for new sites to be discovered. The reviewed material (WA 2003: 2-3) consisted of:

- Records of wrecks, obstructions and casualties collated by the National Record of the Historic Environment (NRHE);
- Records of wrecks held by the Royal Commission for Ancient Historic Monuments of Wales;
- Records from the Sites and Monuments Record (SMR) of Glamorgan and Gwent;
- Records from the Sites and Monuments Record (SMR) of Somerset;
- Records held by the Sites and Monuments Record (SMR) of North Somerset;
- Records from the Sites and Monuments Record (SMR) of the City of Bristol;
- Records provided by the Receiver of Wreck;
- Records of wrecks kept by the UK Hydrographic Office (UKHO);
- Historic charts and surveys kept by the UK Hydrographic Office (UKHO);
- Records held by the Department for Culture, Media and Sport (DCMS); and
- Records kept by the Naval Staff Directorate, Ministry of Defence.

1.2.3 The geophysical datasets assessed for the DBA consisted of sidescan sonar and sub-bottom profiler data acquired in 1999 and 2000 (WA 2003: 4). The archaeological interpretation of geophysical data aimed to locate, assess and report on the position, character and nature of known and newly discovered archaeological sites.

1.2.4 No archaeological anomalies were noted in Area 472 during the geophysical assessment for the DBA (WA 2003: 5).

1.2.5 A pre-dredge assessment was undertaken in 2008, which reviewed sidescan sonar data collected by Gardline during July 2008 (WA 2008: 3). The report identified fifteen sites characterised as being of uncertain origin and potential archaeological interest, eight of which were located within Area 472 (WA 2008: 6).

1.2.6 An archaeological assessment of sidescan sonar and multibeam data was undertaken in 2009 by EMU Ltd (EMU 2010) using data acquired by Gardline in September and October 2008, as part of the impact monitoring process (EMU 2010: 13). The monitoring report identified sixteen seabed contacts, all of low archaeological potential (EMU 2010: 15). Seabed changes noted during the assessment were determined to be caused by natural processes (EMU 2010: 18).

1.2.7 The second year of archaeological monitoring was undertaken by EMU Ltd in 2011 (EMU 2011). The geophysical data utilised were obtained by Gardline in November and December 2010 (EMU 2011: 7). The assessment identified eight anomalies, all of which were classed as being of low archaeological potential; only two were located within the licence area (EMU 2011: 8).

1.2.8 No artefacts have been discovered and reported through the BMAPA Protocol for Reporting Finds of Archaeological Interest since dredging activities commenced (BMAPA & English Heritage 2003).

### **1.3 SEABED GEOLOGY**

1.3.1 The DBA identified that sediments overlying the bedrock in this area were scoured during the Devensian glacial period (WA 2003: 2). The existing gravels and sandy gravels were deposited during the early Holocene and form a layer which is



generally less than 1m thick (*ibid*). Other bedforms are the result of tidal flows around Steep Holm (*ibid* and see Hanson Aggregates Marine Ltd 2002). Gardline describe the seabed sediments as being generally of two types: very fine sediment which variably covers the bedrock in the western and southern portions of the survey area; and gravels with sands upon them which form waves in the central and eastern parts of the survey area (Gardline 2011: 7).

## 1.4 AIM

1.4.1 The aim of this report is to provide Cemex, Hanson and Tarmac with an archaeological review of the effects of dredging on known archaeological sites and previously identified geophysical anomalies that may be of potential archaeological interest; and to assess the areas for new sites of potential archaeological interest.

## 2. METHODOLOGY

### 2.1 DATA SOURCES

2.1.1 The sidescan sonar data for this report were provided by Gardline Environmental Ltd, and was collected in September and October 2011. Further background information was obtained from archaeological assessments of geophysical surveys of the site (EMU 2010 and 2011).

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

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

**Table 2: Criteria for assigning data quality rating**

2.1.3 The sidescan sonar data have been rated as “Good” using the above criteria.

### 2.2 GEOPHYSICAL DATA - TECHNICAL SPECIFICATIONS

2.2.1 The data assessed were obtained by Gardline Environmental Ltd during September and October 2011 on the MV Titan Explorer. The dataset consisted of sidescan sonar and multibeam bathymetry data.

2.2.2 Gardline used an Edgetech 4200 dual frequency sidescan sonar system, operated at both frequencies (100/420kHz) simultaneously and a range of 75m. The data were recorded digitally and provided to WA as .xtf files.

2.2.3 Multibeam bathymetry data were obtained using a GeoAcoustics GeoSwath Plus, which was operated at 250kHz. The data were recorded digitally and provided to WA as calibrated and processed .xyz files.

2.2.4 For this survey all positions were recorded and expressed in WGS 1984, UTM Zone 30N.

### **2.3 GEOPHYSICAL DATA - PROCESSING**

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

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

2.3.3 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.

2.3.4 The multibeam bathymetry data were analysed to identify any unusual seabed structures that could be shipwrecks or other anthropogenic debris. This was correlated with the sidescan sonar interpretation. The data were gridded and analysed using Fledermaus software, which enables 3-D visualisation of the acquired data and geo-picking of seabed anomalies.

### **2.4 GEOPHYSICAL DATA - ANOMALY GROUPING AND DISCRIMINATION**

2.4.1 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.

2.4.2 To address this fact, the anomalies were grouped together along with the results of the DBA and previous monitoring report. This allows one ID number to be assigned to a single object for which there may be, for example, a UKHO record and multiple sidescan sonar anomalies.

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

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

**Table 3: Criteria for discriminating archaeological importance of feature**

- 2.4.4 All the sites that have been identified within the Study Area are presented in **Appendix I** and discussed in this report.
- 2.4.5 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 SEABED FEATURES

- 3.1.1 Interpretation of the geophysical data identified a total of four sidescan sonar anomalies of possible archaeological potential within the Study Area (**Figure 2, Appendix I**). All anomalies were classified as A2 – Uncertain origin of possible archaeological interest; as per the discrimination scheme outlined in **Table 3**.
- 3.1.2 Three of the anomalies (**7001, 7002 and 7003**) have been identified as linear features, which are probably rope, chain or disused cables. These anomalies range between 16.1m and 138.3m in length, with small widths of around 0.5m. The fourth anomaly (**7000**) is a seafloor disturbance with a length of 17.5m and a width of 0.5m.
- 3.1.3 Of the four anomalies, one (**7003**) lies within the licenced dredging Area 472, with the remaining three anomalies (**7000, 7001 and 7002**) found within the 500m buffer zone.
- 3.1.4 Anomalies **7002** and **7003** correspond with anomalies noted in the previous years of archaeological monitoring. Anomaly **7002** was noted in both 2010 and 2011, as Contact0019, a sand wave or cable (EMU 2010: 25); Contact0022, a seabed scar (*ibid*); and 3039, a linear feature and potential cable (EMU 2011: 13). Anomaly **7003** was seen in the vicinity of Contact0041, a seabed scar or possible cable noted in 2010 (EMU 2010: 25).
- 3.1.5 Anomalies **7000** and **7001**, while not corresponding directly with anomalies noted during previous monitoring assessments by EMU (2010 and 2011), are located in the vicinity of such features. Anomaly **7000**, a seafloor disturbance, is located approximately 25m from 3035, a hard reflector with a pronounced shadow (EMU 2011: 13). Anomaly **7001**, a linear feature, is located approximately 122m from 3032, a semi-angular hard reflector (EMU 2011: 13). These anomalies may be related to one another, but appear in a different form for a number of reasons which may include erosion, deposition or movement of sediment.
- 3.1.6 None of the four anomalies are of definite archaeological origin and therefore no exclusion zones have been recommended for them.

### **3.2 BATHYMETRY DATA**

- 3.2.1 The bathymetry data were processed by Gardline and a difference plot was generated for the 2010 and 2011 data (Gardline 2011). This can be viewed in **Figure 3**.
- 3.2.2 Little variation is seen in the bathymetry datasets between 2010 and 2011 (Gardline 2011: 10). Locally, within the licence area, concentrations of dredging activity can be seen through a maximum increase in water depth of 0.5m along a 1300m section of dredging lane (Gardline 2011: 14). In the wider survey area erosion and deposition of sediment appears to be limited to the areas which have customarily seen such activity, as noted in surveys since 2008 (Gardline 2011: 9-10). Sand waves have traditionally moved towards the west and are continuing to do so at a seemingly consistent rate (Gardline 2011: 9-11). No significant evidence of movement of sediment between 2010 and 2011 is seen in the survey corridors (Gardline 2011: 19).
- 3.2.3 Movement of sand waves in the main survey area is interpreted by Gardline as being caused by natural processes (Gardline 2011: 19). Significantly, no change is seen outside the dredging area, except for movements of mobile sediments (Gardline 2011: 19).

### **4. MITIGATION**

- 4.1.1 According to heritage agencies and the principles outlined in Marine Aggregate Dredging and the Historic Environment, the preferred approach to the presence of potential archaeological sites is 'to preserve *in situ*' or 'preservation by record' (BMAPA and English Heritage 2003). The mitigation suggested for marine aggregate extraction is avoidance, reduction, or remedying and offsetting, and monitoring.
- 4.1.2 No geophysical anomalies of definite archaeological potential were identified during this assessment, therefore no new exclusion zones are considered necessary at this point.
- 4.1.3 It is recommended that if any objects of possible archaeological interest are recovered during dredging operations from Area 472, that they should be reported using the established BMAPA Protocol for reporting finds of archaeological interest.

## 5. REFERENCES

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Marine Management Organisation, 2008, Area 472 (Culver Sands), Government View, Draft Schedule of Conditions.

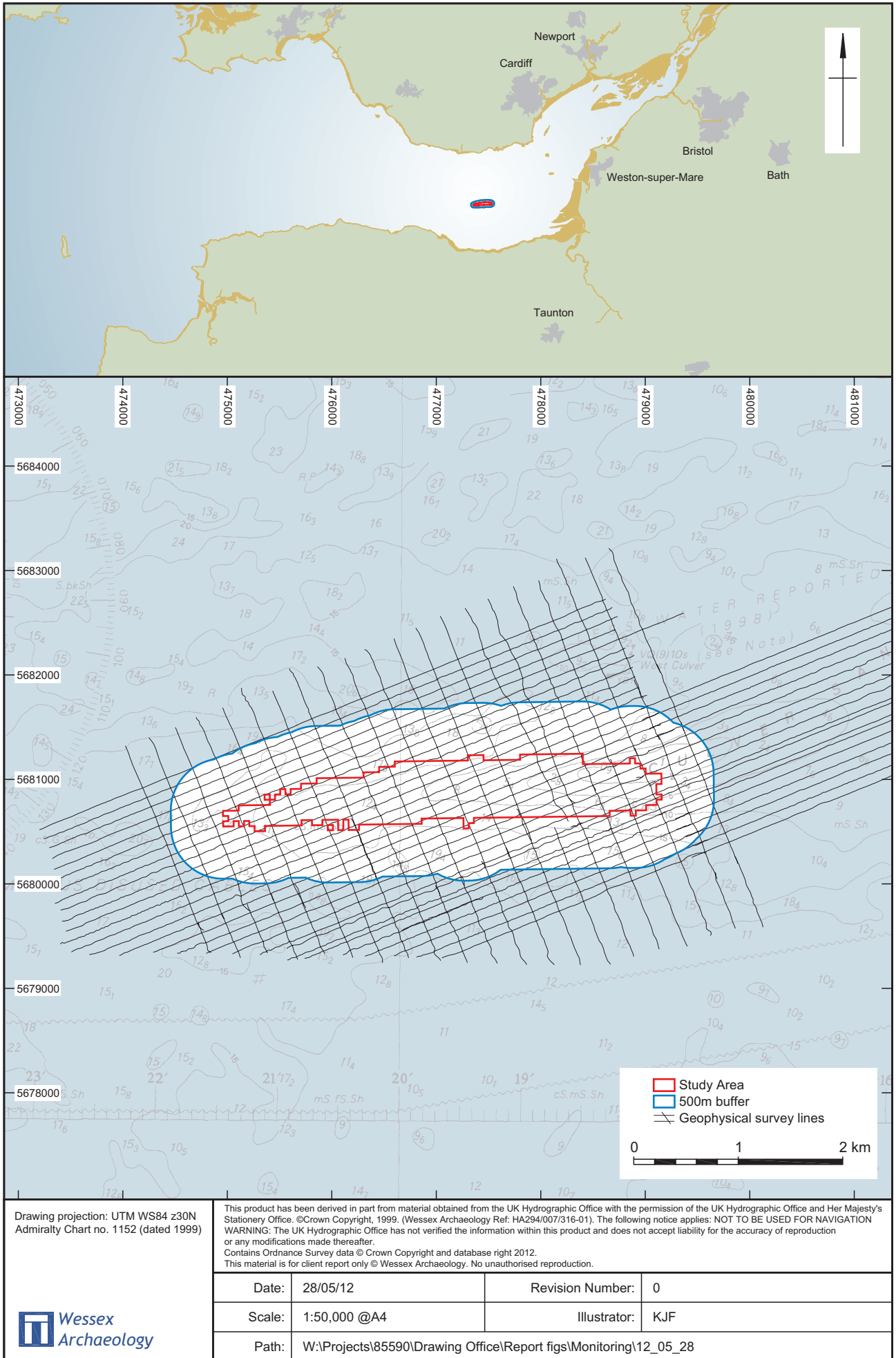
Wessex Archaeology, 2003, 'Area 472-Culver Sand Marine Aggregate Dredging', Unpublished technical report 48644.03.

Wessex Archaeology, 2008, 'Aggregate Dredging Licence, Area 472, Archaeological Assessment of Marine Geophysical Data, Pre-dredging Monitoring Report', Unpublished technical report 69900.02.

## 6. APPENDIX I: ANOMALIES OF POSSIBLE ARCHAEOLOGICAL POTENTIAL

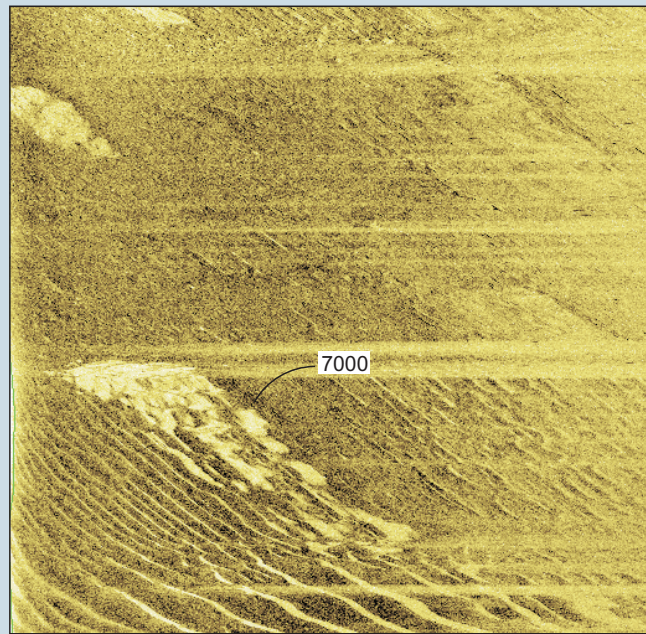
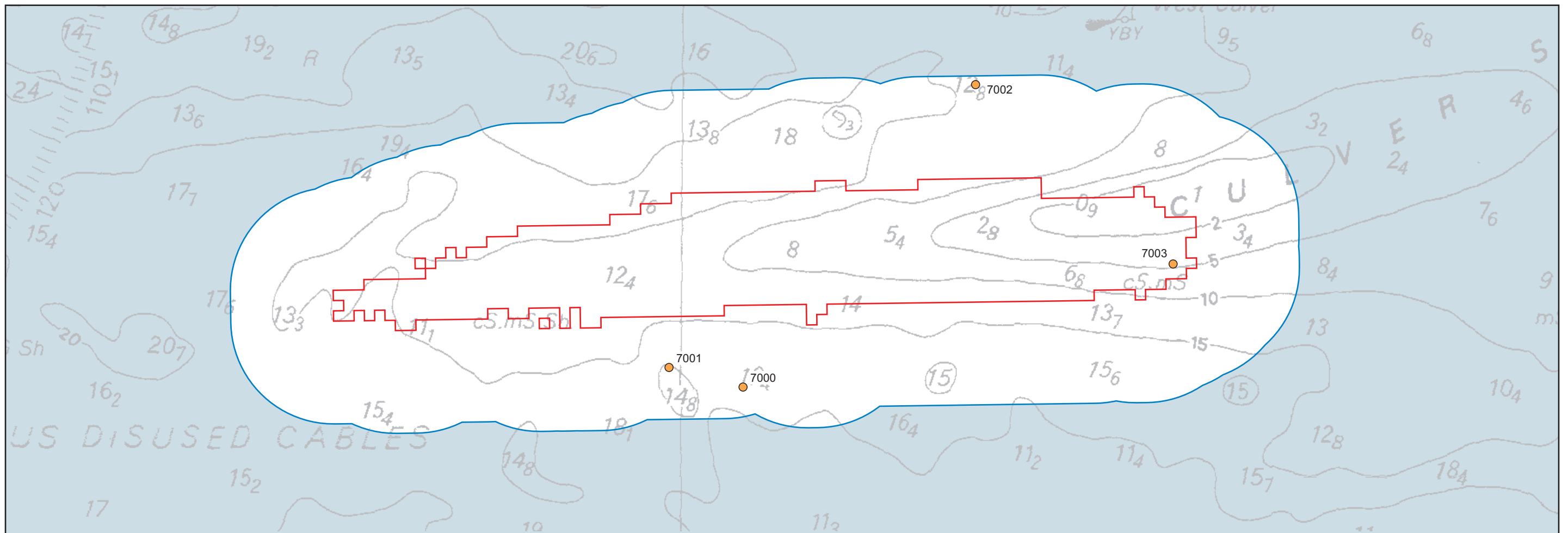
WA ID	Name/ Classification	Easting	Northing	Archaeological Discrimination	Length (m)	Width (m)	Height (m)	Description	Internal reference s	External references	Study Area or buffer
7000	Seafloor disturbance	476952	5680229	A2	17.5	0.5	0	An area of disturbed seafloor, of an irregular, pointed oval shape. This is located in an area of seabed of variable height, with megaripples.	6000	-	Buffer
7001	Linear	476592	5680324	A2	16.1	0.7	0	Elongated and winding anomaly without height. This is visible in an area of sandy seabed with megaripples and little height variations. No comparable anomalies are noted from the area.	6002	-	Buffer
7002	Linear	478083	5681699	A2	138.3	0.4	0	Elongated and winding anomaly. This is visible in an area of sandy seabed with megaripples and little height variation. No comparable anomalies are noted in the area.	6003	Contact0019 and Contact0022 from EMU 2010 Report. Also 3039 EMU 2011 Report.	Buffer
7003	Linear	479043	5680827	A2	32.8	0.2	0	An elongated anomaly without height. This is visible alongside similar features, but no anomalies are noted nearby. The surrounding seabed is of varied sediment type and has megaripples.	6006	Contact0041 EMU 2010 Report	Study Area

1. Co-ordinates are in WGS84 UTM30N
2. Positional accuracy estimated  $\pm 10m$

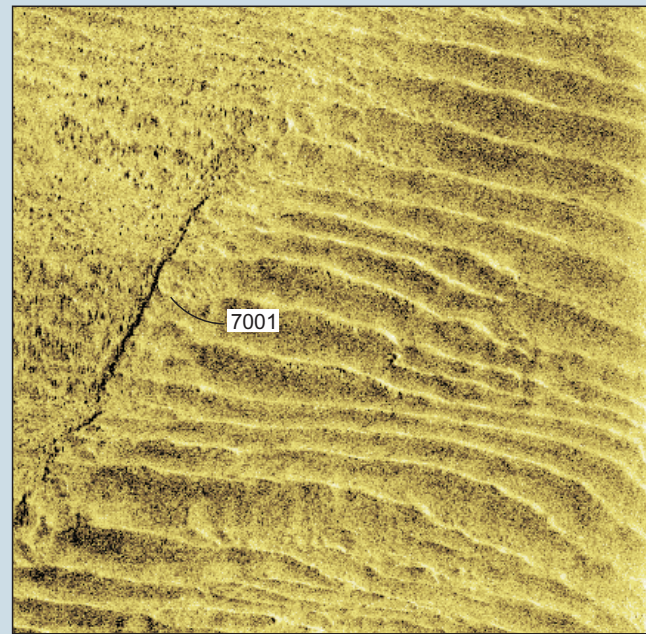


Site location

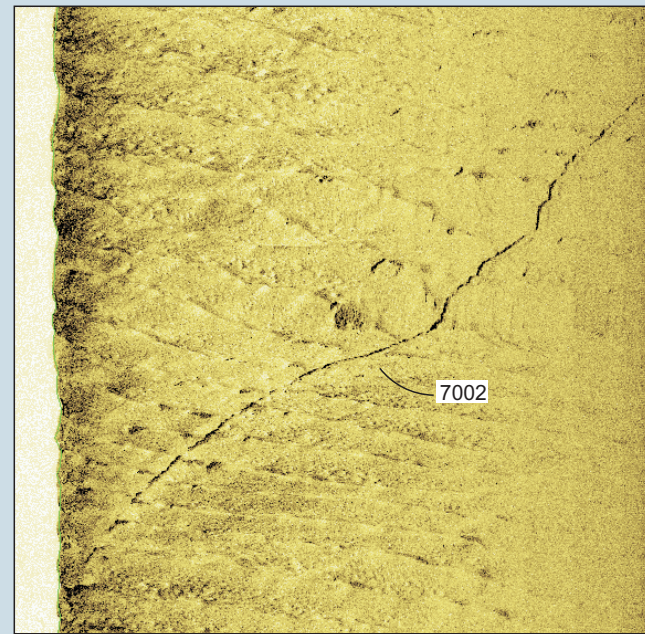
Figure 1



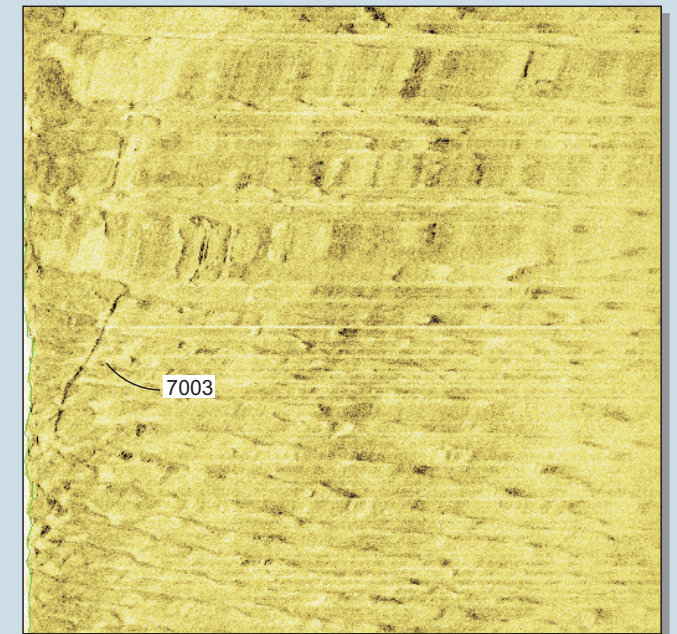
7000: Disturbance



7001: Linear anomaly



7002: Linear anomaly



7003: Linear anomaly

Drawing projection: UTM WS84 z30N  
Admiralty Chart no. 1152 (dated 1999)



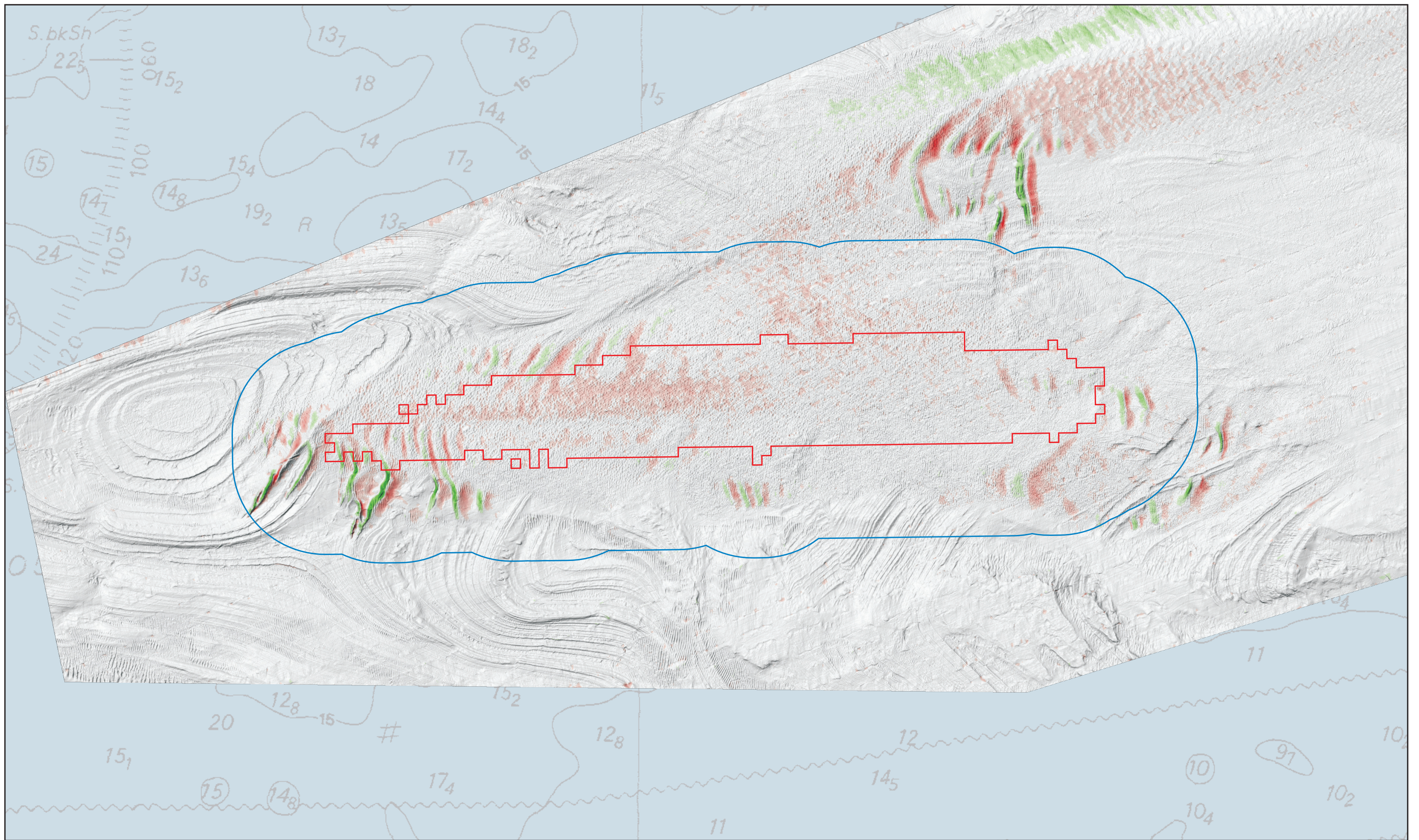
- Study Area
- 500m buffer
- A2 anomalies: Uncertain origin of possible archaeological interest



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Drawing projection: UTM WS84 z30N  
 Admiralty Chart no. 1152 (dated 1999)



□ Study Area  
□ 500m buffer  
▬ Areas of deposition  
▬ Areas of erosion

0  1 km



Multibeam bathymetry © Gardline 2011.  
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Multibeam bathymetry (Gardline 2011)

Figure 3



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