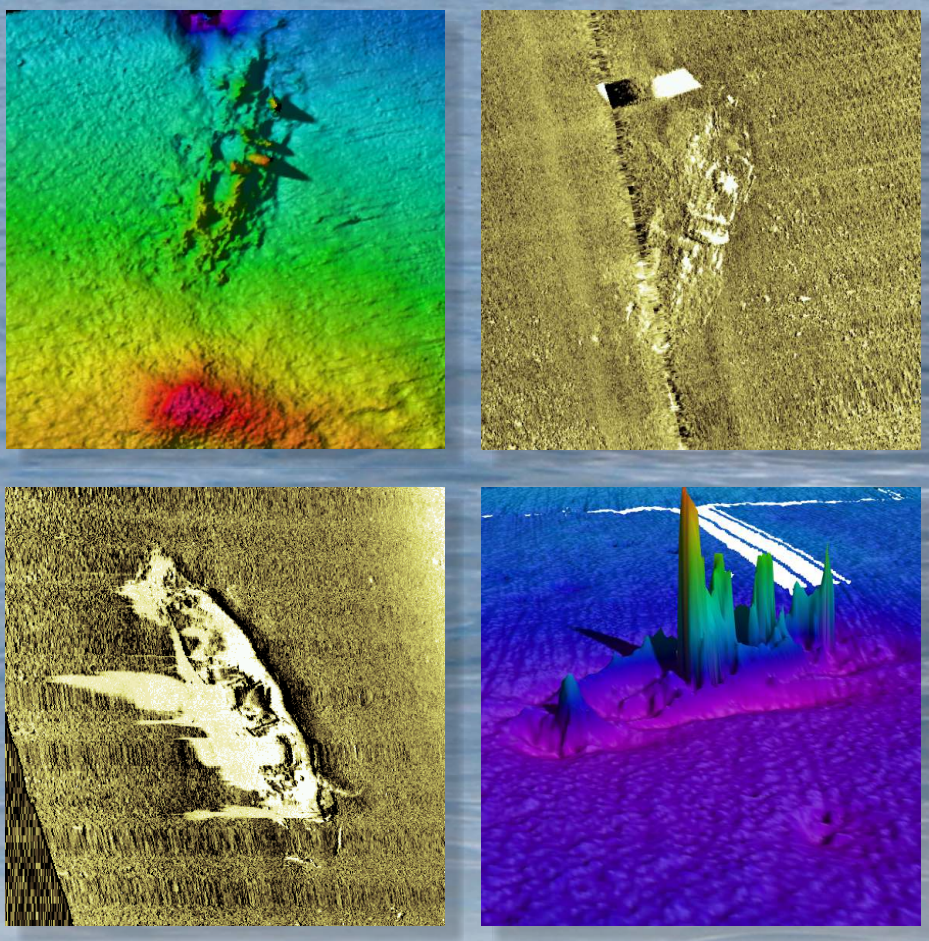
making sense of heritage

Humber Gateway Offshore Wind Farm

2012–13 Archaeological Geophysical Assessment
Volume 1 – Geophysical Report



Ref: 85770.02
January 2014

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Volume 1 – Geophysical Report

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January 2014

Report Ref. 85770.02

Quality Assurance

Project Code	85770	**Accession Code**		**Client Ref.**	CS-1091
Planning Application Ref.		**Ordnance Survey (OS) national grid reference (NGR)**			

Version	Status*	Prepared by	Checked and Approved By	Approver's Signature	Date
v01	I	*S. Arnott*			20/09/2013
File:	W:\Projects\85770\Reports\Drafts\85770.02_Humber_OWF_geophysics_draft_shla_20130920				
v02	E	*S. Arnott*	*P. Baggaley*		23/09/2013
File:	W:\Projects\85770\Reports\Drafts\85770.02_Humber_OWF_geophysics_draft_external				
v03	F	*S. Arnott*	*P. Baggaley*		15/11/2013
File:	W:\Projects\85770\Reports\Drafts\85770.02_Humber_OWF_geophysics_final_20131115				
v04	F	*S. Arnott*	*P. Baggaley*		12/12/2013
File:	W:\Projects\85770\Reports\Final\85770.02_Humber_OWF_geophysics_final_20131212				
v05	F	*S. Arnott*	*P. Baggaley*		24/01/2014
File:	W:\Projects\85770\Reports\Final\85770.02_Humber_OWF_geophysics_final_20140124				
Revisions:	Blue text indicates revisions made to the text following the December 2013 version, v04				

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

Humber Gateway Offshore Wind Farm

2012-13 Archaeological Geophysical Assessment

Volume 1 – Geophysical Report

Contents

Figures

Humber Gateway Offshore Wind Farm

2012-13 Archaeological Geophysical Assessment

Volume 1 – Geophysical Report

Summary

Wessex Archaeology (WA) was commissioned in 2012 by E.ON Climate & Renewables UK, Humber Wind Ltd. to process and interpret geophysical data acquired over the Humber Gateway Offshore Wind Farm and export cable route. The Humber Gateway Offshore Wind Farm is approximately 8km east of Holderness on the East Yorkshire coast. The geophysical data were acquired in 2012 by Osiris Projects and WA was required to assess the sidescan sonar and magnetometer datasets. Following alterations to the inter-array cable routes more survey data were acquired in 2013, which WA was also required to assess.

Wessex Archaeology has been involved in a number of phases for the Humber Gateway development since 2005 including several archaeological geophysical assessments, Written Schemes of Investigation, Desk-Based Assessments and an Environmental Impact Assessment. In order to set the background and context for the assessment of the 2012 and 2013 geophysical data, this document presents a summary of earlier geophysical assessments and the resulting interpretations, Exclusion Zones and buffer zones.

Nine Exclusion Zones and three buffer zones remain in place from earlier assessments by Wessex Archaeology. The assessment of the 2012 to 2013 datasets resulted in a total of 2217 features of potential archaeological interest over both the wind farm and the export cable route corridor.

The recommended mitigation is that all features should be noted during development and construction activities and impacts on them should be avoided where possible. If impacts cannot be avoided then any finds that may be of an archaeological nature should be reported through the Offshore Renewables Protocol for Archaeological Discoveries. In addition, a selection of features resulting from the assessment should be dived in order to aid the archaeological characterisation of the development area.

The geophysical report is given in Volume 1 and the gazetteers of geophysical anomalies of potential archaeological interest are given in Volume 2. This report is Volume 1.

Humber Gateway Offshore Wind Farm

2012-13 Archaeological Geophysical Assessment

Volume 1 – Geophysical Report

Acknowledgements

This assessment was commissioned by E.ON Climate & Renewables and the assistance provided by Tom Griffiths, Philippa Powell, Andy Shaw and Tim Robins is gratefully acknowledged.

The geophysical data were acquired by Osiris Projects and thanks are due to Caroline Tweedle for her assistance with it. Lee Gooderham of 6Alpha/Ordtek has also been helpful concerning the UXO interpretation of the data with regard to the management of the anomaly databases.

The processing and interpretation of the geophysical data were undertaken by Dr Stephanie Arnott, Laura Andrews, Hannah Brown, Patrick Dresch, David Howell, Ross Lefort, Abby Mynett, Genevieve Shaw and Sophie Thorogood. The data processing and interpretation were overseen and the report was written by Stephanie Arnott. Illustrations were prepared by Kitty Foster and Ken Lymer. The project was managed for Wessex Archaeology by Toby Gane and Dr Paul Baggaley.

Humber Gateway Offshore Wind Farm

2012-13 Archaeological Geophysical Assessment

Volume 1 – Geophysical Report

1 INTRODUCTION

1.1 Project Background

1.1.1 Wessex Archaeology (WA) was commissioned by E.ON Climate & Renewables UK, Humber Wind Ltd. (E.ON) to process and interpret geophysical data acquired over the Humber Gateway Offshore Wind Farm and export cable route.

1.1.2 The geophysical data assessed by WA were acquired by Titan Environmental Surveys Limited in 2004 and Osiris Projects between 2008 and 2013.

1.1.3 This geophysical assessment is the latest in a series of projects conducted by WA including Desk-Based Assessments, archaeological interpretation of geophysical datasets and Written Schemes of Investigation. In addition to presenting the results of the current geophysical evaluation, this document will also summarise the results of the previous geophysical assessments and mitigation strategies, including the application, and in some cases removal of Archaeological Exclusion Zones and buffer zones.

1.1.4 The extensive gazetteers of all geophysical anomalies of potential archaeological interest from the current evaluation are given as an Appendix in the accompanying Volume 2 (WA 2014a). The gazetteers from selected earlier projects are also included in Volume 2. Within this current report references to an Appendix should be taken to mean an Appendix within Volume 2.

1.2 Development Description

1.2.1 The Humber Gateway Round 2 Offshore Wind Farm (OWF) development is located offshore of the mouth of the River Humber, approximately 8km off the Holderness coast of the East Riding of Yorkshire (**Figure 1**). The OWF footprint is an irregular polygon covering an area of approximately 25km^2 and with the export cables making landfall at Easington.

1.2.2 The development consists of three physical elements - the offshore wind farm and inter-array cabling and offshore substation, the submarine export cables and the terrestrial export cables. This project includes the assessment and interpretation of geophysical data over the first two of these elements.

1.2.3 The offshore development area has altered since the inception of the development in 2004, where the earlier perceived extents of the wind farm and export cable routes are illustrated in **Figure 1** together with the final development area selected.

1.2.4 The final design of the wind farm includes 73 turbines and a sub-station connected by inter-array cables (**Figure 1**). The buried inter-array cables will have a total cable length of approximately 58km and a burial depth of between 0.6m and 1m.

1.2.5 The wind farm output will be delivered to shore via a pair of buried export cables laid within a single cable route corridor, coming ashore south of Easington (**Figure 1**). The route length from the offshore substation to the landfall is approximately 8km. Approximate average water depth across the OWF footprint and along the export cable route is 15m below Lowest Astronomical Tide.

1.2.6 To allow for anchor handling, construction width requirements will be ±300m for the export cables. The cables are separated by 50m within a 100m wide cable corridor. Cable installation will be by trenching including site preparation methods. Depth of burial will be between 1m and 2m.

1.2.7 The two export cables will be landed at Easington, using a Horizontal Directional Drilling technique, from where they will be connected to the 275 kV grid at Salt End North via a 30 km buried terrestrial cable.

2 PREVIOUS WORK

2.1.1 WA has been involved with the development of the Humber Gateway Offshore Wind Farm for a considerable period of time. A summary of the work undertaken on the offshore elements of the development is arranged in chronological order in **Table 1**.

Table 1: Summary of previous work on the offshore elements of Humber Gateway undertaken by WA. Entries shaded grey are discussed in detail below.

WA Project ID	Date	Project Type
60280	2005	Archaeological Desk-Based Assessment with geophysical assessment
60281	2007	Geophysical assessment and review of Exclusion Zones
60282	2006	Archaeological protocol for reporting finds of cultural material made during construction
60283	2007	Marine Environmental Impact Assessment and draft Written Scheme of Investigation
60287	2008	Desk-Based Assessment – cable route realignment
60288	2009	Geophysical assessment
60289.05	2011	Geophysical assessment (turbine locations)
60289.06	2012	Archaeological review of groundtruthing survey (turbine locations) (report updated 2014)
85770.01	2012	Revised Written Scheme of Investigation
85771.01	2013	Geoarchaeological assessment

2.1.2 In order to track the development of offshore mitigation strategies, particularly the implementation of Archaeological Exclusion Zones (AEZs) and their subsequent modification or removal, certain earlier projects are discussed in detail below. AEZs may be modified or removed following alterations to the scheme extents or details and assessment of more recent and higher resolution geophysical data.

2.2 2005 Desk-Based Assessment – Includes Review of Sidescan Sonar Data

2.2.1 WA was commissioned to provide a specialist assessment regarding the possible impacts on the archaeological and historical environment and appropriate mitigation measures of those impacts for the proposed development.

2.2.2 Both archaeological and geophysical information were collated for the proposed wind farm and offshore cable route – the Marine Study Area (MSA) – which included a 1km buffer zone. Sources included the National Monuments Record (NMR), the UK Hydrographic Office (UKHO), the Ministry of Defence and the local Sites and Monuments Record maintained by the Humber Archaeology Partnership. Sidescan sonar data provided by the Client, acquired in 2004 by Titan, were also reviewed (WA 2005).

2.2.3 The maritime archaeological potential of the MSA comprised eight identified shipwrecks, a possible shipwreck site and one crashed aircraft plus seven or eight documentary losses. Additionally, the assessment of the sidescan sonar data resulted in 269 anomalies, resulting in the identification of 251 sites of archaeological potential. Three of these sites were previously unrecorded shipwrecks (WA 2005).

2.2.4 13 sites of high archaeological potential were identified in the MSA (**WA ID 2001-10**, **5084** with **5088**, **5094** with **5026-7** and **5018-19**, and **5243**). They were located in areas where development activities might reasonably have suggested impacts on their preservation. Exclusion Zones were therefore recommended for each of these sites as shown in **Table 2**.

Table 2: 2005 Exclusion Zones for sites of high archaeological potential

WA ID	SSS ID	Name/Type	Buffer Zone	Centre point (WGS84 UTM31N)
2001	**5244**	*Ionic* (?)	250m EW x 200m NS	320795E 5945366N
2002	**5242 & 5068**	*Dido*	300m radius	318317E 5944993N
2003	**5250**	*Fermo*	200m radius	318950E 5942008N
2004	**5230**	*Winga*	300m radius	319095E 5943732N
2005	**5212**	*Nora*	200m radius	317184E 5949585N
2006	Undetected	*Saltoun*	200m radius	318057E 5947949N
2007	Undetected – UKHO position	*Marshall* (?)	200m radius	320413E 5949004N
	5245	*Marshall* (?)	200m radius	320430E 5949497N
2008	**5246**	*Giuseppe*	200m radius	322049E 5950913N
2009	Undetected	F3 Tornado Aircraft	200m radius	321426E 5944232N
2010	Possibly **5196**	Wreck (?) - bubbles	300m EW x 200m NS	323415E 5948819N
-	**5243**	Uncharted 1	150m radius	319417E 5941528N
-	**5094, 5026-7 & 5018-9**	Uncharted 2	200m radius	318310E 5949302N
-	**5084 & 5088**	Uncharted 3	200m radius	311380E 5948225N

2.2.5 In addition to the Exclusion Zones above a further 92 smaller precautionary exclusion zones were recommended around the sidescan sonar anomalies of medium archaeological potential.

2.2.6 The over-arching recommendation for mitigation was that all aspects of any further archaeological work should be detailed within a Written Scheme of Investigation. This document should make provision for other forms of mitigation that might be required with regard to pre-construction investigations; the main construction phase; operation and maintenance; and decommissioning (WA 2005).

2.3 2007 Geophysical Interpretation and Review of 2005 Exclusion Zones

2.3.1 WA undertook a review of seismic and magnetometer data over the OWF area and export cable route corridor to complement the previous Desk-Based Assessment and assessment of sidescan sonar data undertaken in 2005. Both datasets were acquired on the same 2004 survey as the sidescan sonar data.

2.3.2 The seismic data were reviewed in order to identify palaeogeographic features or shallow deposits of interest. Two possible palaeochannels were noted that may have contained derived archaeological material, one to the north of the site and one to the south. The proposed mitigation consisted of advising that vibrocores obtained in these areas for engineering purposes should be sited at the channel margins if possible to allow for archaeological assessment (WA 2007a).

2.3.3 The magnetic data were processed and interpreted to identify magnetic anomalies and to combine this information with the sidescan sonar anomalies from the 2005 assessment in order to define Exclusion Zones. In addition, the navigation from the sidescan sonar data was reprocessed in order to correct for some positioning errors for sidescan sonar anomalies listed in the original report (WA 2005).

2.3.4 The archaeological potential of each sidescan sonar anomaly was re-evaluated. The anomalies in both the sidescan sonar and magnetometer data were assessed in order to determine the size and location of proposed Exclusion Zones. The Exclusion Zones were implemented around groups of anomalies rather than every individual sidescan sonar anomaly (**Figure 2**). In addition to Exclusion Zones around geophysical anomalies they were also recommended for all UKHO recorded wrecks and obstructions within the study area, including those for which no geophysical anomalies were identified (WA 2007b).

2.3.5 Circular Exclusion Zones with a radius of 100m were implemented around all UKHO record positions, including those for which no geophysical evidence was observed. For the geophysical anomalies, polygons were created around the observed extent and then these polygons were buffered by 50m. Where a UKHO recorded wreck position corresponded with observed anomalies then the polygon and 50m buffer was generally taken to be the more meaningful exclusion zone. However, for the wrecks of the *Winga, Dido* and *Fermo* the 50m and 100m buffers were combined to produce a single exclusion zone (WA 2007b).

2.4 2009 Archaeological Assessment of Geophysical Data

2.4.1 In 2009, WA undertook a monitoring review of new sidescan sonar and magnetometer data, acquired in 2008, over the offshore wind farm and export cable routes. Four wrecks, one unidentified and three corresponding to UKHO records were verified. A further 56 sites of possible archaeological interest were also identified (WA 2009).

2.4.2 The three sites thought to be directly associated with UKHO recorded wrecks are the *Nora* (**7000**), *Dido* (**7002**), and *Ionic* (**7003**). A fourth site, **7001**, appears to be an unknown wreck as no UKHO or NMR records are located at this position.

2.4.3 There are two recorded positions for the wreck of the *Marshall* – **7061** from the UKHO record and **7062** from the NMR record. Neither position has been verified and it is possible that **7001** may be the wreck of the *Marshall*.

2.4.4 In addition to the interpretation of the 2008 geophysical data this assessment also looked at the 35 Exclusion Zones resulting from the 2007 assessment (WA 2009). A change in

the development footprint and improved data quality resulted in a reduction to only nine Exclusion Zones, seven of which corresponded to UKHO and NMR recorded wreck positions (**Figure 3**). A summary of the review is presented in **Table 3**.

Table 3: 2009 review of Exclusion Zones

Status	No of EZs
New EZs	1
Retained EZs	4
Modified EZs	4
Removed EZs	26
Total	**35**

2.4.5 The new Exclusion Zone was implemented around **7061**, the UKHO recorded position for the *Marshall*. The existing Exclusion Zone around the NMR position for the same wreck **7062** was retained. The other three retained Exclusion Zones were retained on the basis of material re-identified in the 2008 datasets or as a preventive mitigation measure. Four Exclusion Zones were modified to accommodate the detection of new material of probable archaeological interest identified in the 2008 data. Details are given in **Table 4** below.

Table 4: Exclusion Zones remaining following 2009 review of 2008 data

2009 EZ IDs	Previous EZ IDs	2009 review status	Site Description	External Reference
7061	None	New	Unknown wreck, possibly *Marshall*	UKHO 9065
7003	6004	Retained	Wreck of *Ionic*	UKHO 8853
7062 (incl. 7004)	6002	Retained	*Marshall* (possibly)	NMR 907863
7063	6012	Retained	Oil and bubbles	UKHO 9073
7064	6001	Retained	*Saltoun*	UKHO 8859
7000	6008, 6014, 6064, 6065, 6133, 6147, 6148, 6152, 6163	Modified	Suspected wreck site of the *Nora*	UKHO 58338
7001	6174 and 6175	Modified	Unknown wreck, possibly *Marshall*	NMR 907863 UKHO 9065
7002	6006, 6017, 6018	Modified	Wreck of *Dido*	UKHO 8849
7028	6228	Modified	Debris	-

2.4.6 A total of 26 Exclusion Zones proposed by WA in 2007 were removed on the basis of their location in relation to the updated boundaries of the development areas or as a result of the interpretation of the 2008 data.

2.5 2011 Geophysical Review (Turbine Locations)

2.5.1 WA undertook a review of geophysical data prior to geotechnical surveys at the proposed borehole locations for each of the planned 74 turbine foundation locations (one location has since been abandoned) and for the proposed met mast and sub-station locations as shown in **Figure 4**.

2.5.2 Boreholes were to be drilled at all of these locations and WA was required to process data covering boxes measuring 120m x 120m centred on each proposed borehole location prior to a jack-up rig arriving on site.

2.5.3 To provide more specific detail on sites of archaeological potential likely to be impacted during the drilling operations WA was provided with the details of the drilling rig and proposed positions at the borehole locations. The positions of the jack-up legs and moonpool were buffered and the presence or absence of sites of archaeological potential was assessed (WA 2011).

2.5.4 Magnetometer, sidescan sonar and multibeam bathymetry data were collected on all lines by Osiris Projects in May and June 2011. The magnetometer data for all lines were made available to WA together with some of the sidescan sonar data and a small amount of gridded multibeam bathymetry data. All the magnetometer and sidescan data received were assessed but the multibeam bathymetry was of too coarse a grid size to be useful.

2.5.5 A total of 51 sites of potential archaeological interest were located within the borehole location boxes (**Appendix 1**). It should be noted that only anomalies with their centre point within the boxes were included and that those that have their centre point just outside were excluded even though part of the anomaly may have extended inside the box. This was done on the basis of information from E.ON stating that only features at the drilling rig location were likely to be impacted.

2.5.6 None of the anomalies identified were classified as being of certain archaeological interest, but they were all of potential archaeological origin. It was therefore recommended that action was taken to avoid impact on these anomalies where possible.

2.5.7 All of the anomalies located within the rig leg buffers could be avoided by ensuring that a particular rig orientation was used. For those anomalies covered by leg buffers in the southern rig position then the northern rig position could be used and vice versa.

2.5.8 A single anomaly was situated within a moonpool buffer and hence changing the orientation of the rig would not alter the impact on the anomaly. It was recommended that this anomaly be avoided by drilling the borehole in a different location but when doing so the presence of other anomalies at the locations of the legs of the rig in this new position should be assessed.

2.5.9 If the location of the borehole could not be altered, it was recommended that the site of the anomaly be surveyed by diver or ROV, with support from a suitably experienced marine archaeologist, prior to installation of the drilling rig.

2.5.10 The possible archaeological sites outside the drilling rig leg buffers, but still within borehole location boxes, were less likely to be impacted by the actions of drilling. However, they were to be taken into account during planning and during the installation phase of the turbine bases to avoid impacts to these features.

2.5.11 No Exclusion Zones were implemented at this stage of the works.

2.6 2012 Archaeological Review of Groundtruthing Survey for Seabed Features (Turbine Locations)

2.6.1 This review followed on directly from the geophysical review above. WA undertook an archaeological review of the results of the diver survey for pre-geotechnical purposes at proposed borehole locations for each of the planned turbine base locations at which potential archaeological anomalies were present in areas likely to be impacted during the drilling (WA 2014b).

2.6.2 A total of 10 sites of potential archaeological interest were reviewed (**Appendix 2**) and advice given to E.ON on appropriate follow-up actions. Material of archaeological potential found within the borehole location boxes was characterised by WA as shown in **Table 5**.

2.6.3 All the discoveries of archaeological significance were geographically recorded and left *in situ* with the exception of **7042**, a windlass, which was recovered to WA for archaeological interpretation and recording. Where objects were left *in situ* it was recommended that they are avoided during development and construction activities. For this purpose, buffers of 50m were recommended to be applied to project charts and navigation software (**Table 6** and **Figure 4**).

Table 5: Summary of archaeological potential of finds

Archaeological Discrimination	Number of Sites	Interpretation
A	4	Material of archaeological interest
P	0	Material of possible archaeological interest
U	2	Modern or non-archaeological material
N	4	Natural material
Total	**10**	

2.6.4 Buffer zones differ from Exclusion Zones in that the latter are formally agreed with English Heritage around features of known or high archaeological potential and it is agreed that no construction or development activities will take place within them. Buffer zones are a more informal arrangement to help a developer keep track of features that are of lower archaeological potential but that should be avoided where possible.

Table 6: Buffer zones implemented around finds

WA ID	Name/Type	Archaeological Discrimination	Buffer Zone	Centre Point (WGS84 UTM31N)
7026	Magnetic	A	50m radius	320471E 5947510N
7041	Magnetic	A	50m radius	320073E 5949323N
7105	Magnetic	A	50m radius	318425E 5949059N

2.6.5 The possible archaeological sites outside the area of immediate impact posed by site investigations, but still within borehole location boxes, were less likely to be impacted by the actions of pile driving. However, they will still need to be taken into account and circumvented during planning and installation phases of the turbine bases or cables to avoid impacts to these features where possible.

3 2012-13 – CURRENT PROJECT

3.1 Introduction

3.1.1 WA was commissioned by E.ON to conduct an archaeological assessment of geophysical data over the Humber Gateway Offshore Wind Farm, including the export cable route.

3.1.2 The geophysical data were acquired by Osiris Projects in January to March 2012. Following alterations to the final array cables routes further data were acquired in January 2013. Full details of each dataset are provided below. The geophysical data sets were of high resolution and to be used by multiple contractors in order to identify boulders/obstructions, UXO and archaeology.

3.1.3 The sidescan sonar data were supplied to WA as xtf files with navigation data supplied separately as txt files. The magnetometer data were provided as a single xyz file for each dataset. Multibeam bathymetry data were provided as gridded text files with 1m, 2m and 4m cell sizes.

3.1.4 Records of wrecks and obstructions within the wind farm, export cable route and surroundings were obtained from the UKHO. Wreck records include a state of wreck as one of four classifications according to the following definitions:

- *Live – Wreck considered to exist;*
- *Dead – Not detected by repeated surveys, therefore considered not to exist;*
- *Abey – Existence of wreck in doubt - not shown on charts;*
- *Lift – A salvaged wreck.*

3.1.5 Both live and dead wrecks are located within the development area. Obstructions are limited to fouls. The UKHO does not define types of obstructions but the International Hydrographic Organization (IHO) defines foul ground as an area where the holding qualities for an anchor are poor, or where danger of striking or fouling the ground or other obstructions exists.

3.1.6 All work was undertaken in WGS84 UTM Zone 31 North projected coordinates. UKHO records are provided in WGS84 geodetic coordinates and these were projected into UTM31N using QGSL Geodetic Calculator software.

3.2 2012 Geophysical Data

3.2.1 WA was required to process and interpret geophysical data collected by Osiris in 2012 over the wind farm and export cable route. The wind farm area had not been surveyed in its entirety with data principally acquired along 10 corridors oriented approximately north-south, named from A in the west to J in the east (**Figure 5**). The corridors were all approximately 300m in width. Although cross lines were obtained over the turbine locations these were not required to be processed and were not provided to WA. All main line sidescan sonar and magnetometer data acquired over these corridors and provided to WA were processed and interpreted.

3.2.2 To cover the proposed inter-array cable routes narrow corridors of data were acquired over them, approximately 50m across. These corridors were only acquired where the inter-array cable route was not contained within and oriented parallel to a north-south corridor (**Figure 5**). These corridors were collectively termed the east-west (or EW) corridors to distinguish them from the main NS corridors.

3.2.3 After the data in the EW corridors were obtained the inter-array cable routes were altered with the result that some sections of the route were no longer covered by data and many were only partially covered (**Figure 5**). E.ON requested that WA assess all sections of data that covered, even if only partially, any section of a 50m wide corridor centred on the new inter-array cable routes.

3.2.4 There are also 13 cable burial trial locations distributed over the wind farm. The majority are covered by the NS corridors but four are not, with three situated along the old inter-array cable route and one adjacent to the met mast location (**Figure 5**). WA were required to process and interpret data over these four trial locations (D, I, O and P) in advance of the rest of the EW data to be processed.

3.2.5 A corridor of data was obtained over a single export cable route. This corridor was approximately 100m wide and had cross lines run at approximately 1km intervals. Only the main lines were provided to WA and assessed (**Figure 6**).

3.2.6 Multibeam bathymetry data were acquired in addition to the sidescan sonar and magnetometer data but these were not provided to WA originally as assessment of these data was not required by the Client. However, some of these data were subsequently assessed by WA in an attempt to reduce the number of potential archaeological targets.

3.2.7 Sub-bottom profiler data were also acquired by Osiris but were not required for the archaeological assessment of features on the seafloor.

3.3 2013 geophysical data

3.3.1 Osiris was required to acquire more data to cover the amended inter-array cable routes. Data were also required to cover wider corridors, with a width of 100m. Accordingly, Osiris infilled the gaps between the NS corridors. This time the data were acquired over lines parallel to the NS corridors instead of following the inter-array cable routes. The data were also obtained in large blocks rather than just over the required corridors (**Figure 5**).

3.3.2 In addition to the new data between the NS corridors some infill data were also acquired within the NS corridors where insufficient coverage was present.

3.3.3 WA was required to process and interpret all sidescan sonar and magnetometer data within 50m corridors centred on the amended inter-array cable route, irrespective of whether 2012 data had already been processed over any sections of the route. The infill data within the NS corridors were also required to be assessed.

3.3.4 In addition to the data acquired in 2013 over the OWF, WA was also required to assess some additional sidescan sonar data along the export cable corridor. This dataset was collected in 2013 by Osiris as part of a winter monitoring survey. Only three lines of data were required to be assessed at the inshore end of the cable route.

3.3.5 Additional magnetometer data were also acquired during 2013 over part of the export cable corridor. These were also assessed by WA.

3.4 Data Processing Methodology

3.4.1 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.

3.4.2 When measuring targets in sidescan sonar data the maximum length, width and height of each anomaly are measured. If an object is seen on more than one line of data then the anomalies for this object are grouped together. The average position of the anomalies is given for the target. The maximum of each of the three measurement values are given, irrespective of which anomaly the measurement was made on.

3.4.3 A mosaic of the sidescan sonar data is produced during the data processing to assess the quality of the sonar towfish positioning. The navigation was corrected with CNV files

provided by Osiris. This allows the position of anomalies to be checked between different survey lines and for the layback values to be further refined if necessary.

3.4.4 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. The application of a ratings system is therefore a means of prioritising sites in order to inform further stages of the interpretation process, and on its own is not definitive.

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

3.4.6 The software enables both visualisation of individual lines of data and gridding of data to produce a magnetic anomaly map. Smoothed averages of the data were first calculated, and then subtracted from the raw data values in order to reduce the effect of natural variations in the magnetic field such as changes in geology or water depth.

3.4.7 When picking magnetic anomalies the method differs according to whether the feature is a dipole or a monopole. For a dipole the maximum and minimum magnetic values are used to calculate the magnetic amplitude of the anomaly. The position is given as the midpoint of the anomaly. For a monopole the largest deviation of the anomaly from the background magnetic field strength is taken as the magnetic amplitude of the anomaly. The position is given for the point at which this occurs.

3.4.8 Following standard WA procedure anomalies were picked if they were greater than 5nT in amplitude. However, owing to the magnetometer being towed from the sidescan sonar towfish and hence close to the seabed (less than 5m above the seabed) this resulted in an unnecessarily large number of anomalies. The threshold was therefore altered so that only anomalies of 50nT or greater were picked.

3.4.9 Magnetic anomalies for the later corridors of the 2012 dataset were also only picked outside the turbine location boxes as these had been thoroughly investigated during the 2011 review of geophysical data (WA 2011).

3.4.10 For the 2013 inter-array data all the magnetic data were processed and a geotiff of the gridded data was put into the GIS to enable only anomalies within the Inter-Array Cable Corridor to be picked. It is not possible to do this with the sidescan sonar data so all lines were processed and anomalies found outside the Inter-Array Cable Corridor were not taken through to the interpretation stage.

3.4.11 The multibeam bathymetry data were made into a digital terrain map using IVS Fledermaus software. These data were only examined for evidence of anomalies already identified in the sidescan data.

3.4.12 A limited assessment of the bathymetry data was conducted, with data for Corridors A and J assessed after full assessment of all corridors in the other datasets. It was concluded that the multibeam data did not reduce the number of sidescan sonar and magnetometer anomalies interpreted to be of archaeological potential and no further bathymetry data were assessed.

3.4.13 The initial interpretation of the geophysical data sets is 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 area.

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

3.4.15 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 listed in **Table 7**.

Table 7: Criteria discriminating relevance of feature to proposed scheme

Origin	Discrimination Class	Interpretation
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

3.4.16 The sidescan and magnetometer anomalies were grouped together where they correlate. UKHO records that fall within the sidescan coverage were included and grouped where appropriate. UKHO records that fall within the development area but are not covered by the geophysical data were also added. This produced the final gazetteer of features. These features are numbered with a WA ID which takes the form of a 70000 number series.

3.4.17 Where features correspond with sidescan or magnetic anomalies already picked by Osiris the Osiris ID numbers were entered in the External References column in the gazetteer. UKHO record numbers are also included in this column.

3.4.18 All of the anomalies WA picked and that were entered into the database were potentially archaeological in origin. WA selected those with higher potential as suspect targets requiring further investigation. The categorisation of anomalies as 'suspect' targets was carried out by the use of threshold values, above which features will have a higher archaeological potential.

3.4.19 The criteria chosen to select targets for further investigation were based on previous experience of interpreting geophysical data for this area and the results of the groundtruthing of targets of archaeological potential that were dived during 2011 (WA 2014b). The selected criteria are:

- *Sidescan sonar anomalies larger than 3m or with an associated magnetic anomaly will be classed as suspect;*
- *Magnetic only anomalies with an amplitude greater than 80nT will also be classed as suspect.*

3.4.20 All features in the gazetteers for each Corridor were entered into Access databases produced by E.ON. The databases were sent first to Osiris to enter all their sidescan sonar, magnetometer and pinger anomalies. Osiris then sent on the databases to

6Alpha/Ordtek. 6Alpha/Ordtek completed their assessment of the magnetometer anomalies as suspect UXO or not and entered their interpretation into the database. The databases were then passed on to WA.

3.4.21 Features for which there are no corresponding Osiris anomalies were given new entries in the database. Features which corresponded with one or more Osiris anomalies were added to the Osiris entry for the best corresponding anomaly.

3.4.22 It should be noted that WA were only able to see Osiris' entries into the database and not those made by 6Alpha/Ordtek. WA was therefore not able to see which anomalies had been assessed by 6Alpha/Ordtek as being suspect UXO.

3.5 Results

3.5.1 A summary of the results within the corridors is given in **Table 8** below. The two additional UKHO records within the development area, outside the corridors, are not included here but are discussed below and listed in **Table 21**. It should be noted that the much larger number of features in Corridors A and B is down to the picking of the magnetometer data. Anomalies in the data in these corridors were picked if greater than 5nT. Anomalies in the rest of the data were only picked if they were greater than 50nT, as explained in **Section 3.4** above.

Table 8: Features of archaeological interest by corridor

Dataset	Corridor	Total features	Suspect features
2012	A	573	133
	B	512	105
	C	146	84
	D	178	91
	E	107	52
	F	138	78
	G	154	96
	H	81	46
	I	75	39
	J	42	14
	Export Cable	64	42
	Inter-Array Cables	48	33
2013	Export Cable Infill	5	2
	Inter-Array Cables Re-surveyed	92	45
	Total	**2215**	**860**

3.5.2 The gazetteers for all 2217 features are included in **Appendix 3**. Locations of all features and example images of a variety of feature types are shown for each corridor in **Figures 9** to **34**.

Corridor A

3.5.3 Corridor A is the westernmost of the NS corridors. It contains a wide range of feature types as shown in **Table 9**. Of a total of 573 features, 133 were categorised as suspect archaeology.

3.5.4 There is a single anomaly discriminated as A1. **70032** is a wreck that appears to be unrecorded by the UKHO. It is located in the extreme northwest corner of Corridor A (**Figure 7**), and is oriented approximately northeast to southwest with the nearest point 85m outside the development area. The wreck covers an area measuring 40.4m x 20.6m x 2.5m and has a large magnetic anomaly of 10218nT associated with it. It appears to be broken up with little visible superstructure remaining (**Figure 8**). It is located in an area of flat rocky seabed with occasional rocks scattered in the vicinity. The size of the magnetic anomaly indicates that the vessel construction and/or the cargo contains a large amount of ferrous metal.

Table 9: Features of potential archaeological interest in Corridor A

Feature Type	Corridor A
Bright Reflector	0
Dark Reflector	32
Debris	3
Depression	0
Magnetic	534
Mound	0
Recorded Foul	1
Recorded Wreck	1
Rope/Chain	0
Seafloor Disturbance	1
Wreck	1
Total	**573**

3.5.5 Although there is no UKHO record at this location, previous assessments (WA 2005; WA 2007 and WA 2009) have interpreted it as possibly being the *Nora*. The UKHO recorded position for this wreck lies approximately 1.2km to the northwest, outside the development area.

3.5.6 The *Nora* was a Danish steamship built in 1910 by the Antwerp Engineering Co. of Hoboken. The vessel was owned at the time of its loss by Dampskeisk of Vesterhavet. The vessel was of steel construction with a length of 63.4m, a beam of 9.5m and a draught of 3.9m. The ship was carrying a cargo of wood when lost on 10th December 1916 on passage for Gijon from Hernosand. The *Nora* struck a mine laid by UC-10 and is reported as having been lost 7 miles south of Withernsea. However, the Danish authorities placed the loss as being near Flamborough Head.

3.5.7 The wreck was dived in 2000 and reported to consist only of well broken plates and some small pieces and the wreck is charted as a foul rather than a wreck. A small magnetic anomaly was also reported by the dive. The interpretation of the geophysical data over the observed wreck identified a very large magnetic anomaly. The wreck in the sidescan sonar data has a length only two thirds that of the *Nora* as built but a much larger width than the beam of the vessel. These differences could be explained by the broken up state

of the wreck. The maximum height observed in the data, 2.5m, comes from a distinct square object several metres away from the bulk of the wreck. The appearance of the wreck in the data does not closely match the description of the *Nora* as built or as found by divers.

3.5.8 In addition to the observed wreck, there is a UKHO recorded wreck within Corridor A that was not observed in the geophysical data and hence was discriminated as A3. This is **70571**, the wreck of the *River Don*. This was a British steam trawler that was built in 1918 by Hall, Russell and Company Limited of Montrose. It was owned at the time of its loss by AA Davidson of Aberdeen. The dimensions of the vessel are given as a length of 34.2m, a beam of 6.7m and with a draught of 3.5m. It is recorded to have been both sunk by collision and sunk by a U-boat on November 27th 1931. The record was amended to dead in 1978 after the wreck was not located during a search. The position of this record lies approximately 300m east of the observed wreck.

3.5.9 There is also a recorded foul, **70572**, located within Corridor A. This was a 4m length of drill bit that was discovered in 2009. The record was amended to dead later that year. This feature is also discriminated as A3.

3.5.10 The remaining 570 anomalies are all discriminated as A2. The vast majority, 534, are magnetic only anomalies ranging in amplitude from 6nT to 3872nT. They are scattered throughout the corridor.

3.5.11 Of the 32 dark reflectors in Corridor A (**Table 9**), there are two main types of feature: linear or curvilinear objects, with or without height, and more blocky or compact objects. The largest of the dark reflectors are the linear features **70018** and **70022**. The slightly larger feature, **70018**, is a straight linear dark reflector measuring 13.5m x 1.3m with no height (**Figure 9**). It may represent a section of rope or cable but its form is indistinct and it is not possible to be certain. **70022** is a similar but curving feature of equal length but narrower, with a width of 0.3m and a height of 0.1m. It is also possibly a section of rope or cable.

3.5.12 There are three items of debris in Corridor A. Two of these are small individual objects and the third is a large debris field. **70017** is a rectangular anomaly measuring 4.6m x 1.1m x 1.1m. **70024** is a V-shaped object measuring 2.4m x 1.5m x 0.2m (**Figure 9**). The debris field, **70003**, covers an area of 115.0m x 4.6m x 0.5m and consists of an elongated spread of linear and curvilinear dark reflectors. It is located in an area of flat seabed with many small rocks scattered in the vicinity.

3.5.13 A single seafloor disturbance was observed in this corridor. **70020** is an irregular shaped area of anomalous seabed defined by closely spaced dark reflectors. It measures 44.8m x 16.7m x 0m and is located in an area of flat seabed with abundant small rocks.

Corridor B

3.5.14 This corridor contains a total of 512 features with 105 classed as suspect archaeology. There are 16 features that have been discriminated as A1. All remaining features have been discriminated as A2. There are no recorded wrecks or obstructions within Corridor B.

3.5.15 The majority of the features are magnetic only as shown in **Table 10.** These range in amplitude from 7nT to 4178nT and are located throughout the Corridor but with fewer occurrences at the northern end (**Figure 10**).

3.5.16 The second most common classification was debris, with 42 features. The majority of these features are of the order of 5m in size or smaller. There are only two larger than this, which are both debris fields. **71058** is an area of irregular dark reflectors with height associated with a broad complex magnetic anomaly of 96nT. It measures 28.0m x 16.5m x 0.5m and has been interpreted as a possible scatter of ferrous debris. **71070** is a larger feature, measuring 38.8m x 10.2m x 0.6m. It comprises a rectangular arrangement of four angular objects, the largest of which measures 1.2m x 0.9m. The feature is associated with a number of large magnetic anomalies, with a maximum amplitude of 261nT. It has been interpreted as probable ferrous debris, possibly modern in origin.

Table 10: Features of potential archaeological interest in Corridor B

Feature Type	Corridor B
Bright Reflector	0
Dark Reflector	6
Debris	42
Depression	0
Magnetic	458
Mound	0
Recorded Foul	0
Recorded Wreck	0
Rope/Chain	4
Seafloor Disturbance	2
Wreck	0
Total	**512**

3.5.17 Four objects were classified as being rope or chain. All are long sinuous linear objects. Two, **70651** and **70752,** have magnetic anomalies associated with them and have been discriminated as A1. **70651** is a sinuous elongated dark reflector with a small shadow in an area of coarse seabed and boulder field. It measures 17.1m x 0.3m x 0.1m and is associated with a large magnetic anomaly of 175nT. **70752** is a much larger feature, measuring 35.5m x 0.4m x 0.1m and associated with a magnetic anomaly of 120nT. It is also a sinuous linear object but in addition has a rounded object at its southern end. It is possible that other buried ferrous debris is present at both locations and contributes to the magnetic anomalies.

3.5.18 The six features classified as dark reflectors are quite small, ranging in size from 1.8m to 3.4m in length. The majority (**70982**, **70995**, **71079** and **71108**) are angular features with the remaining two (**70939** and **71074**) being rounded objects. None of these features have magnetic anomalies associated with them indicating they may be non-ferrous debris or possibly natural features.

3.5.19 Two seafloor disturbances were observed in this corridor. **70666** is a sub-oval shaped anomaly that appears to be a depression (**Figure 11**). It measures 7.4m x 2.5m x -0.2m and is situated in an area of flat seabed with many small rocks. The second seafloor disturbance, **70817**, is larger and measures 22.4m x 5.1m x 0m. It contains two sub-rounded depressions located approximately 18m apart.

3.5.20 There were no recorded wrecks or obstructions within Corridor B.

Corridor C

3.5.21 Corridor C contains a total of 146 features of potential archaeological interest (**Table 11**) with 84 of them classed as suspect archaeology. 12 of the features are discriminated as A1 and the remainder as A2. There are no recorded wrecks or obstructions within Corridor C.

3.5.22 The majority of the features are magnetic only anomalies ranging in amplitude from 50nT to 2671nT. They are spread throughout the corridor but with a greater density at the southern end (**Figure 12**).

3.5.23 The second most common feature type in Corridor C is the dark reflector. A total of 26 such features are scattered along the corridor, ranging in size from 0.8m to 4.6m in length. The majority have no associated magnetic anomaly and of the eight that do, the magnetic anomalies are very small, ranging from 5nT to 21nT.

Table 11: Features of potential archaeological interest in Corridor C

Feature Type	Corridor C
Bright Reflector	2
Dark Reflector	26
Debris	11
Depression	0
Magnetic	98
Mound	1
Recorded Foul	0
Recorded Wreck	0
Rope/Chain	8
Seafloor Disturbance	0
Wreck	0
Total	**146**

3.5.24 There are two bright reflectors approximately 20m apart. The larger, **71303**, is a curved feature measuring 12.8m x 1.9m x 0m. **71304** is a smaller feature measuring 3.9m x 2.7m x 0m. Neither have magnetic anomalies associated with them.

3.5.25 A single feature, **71214**, was classified as a mound (**Figure 13**). It measures 5.1m x 1.7m x 0.3m and appears as a small, irregular seabed mound comprising a number of dark reflectors with shadows indicating height. It does not have a magnetic anomaly associated with it.

3.5.26 There are eight features interpreted as ropes or chains. They range from small features below 5m in length to much larger features up to 44m in length. The largest features **71235** and **71253** are much the largest. **71235** is a curvilinear dark reflector measuring 28.1m x 0.9m x 0.4m which has a larger dark reflector with height at one end. **71253** is the largest feature measuring 44.0m x 0.3m x 0.1m and is also a curvilinear dark reflector (**Figure 13**).

3.5.27 A total of 11 features were classified as debris. Ten of these are less than 5m in size but one, **71287**, is significantly larger at 10.6m x 0.9m x 0m (**Figure 13**). It is a curvilinear dark reflector with no apparent height. It is associated with a large magnetic anomaly of 170nT

and may be a piece of ferrous debris. Eight of the Ten smaller items of debris also have magnetic anomalies associated with them and may be ferrous in nature as well.

Corridor D

3.5.28 Corridor D contains a total of 178 features of potential archaeological interest (**Table 12**) with 91 of them classed as suspect archaeology. 15 of the features are discriminated as A1 and the remainder as A2 (**Figure 14**). There are no recorded wrecks or obstructions within Corridor D that were not detected in the geophysical data.

Table 12: Features of potential archaeological interest in Corridor D

Feature Type	Corridor D
Bright Reflector	2
Dark Reflector	34
Debris	24
Depression	0
Magnetic	115
Mound	0
Recorded Foul	0
Recorded Wreck	0
Rope/Chain	1
Seafloor Disturbance	1
Wreck	1
Total	**178**

3.5.29 There is one wreck located within Corridor D, **71542,** which the UKHO records as probably being the wreck of the *Ionic*. It is located approximately 25m southwest of the UKHO recorded position and appears in the sidescan sonar and multibeam bathymetry data as a wreck measuring 30.9m x 6.5m x 2.5m. It appears possibly to be mostly intact and relatively upright with some structure clearly visible (**Figure 15**). The wreck has a very large magnetic anomaly associated with it of 48487nT which suggests the wreck is of principally ferrous construction i.e. metal hulled.

3.5.30 The *Ionic* is recorded by the UKHO as a British steam trawler built in 1890 by Earle's SB Co. Ltd. of Hull. The vessel sank on 7th March 1928 while under tow after being damaged in a collision with the Hull fish carrier *Hornbill*. The wreck is believed to be intact but well buried with the bows to the southeast. The dimensions of the vessel are given as a length of 30.8m, beam of 6.2m and a draught of 3.2m. The length and width from the geophysical data are remarkably similar but the smaller height indicates the wreck may be partially buried.

3.5.31 The majority of the features in Corridor D are magnetic only anomalies ranging in amplitude from 50nT to 2046nT. Two of these are discriminated as A1. **71543** has an amplitude of 426nT and is approximately 55m northeast of wreck **71542**. It possibly represents buried ferrous debris associated with the wreck. The other is **71473** which has an amplitude of 2046nT and so may originate from a relatively large item of buried ferrous debris.

3.5.32 The remaining 12 A1 discriminated features are classified as debris or debris fields and all have associated magnetic anomalies. The larger features are the two debris fields, **71425**

and **71434**. Both consist of areas of irregular dark and bright reflectors with **71425** measuring 16.5m x 6.6m x 0m with a magnetic amplitude of 34nT and **71434** smaller at 8.5m x 4.2m x 0m but with a larger magnetic amplitude of 264nT.

3.5.33 The 10 features classified as debris and discriminated as A1 (**71410, 71411, 71426, 71466** (**Figure 16**), **71467, 71471, 71496, 71510, 71552** and **71565**) are all less than 5m in size and have magnetic amplitudes ranging from 28nT to 752nT.

3.5.34 The most common type of feature seen in this corridor is the magnetic only anomaly. These occur throughout the corridor and range in amplitude from 50nT to 2046nT.

3.5.35 Dark reflectors are the second most common feature in Corridor D. They occur throughout the corridor and are small in size. The largest, **71516**, measures 5.0m x 0.4m x 0.4m and is an elongate feature with a large shadow. It has no magnetic anomaly and may possibly be an item of non-ferrous debris.

3.5.36 The single item interpreted as rope or chain, **71414**, is a curvilinear feature located in an area of coarse seabed. It measures 47.1m x 0.3m x 0m.

3.5.37 There are two features classified as bright reflectors, both of which are interpreted as possible depressions. **71422** is an elongate feature measuring 5.2m x 1.6m x -0.1m and **71421** is a smaller feature measuring 2.7m x 1.6m x -0.2m.

3.5.38 There is a single seafloor disturbance, **71517**, that consists of a curvilinear dark reflector. It may possibly be a seabed scar or may be indicative of buried debris. It measures 18.4m x 1.2m x 0.2m and has no magnetic anomaly so if there is any debris here it is likely to be non-ferrous in nature.

Corridor E

3.5.39 Corridor E contains a total of 107 features of potential archaeological interest (**Table 13**) with 52 of them classed as suspect archaeology. Eight of the features are discriminated as A1 and the remainder as A2 (**Figure 17**). There are no recorded wrecks or obstructions within Corridor E that were not detected in the geophysical data.

Table 13: Features of potential archaeological interest in Corridor E

Feature Type	Corridor E
Bright Reflector	0
Dark Reflector	25
Debris	16
Depression	0
Magnetic	61
Mound	0
Recorded Foul	0
Recorded Wreck	0
Rope/Chain	4
Seafloor Disturbance	0
Wreck	1
Total	**107**

3.5.40 There is one wreck, **71600**, located in this corridor at the northern end. It may be the wreck of the *Marshall* but the UKHO recorded position lies approximately 550m to the south of the geophysical anomaly. The wreck appears badly broken up in the sidescan sonar data and measures 38.0m x 13.7m x 1.8m (**Figure 18**). It is probably partially buried although some features retain significant height.

3.5.41 The UKHO record describes the wreck as being possibly the *Marshall*. This vessel was built in 1846 by Shields. It was owned at the time of loss by the Elbe and Humber Steam Navigation Co. It was presumed to have sunk following a collision with the barque *Woodhouse* while on passage from Hamburg to Hull on 26th November 1853. In May 1988 the wreck was reported to lie in a scour with the boiler standing about 8 feet high. In August 1989 the wreck was reported to be a small coastal vessel about 120 feet long and thought possibly to be the *Marshall*.

3.5.42 The most common features are magnetic only anomalies. They range in amplitude from 51nT to 5072nT. The three highest amplitude anomalies are discriminated as A1. **71703** is a large complex anomaly with an amplitude of 605nT. **71692** and **71675** are very large magnetic anomalies with amplitudes of 2264nT and 5072nT respectively. All three anomalies suggest the presence of a significant amount of buried ferrous debris. Magnetic only anomalies are spread throughout the corridor with the exception of the northern end. The three largest anomalies all occur towards the southern end.

3.5.43 Dark reflectors are the second most common type of feature in this corridor, with 25 instances. All are discriminated as A2 and none have magnetic anomalies associated with them. All are also small, being less than 3m in size. They occur throughout the corridor.

3.5.44 There are 16 items of debris in Corridor E, including one debris field. The debris field is located in the northern end of the corridor, to the northwest of wreck **71600**. It measures 59.1m x 27.6m x 0.8m and consists of an area of dark reflectors with shadows located in an area of coarse seabed sediment. It may possibly be related to the wreck but it is also possible that it is an area of boulders. It does not have a magnetic anomaly associated with it.

3.5.45 Of the remaining 15 items of debris three are discriminated as A1 with the other 12 and the debris field discriminated as A2. **71664** is a small object measuring 1.5m x 0.7m x 0.4m and with an associated magnetic anomaly of 238nT. The magnetic anomaly seems unusually large to be associated with such a small object and it is possible that there are further items of ferrous debris buried close by. **71630** is a bright reflector with a series of small, parallel dark reflectors running across it and a distinct shadow (**Figure 19**). A magnetic anomaly of 246nT is associated with this feature and indicates it may be a piece of ferrous debris. The third remaining A1 debris feature is **71650**. It is a poorly defined irregular dark reflector with a small shadow and measures 5.0m x 1.0m x 0.1m. A large magnetic anomaly of 376nT appears to be associated with it.

3.5.46 There are four objects classified as rope or chain (**71629, 71656, 71658** and **71697**). They range in length from 5.3m (**71629**) to 18.0m for the largest feature, **71697** (**Figure 19**). Only one, **71656**, has a magnetic anomaly associated with it and has thus been discriminated as A1, the remaining three objects have been discriminated as A2. **71656** appears to be a coil of linear material covering an area measuring 7.6m x 6.7m x 0.1m and with a magnetic amplitude of 127nT.

Corridor F

3.5.47 Corridor F contains a total of 138 features of potential archaeological interest (**Table 14**) with 78 of them classed as suspect archaeology. Six of the features are discriminated as A1 and the remainder as A2. There are no recorded wrecks or obstructions within Corridor F.

3.5.48 The majority of features in Corridor F, 92, are magnetic only anomalies. These occur throughout the corridor (**Figure 20**). They range in amplitude from 50nT to 2712nT. The four largest anomalies are discriminated as A1 with the rest as A2. **71823** (703nT), **71831** (2712nT), **71899** (917nT) and **71917** (736nT) are all large anomalies identified on several lines of data that may indicate the presence of buried ferrous debris.

3.5.49 The remaining two features discriminated as A1 are two of the eight items of debris located in the corridor. **71816** is an elongate dark reflector with a large shadow and measures 4.9m x 1.4m x 1.1m. It is associated with a very large magnetic anomaly of 992nT, the size of which may indicate that there may be further buried material or that **71816** is itself partially buried. **71838** consists of two short linear dark reflectors with height lying at an angle to each other within an area of coarse seabed sediment (**Figure 21**). The feature measures 4.6m x 0.4m x 0.2m and has a magnetic anomaly of 530nT in amplitude associated with it, indicating that it is likely to be ferrous in nature.

Table 14: Features of potential archaeological interest in Corridor F

Feature Type	Corridor F
Bright Reflector	1
Dark Reflector	31
Debris	8
Depression	0
Magnetic	92
Mound	0
Recorded Foul	0
Recorded Wreck	0
Rope/Chain	4
Seafloor Disturbance	2
Wreck	0
Total	**138**

3.5.50 As is common throughout the Humber Gateway development area, dark reflectors are the second most common type of feature, with 31 distributed along the length of the corridor. All are fairly small in size with maximum dimensions ranging from 1.2m to 5.0m and none have magnetic anomalies associated with them.

3.5.51 There is a single bright reflector in Corridor F that is located approximately halfway along the corridor. **71873** is a small rounded object measuring 4.2m x 3.9m x -0.2m. There are no similar natural features identified in the area and it is possibly of anthropogenic origin.

3.5.52 There are four features classified as rope or chain located within the central third of the corridor – **71848, 71858, 71859** and **71887**. All are curvilinear features with lengths between 8.2m and 33.9m. Only one, **71858**, has a magnetic anomaly associated with it indicating it may be of ferrous construction (**Figure 21**).

3.5.53 A single seafloor disturbance has been interpreted within Corridor F. **71906** is a large feature measuring 15.7m x 3.0m x 0m without an associated magnetic anomaly. It comprises a number of irregular dark and bright reflectors and may indicate the presence of non-ferrous debris.

Corridor G

3.5.54 Corridor G contains a total of 154 features of potential archaeological interest (**Table 15**) with 96 of them classed as suspect archaeology. Three of the features are discriminated as A1 and the remainder as A2 (**Figure 22**). There are no recorded wrecks or obstructions within Corridor G.

3.5.55 The majority of features in this corridor are magnetic only anomalies. The 110 anomalies range in amplitude from 50nT to 5508nT. All three A1 discriminated features are magnetic only anomalies. **72002** (1893nT), **72016** (5508nT) and **72082** (1661nT) are all very large anomalies that may represent a large amount of buried ferrous debris.

Table 15: Features of potential archaeological interest in Corridor G

Feature Type	Corridor G
Bright Reflector	1
Dark Reflector	29
Debris	10
Depression	1
Magnetic	110
Mound	0
Recorded Foul	0
Recorded Wreck	0
Rope/Chain	0
Seafloor Disturbance	3
Wreck	0
Total	**154**

3.5.56 There are 29 dark reflectors in this corridor distributed throughout but with a lower density in the central portion. None have magnetic anomalies associated with them and most are small with maximum dimensions of 0.9m to 5.9m.

3.5.57 A single bright reflector is located towards the southern end of the corridor. **72110** is an irregular feature measuring 3.0m x 1.7m x 0m located in an area of generally featureless seabed.

3.5.58 There are 10 items of debris scattered throughout the corridor. The majority are small, between 1.7m and 3.5m across. The exception is **72143**, which is considerably bigger at 9.7m x 0.6m x 0.3m. It is a linear object without an associated magnetic anomaly and may be a piece of non-ferrous debris.

3.5.59 A single depression is located within the central part of the corridor. **72088** is a small depression with a dark reflector in the centre of it. As there is no associated magnetic anomaly it could possibly be a piece of non-ferrous debris. The depression measures 4.6m x 2.9m x -0.2m.

3.5.60 Near the southern end of the corridor are three seafloor disturbances, one small (**72131**) and two large (**72135** and **72150**). None have magnetic anomalies associated with them so if they contain debris it is non-ferrous in nature. **72135** is the largest feature and measures 43.6m x 14.5m x 0m (**Figure 23**). It appears to be an isolated area of scarred seabed that may contain buried debris or alternatively may possibly be the result of geotechnical work undertaken at nearby borehole location BH12.

Corridor H

3.5.61 Corridor H contains a total of 81 features of potential archaeological interest (**Table 16**) with 46 of them classed as suspect archaeology. Two of the features are discriminated as A1 and the remainder as A2. There are no recorded wrecks or obstructions within Corridor H.

Table 16: Features of potential archaeological interest in Corridor H

Feature Type	Corridor H
Bright Reflector	0
Dark Reflector	8
Debris	3
Depression	0
Magnetic	70
Mound	0
Recorded Foul	0
Recorded Wreck	0
Rope/Chain	0
Seafloor Disturbance	0
Wreck	0
Total	**81**

3.5.62 The large majority of features in this corridor are magnetic only anomalies, ranging in amplitude from 50nT to 2475nT. They are distributed throughout the corridor but with a higher density in the northern half (**Figure 24**). Of the 70, only one is discriminated as A1. **72218** has an amplitude of 854nT and it is possible that it represents a large piece of buried ferrous debris. There are only two other types of features observed in this corridor, dark reflectors and debris. Dark reflectors are the more common with eight having been observed in total, seven in the northern half of the corridor and one at the southern end. All are discriminated as A2 and are small in size with the largest being 3.0m in length.

3.5.63 There are three features classified as debris, two which have magnetic anomalies associated with them. The larger of these two features is **72270**, which is discriminated as A1. It measures 4.7m x 0.6m x 0.3m and has a magnetic amplitude of 563nT. It is an irregular dark reflector with height located in an area of coarse seabed sediment and is a possible piece of ferrous debris (**Figure 25**). As the magnetic anomaly is quite large it is possible that there is further buried ferrous material in the immediate vicinity.

Corridor I

3.5.64 Corridor I contains a total of 75 features of potential archaeological interest (**Table 17**) with 39 of them classed as suspect archaeology. Three of the features are discriminated as A1 and the remainder as A2 (**Figure 26**). There are no recorded wrecks or obstructions within Corridor I.

3.5.65 The majority of features in Corridor I are magnetic only anomalies. They have amplitudes ranging from 50nT to 3486nT and are present throughout the corridor. A single magnetic only anomaly, **72360**, is discriminated as A1. This is a very large magnetic anomaly with an amplitude of 2524nT. It lies towards the southern end of the corridor and has a smaller anomaly, **72361**, close by. **72361** lies approximately 15m to the south and has an amplitude of 485nT. It may indicate the presence of further ferrous debris that may be related to that indicated by **72360**.

3.5.66 The other features discriminated as A1 are the two items of debris. **72365** is an area of irregular dark reflectors with height measuring 3.5m x 3.1m x 0.2m (**Figure 27**). A magnetic anomaly of 238nT is associated with it indicating the presence of ferrous debris. **72313** is a similar but larger feature measuring 8.7m x 6.3m x 0.4m and with a magnetic amplitude of 376nT. **72365** is located near the southern end of the corridor while **72313** lies towards the northern end.

Table 17: Features of potential archaeological interest in Corridor I

Feature Type	Corridor I
Bright Reflector	0
Dark Reflector	15
Debris	2
Depression	0
Magnetic	57
Mound	0
Recorded Foul	0
Recorded Wreck	0
Rope/Chain	0
Seafloor Disturbance	1
Wreck	0
Total	**75**

3.5.67 There are 15 dark reflectors in Corridor I with 12 of them in the southern half of the corridor. The remaining three are located towards the northern end. All are small objects with a maximum dimension of between 0.8m and 2.3m. None have magnetic anomalies associated with them and are hence likely to be non-ferrous in nature.

3.5.68 A single seafloor disturbance, **72316**, is located in the central portion of the corridor (**Figure 27**). It measures 5.2m x 2.9m x 0m and appears as a small depression containing three dark reflectors with height, the largest measuring 0.7m x 0.5m x 0.3m. These may be items of non-ferrous debris.

Corridor J

3.5.69 Corridor J is the easternmost corridor. It is also the shortest of the corridors, approximately half the length of the others (**Figure 28**), resulting in the lowest number of features of potential archaeological interest of all the corridors (**Table 18**). Of the 42 features in total 14 were classed as suspect archaeology. All features were discriminated as A2 and there are no recorded wrecks or obstructions in this corridor.

3.5.70 The majority of the features are magnetic only, ranging in amplitude from 51nT to 723nT. They are distributed throughout the corridor (**Figure 28**).

3.5.71 A single item of debris is located towards the centre of the corridor. **72424** is a small dark reflector with height that measures 1.2m x 0.4m x 0.9m (**Figure 29**). It has a small magnetic anomaly of 79nT associated with it.

3.5.72 The 18 dark reflectors are generally small in size, with 17 of them ranging from 0.9m to 2.6m. None have magnetic anomalies associated with them, indicating they are likely to be non-ferrous in nature. The 18th and largest dark reflector is **72407**, which measures 3.9m x 0.3m x 0m. It is a poorly defined, irregular linear feature located in an area of coarse seabed sediment.

Table 18: Features of potential archaeological interest in Corridor J

Feature Type	Corridor J
Bright Reflector	0
Dark Reflector	18
Debris	1
Depression	0
Magnetic	23
Mound	0
Recorded Foul	0
Recorded Wreck	0
Rope/Chain	0
Seafloor Disturbance	0
Wreck	0
Total	**42**

Export Cable Corridor

3.5.73 The Export Cable Corridor contains 64 features interpreted from the 2012 data, 42 of which were classed as suspect archaeology. An additional five features were interpreted in the 2013 infill data with two of these classed as suspect. Of the total 69 features only one was discriminated as A1 (**Figure 30**). The remaining 68 features were discriminated as A2. There are no recorded wrecks or obstructions in the Export Cable Corridor.

3.5.74 All but one of the features are magnetic only anomalies (**Table 19**). They are distributed throughout the corridor and range in amplitude from 50nT to 821nT. The largest amplitude anomaly, **72534**, is the sole feature discriminated as A1.

3.5.75 The one feature not a magnetic only anomaly is **72557**, which is a dark reflector (**Figure 31**). It is located towards the eastern end of the corridor and is an irregularly shaped object with a projection on one side. It measures 2.5m x 1.4m x 0.4m and is associated with a magnetic anomaly of 78nT. The object may possibly be an item of ferrous debris.

Table 19: Features of potential archaeological interest in the Export Cable Corridor

Feature Type	2012 Export Cable	2013 Export Cable Infill
Bright Reflector	0	0
Dark Reflector	1	0
Debris	0	0
Depression	0	0
Magnetic	63	5
Mound	0	0
Recorded Foul	0	0
Recorded Wreck	0	0
Rope/Chain	0	0
Seafloor Disturbance	0	0
Wreck	0	0
Total	**64**	**5**

Inter-Array Cable Corridors

3.5.76 The sections of Inter-Array Cable Corridors that lie between the NS corridors were partially covered by data acquired in 2012 (see **Section 3.2** for details and **Figures 5, 32** and **33**). WA interpreted 48 features of potential archaeological interest within this 2012 dataset (**Table 20**), 33 of which were classed as suspect archaeology. Additional data were acquired in 2013 that covered the entirety of the Inter-Array Cable Corridors that lie between the NS corridors. All data covering these corridors were assessed by WA, irrespective of whether any 2012 data had previously been assessed there. An additional 92 features were interpreted, of which 45 were classed as suspect archaeology. WA did not group any features from the 2013 dataset with any from the 2012 dataset as it would have been very confusing if such grouping had taken place and the subsequent groups then entered into the 2013 database.

Table 20: Features of potential archaeological interest in the Inter-Array Cable Corridors

Feature Type	2012 Inter-Array	2013 Inter-Array
Bright Reflector	0	0
Dark Reflector	2	4
Debris	0	8
Depression	0	0
Magnetic	45	78
Mound	0	0
Recorded Foul	0	0
Recorded Wreck	0	0
Rope/Chain	1	2
Seafloor Disturbance	0	0
Wreck	0	0
Total	**48**	**92**

3.5.77 Of the total 140 features six were discriminated as A1, with the remaining discriminated as A2. There are no recorded wrecks or obstructions.

3.5.78 The majority of features are magnetic only anomalies with amplitudes ranging from 50nT to 1277nT. Five of the A1 discriminated features in this corridor are magnetic only anomalies. **72604, 72611**, **72618** and **72631** are similar in amplitude with values of 794nT, 657nT, 721nT and 752nT respectively. The remaining feature, **72624**, is somewhat larger with an amplitude of 1277nT and is likely to result from a larger item of ferrous debris.

3.5.79 The remaining A1 feature is a dark reflector, **72621**, which is an angled object with height associated with a magnetic anomaly of 603nT (**Figure 34**). It is likely to be an item of ferrous debris. The remaining five dark reflectors consist of four small and one large. The small objects range in size from 1.6m to 2.0m and three of them have associated magnetic anomalies. **73002** is the smallest object in size at 1.6m x 0.1m x 0.1m but it has by far the largest magnetic amplitude of 2100nT. The size of the magnetic anomaly suggests either that the majority of the visible object is buried or alternatively that there are other items of ferrous debris buried in the immediate vicinity. The remaining dark reflector, **73043**, is the largest. It is a large triangular feature measuring 9.8m x 3.2m x 0m.

3.5.80 There are eight items of debris, seven of which are fairly small and range from 1.3m to 4.8m in size. The remaining object, **73003**, is much larger and measures 16.6m x 3.3m x 0.1m. It appears to be a debris field and contains curvilinear features with an actual width of approximately 0.1m. It has a small magnetic anomaly of 63nT associated with it, indicating that there is likely to be ferrous content in the debris.

3.5.81 The remaining three features, **72619, 73045** and **73083**, are interpreted as items of rope or chain. **73045** is the smallest at 8.6m x 0.1m x 0m. **73083** is the longest of the three at 27.6m x 0.6m x 0.3m. This item appears possibly attached to an object on the seabed (**Figure 34**). The remaining feature, **72619**, is an area of discontinuous curvilinear dark reflectors with height that appear to indicate rope or chain that is possibly partially buried.

Additional UKHO records within the development area

3.5.82 There are a total of five UKHO recorded wrecks and obstructions within the area of the wind farm itself, with none in the Export Cable Corridor. One of these is covered by the interpreted data but not seen (**70572** In Corridor A) and a second is related to a wreck seen in the geophysical data of Corridor E (**71600**). A further record, **70571**, is covered by the Corridor A data but lies outside the development area.

3.5.83 There are two remaining UKHO records that are not covered by the interpreted geophysical data. These are listed in **Table 21** with a full gazetteer included in **Appendix 3.**

Table 21: Additional UKHO records in the development area

WA ID	Name / Classification	Easting	Northing	Description
73250	*Autumn*	321839	5945454	Reported on 03/02/1933 to be a wreck that is broken up and washed away. The engines and boiler remained but it was no navigational danger. Observations on 17/01/1934 reported that there were still remains on the beach seawards of Kilnsea. No wreck was found during surveys in 1969 and 1974 and the record was amended to dead following a further survey in 1978.
73251	Recorded wreck	323327	5948832	A regular seepage of oil was observed in 1989 and is thought to possibly relate to a wreck. The position is for filing only but the state is given as live. This wreck is referred to as the 'oil bubbles wreck' in earlier WA reports (e.g. WA 2007b).

3.6 Discussion

3.6.1 The vast majority of features of potential archaeological interest are magnetic only anomalies (**Table 22**), with 82% of all features over the wind farm and cable route being this type of feature. This very high proportion is slightly skewed by the exceptionally high numbers of magnetic only anomalies in Corridors A and B resulting from the difference in methodology employed for these two corridors. Although all magnetic anomalies with over 5nT amplitude were picked in these two corridors compared with over 50nT for all others it is still the case that the magnetic only anomaly is the most common type of feature in all corridors.

Table 22: Summary of all features of potential archaeological interest

Feature Type	Quantity
Bright Reflector	6
Dark Reflector	231
Debris	128
Depression	1
Magnetic	1809
Mound	1
Recorded Foul	1
Recorded Wreck	3
Rope/Chain	24
Seafloor Disturbance	10
Wreck	3
Total	**2217**

3.6.2 Magnetic only anomalies may be indicative of ferrous debris that has not been observed in the sidescan sonar data, either due to small size or because it is buried below the surface of the seabed. However, the seabed in the OWF area generally consists of only a thin layer of sandy or gravelly surface sediments overlying a gravelly clay containing

cobbles, meaning objects are unlikely to buried far. Magnetic only anomalies may therefore sometimes be natural in origin.

3.6.3 Three wrecks were observed in the geophysical data. **70032** in Corridor A appears uncharted but is possibly the recorded wreck of the *Nora.* **71542** in Corridor D is a recorded wreck, probably the *Ionic*, and **71600** in Corridor E may be a recorded wreck, possibly the *Marshall*, with the UKHO position approximately 550m south of the wreck position observed in the geophysical data. The UKHO position is not covered by interpreted data but the 2005 and 2009 assessment of geophysical data (WA 2005, WA 2009) found no evidence for the wreck at the UKHO location and placed it approximately 90m to the southwest of the position identified for **71600**.

3.7 Recommended Mitigation

3.7.1 In order to archaeologically characterise the area it is recommended that a series of groundtruthing investigations are undertaken by diver or remotely operated vehicle (ROV) survey. The term 'suspect' has been applied in order to label targets recommended for groundtruthing, as described in Section 3.4. It should be noted that this does not infer that targets not labelled as 'suspect' are no longer regarded as potential archaeology.

3.7.2 Over the entire wind farm and the export cable route, this has resulted in a very large number of targets, 860, being labelled 'suspect' i.e. recommended for groundtruthing. These suspect anomalies have been selected based on either sidescan dimensions and/or magnetic amplitude. However, it is not practical to dive or inspect by ROV all suspect targets for the purposes of characterisation, where this can be achieved by groundtruthing a sample. Therefore, in order to characterise the archaeology of the development area, it is recommended that a representative number of 10% of the suspect targets in the direct footprint of the development are groundtruthed (**Figure 35**). If all of the representative 10% of targets were proved to be of archaeological origin, then there may be an argument for further groundtruthing. However, if the groundtruthing confirmed that over half of the targets are of non-archaeological origin, then no further groundtruthing would be necessary.

3.7.3 The majority of archaeological features labelled as 'suspect' are magnetic only anomalies. As the seabed is quite hard it is not anticipated that many objects will be deeply buried and so the majority of the magnetometer only features were considered likely to be natural. Therefore any groundtruthing investigations of suspect targets should focus more on sidescan anomalies rather than magnetic only anomalies, although a selection of both should be investigated in order to characterise the area.

3.7.4 It is recommended that a programme of groundtruthing should be devised in conjunction with engineering and UXO considerations as some anomalies will be considered suspect by all three disciplines. Data from the groundtruthing investigations should be assessed by an archaeologist to confirm the results of these investigations.

3.7.5 Additional Exclusion Zones were not required to be implemented around features as a result of the current assessment. However, the nine Exclusion Zones remaining after the 2009 geophysical assessment (WA 2009) should be retained. Not all of these overlap the current development footprint as shown in **Table 23** and **Figure 36**, and none are intersected by the inter-array cable and export cable plans, but all should be borne in mind when conducting operations that may impact the seabed outside the development footprint.

Table 23: Exclusion Zone locations

EZ ID	Description	Location
7000	Suspected wreck of the *Nora*	Clips Corridor A
7001	Suspected wreck of the SS *Marshall* (possibly)	Corridor E
7002	Wreck of the *Dido*	Outside development
7003	Wreck of the *Ionic*	Corridor D
7028	Debris	Clips export cable corridor
7061	UKHO position for the SS *Marshall* (possibly)	Corridor E
7062 (inc 7004)	NMR position for the SS *Marshall* (possibly)	Clips Corridor D
7063	UKHO position for oil and bubbles, possible wreck	Clips Corridor J
7064	UKHO position for the *Saltoun*	Outside development

3.7.6 The three buffer zones resulting from the 2012 review of groundtruthing reports (WA 2014b) prior to the geotechnical survey should also be retained. All three buffer zones overlap the development footprint to varying extents, where they are intersected by the final export cable and array cable plans. Impacts within the buffer zones should be avoided where this is possible or managed through the Offshore Renewables Protocol for Archaeological Discoveries (ORPAD) and Written Scheme of Investigation (WA 2013).

3.7.7 All features from the current assessment should be borne in mind when planning development and construction activities. All features, irrespective of whether they have been labelled 'suspect', are potentially of archaeological origin until groundtruthing proves otherwise, and so they should be avoided wherever possible. If avoidance is not possible, then the Offshore Renewables Protocol for Archaeological Discoveries should be implemented.

3.7.8 If items of low archaeological potential are discovered these can be reported through ORPAD. However, if any discoveries of potential significant archaeological interest are made then work should immediately cease at the location at which the discovery was made. The discovery should be reported to WA as the Retained Archaeologist and they will provide the Client with the best way to go about dealing with it.

3.7.9 The geophysical assessment has been conducted in accordance with the Written Scheme of Investigation (WA 2013). Any subsequent work should also follow the Written Scheme of Investigation.

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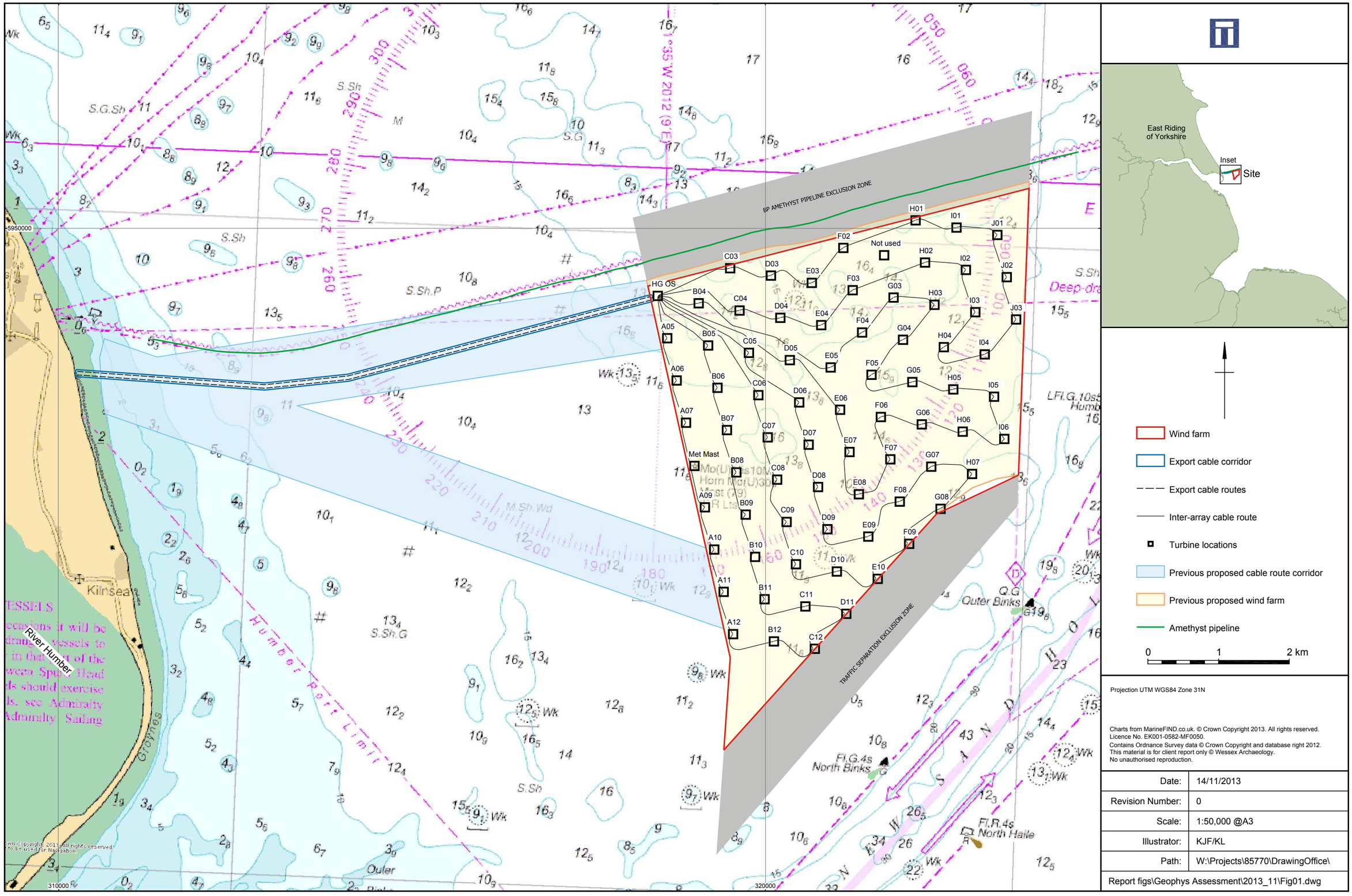

Projection UTM WGS84 Zone 31N

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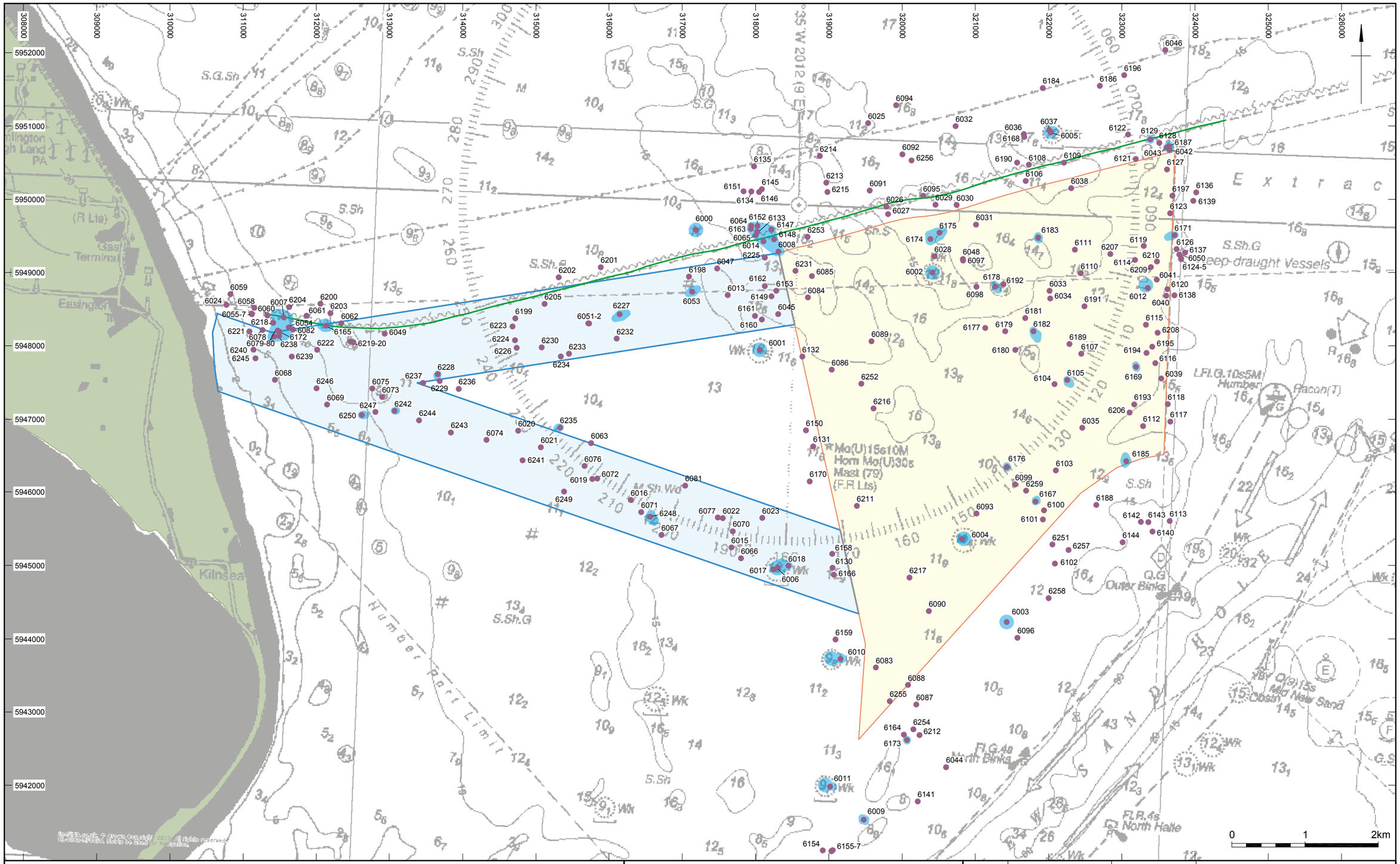
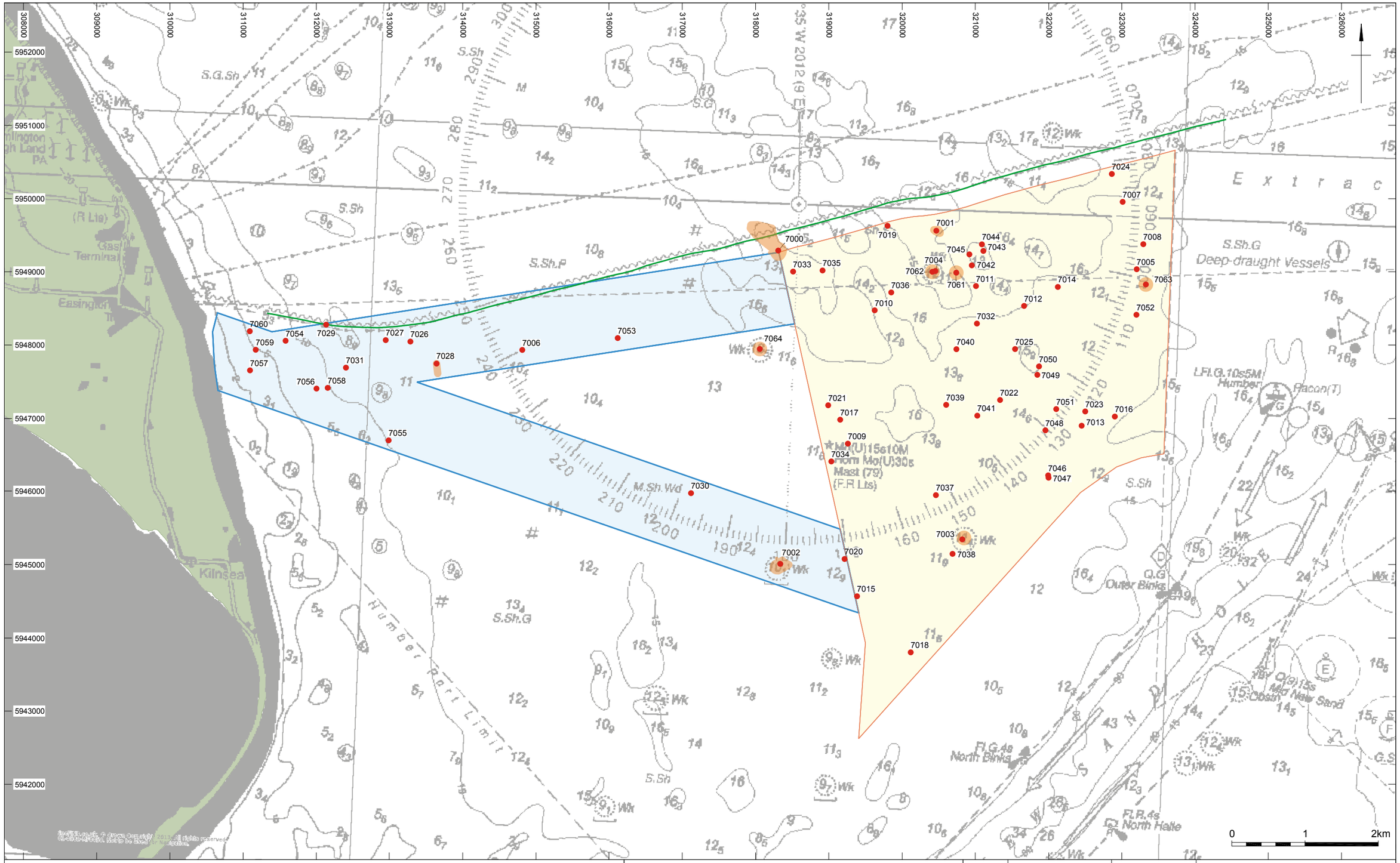
Location map of Humber Gateway Offshore Wind Farm

Figure 1



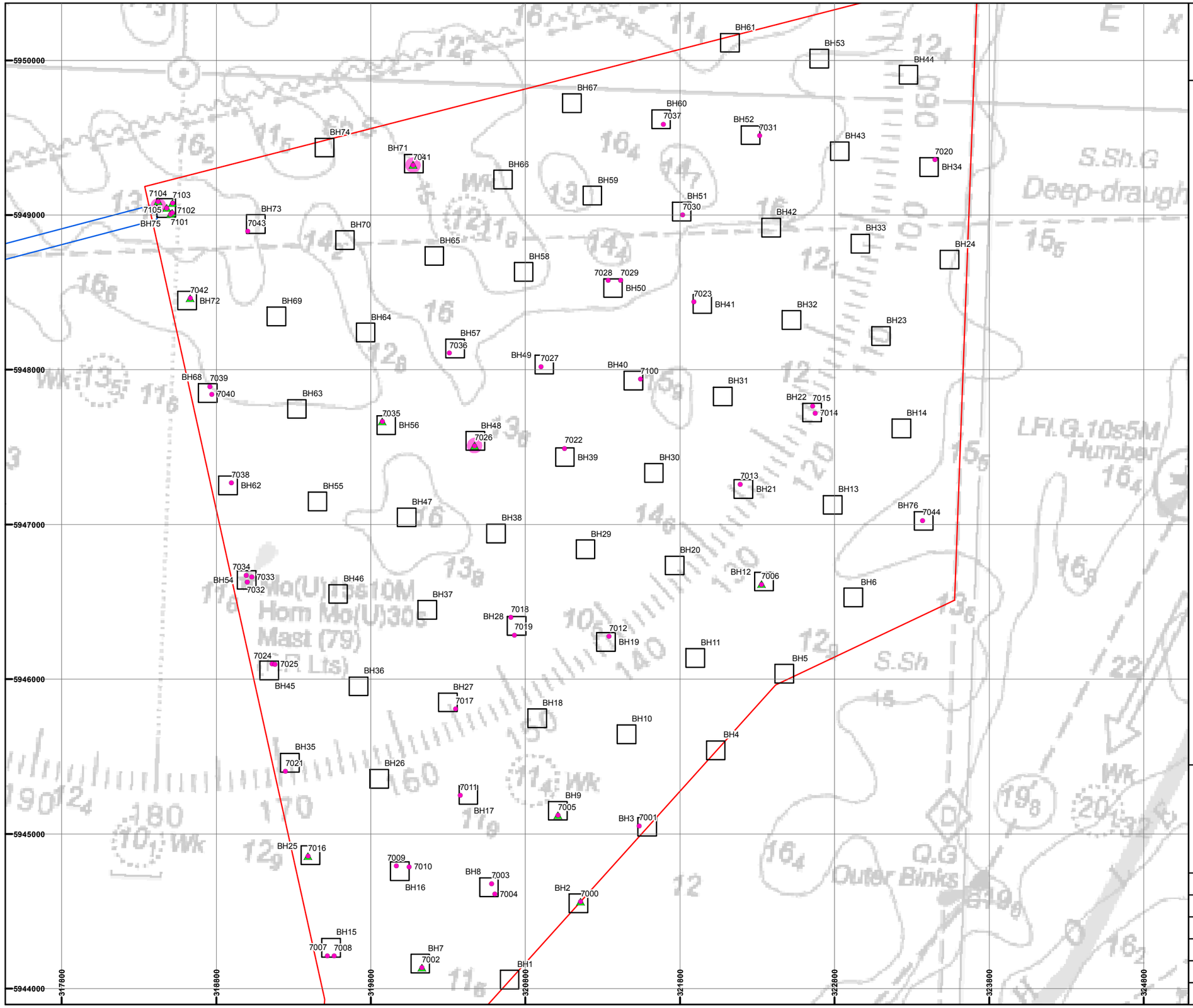
Geophysical anomalies and Exclusion Zones from 2007 assessment

Figure 2



Geophysical anomalies and Exclusion Zones from 2009 assessment

Figure 3



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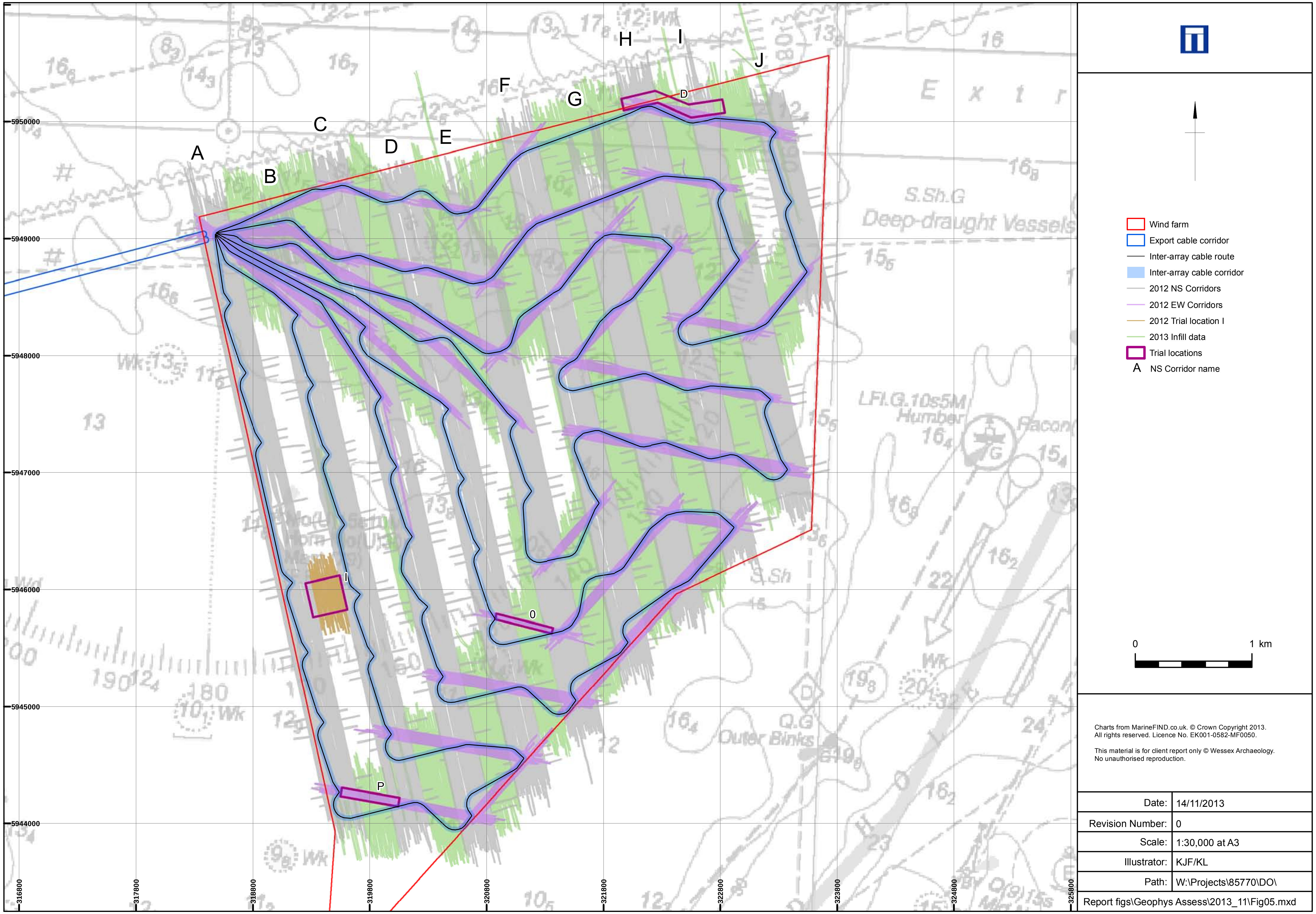
Geophysical anomalies and groundtruthing results from turbine location reviews of 2011 and 2012

Figure 4



Trackplots from 2012 and 2013 geophysical surveys – Wind Farm

Figure 5

i

ii

5948000

310400

311400

312400

313400

314400

314400

5948000

315400

316400

317400

5948000

318400

Wind farm

Export cable corridor

Export cable routes

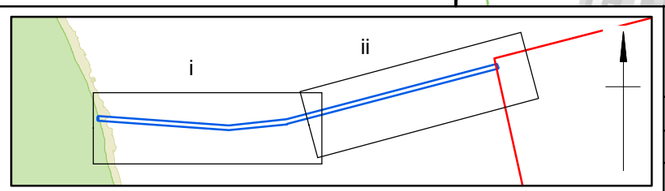
2012 Survey

2013 Infill magnetometer data

2013 Infill SSS data (assessed lines only)

2013 Additional data (not assessed)

0 250 m



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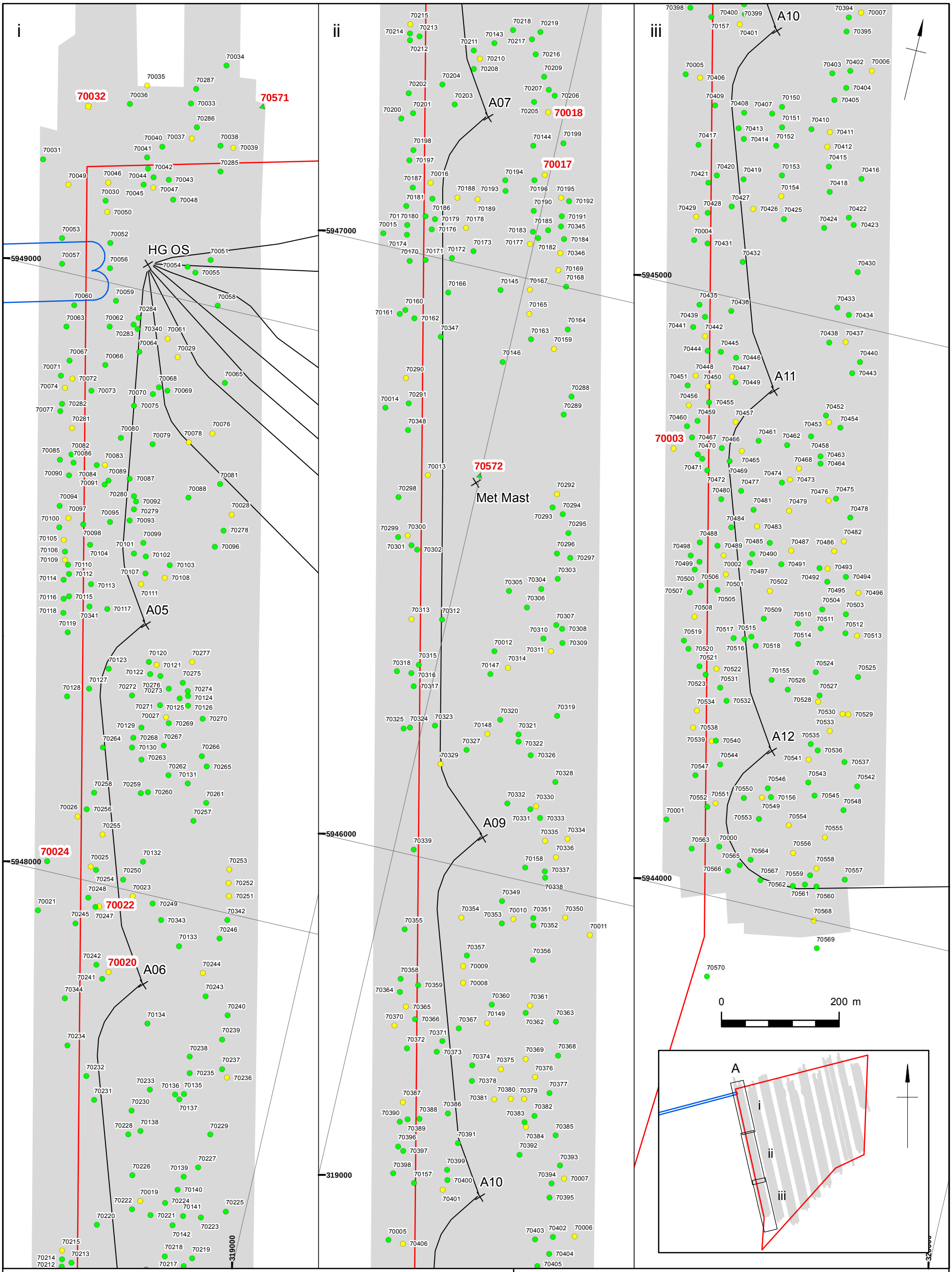
Trackplots from 2012 and 2013 geophysical surveys – Export Cable

Figure 6



Wind farm
Export cable corridor
Inter-array cable route
Turbines
Sidescan sonar coverage

Archaeological anomalies
A1: Anthropogenic origin of archaeological interest (suspect)
A2: Uncertain origin of possible archaeological interest (suspect)
A2: Uncertain origin of possible archaeological interest (not suspect)
A3: Historic record of possible archaeological interest (not suspect)
70020 Anomalies discussed in text

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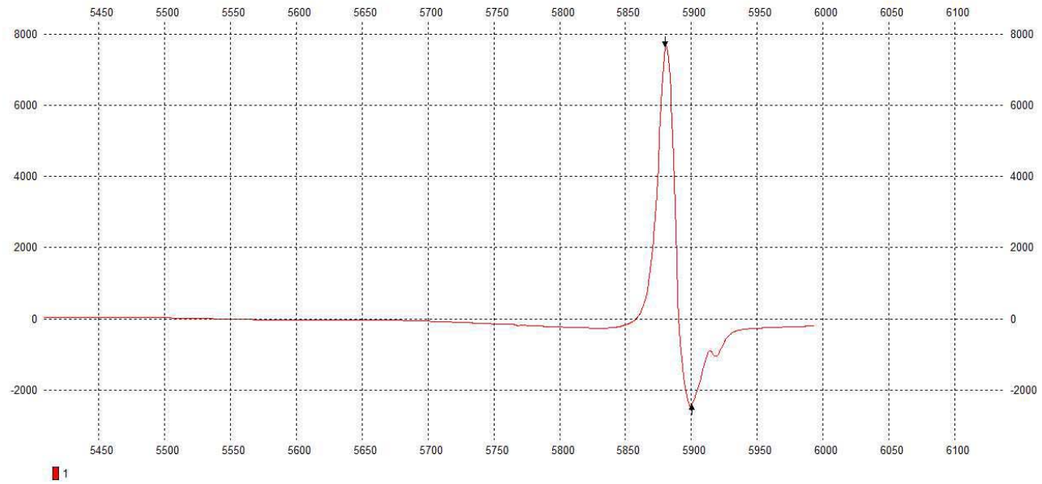
Sites of potential archaeological interest in Corridor A

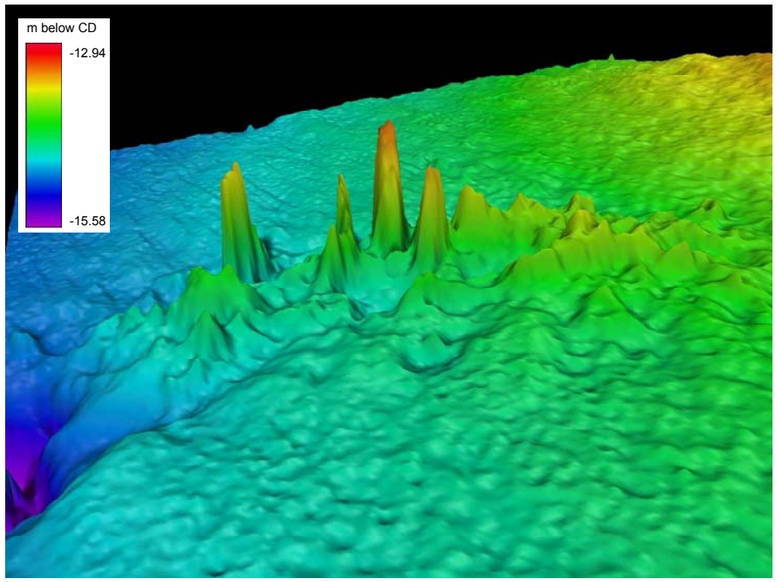
Figure 7

WA ID 70032 - *Nora* - UKHO 58338

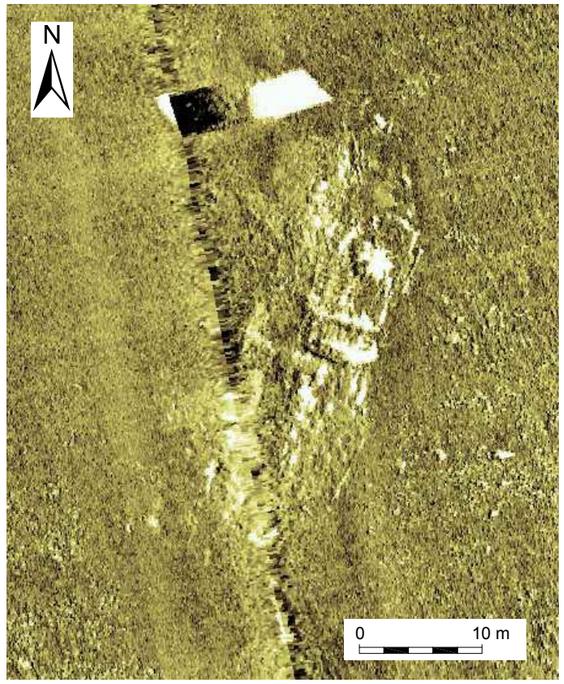
Location	318317 E, 5949285 N (UTM31N)	**Area**	Corridor A
Archaeological Importance	High		
Geophysical survey dimensions and notes	Dimensions: 40.4m x 20.6m x 2.5m. Broken up but coherent wreck. Some evidence of structure is seen but the superstructure is not intact and the hull shape cannot be discerned. The tallest part of the wreck is a rectangular object (5.6m x 3.5m x 2.5m) at the northern end. The majority of the wreck appears chaotic with linear dark reflectors characterising much of the remains. No surrounding debris field is present but a piece of debris is visible a short distance from the wreck and this measures 2.3m x 0.9m x 1.0m. Located in an area of flat rocky seabed with occasional small-medium sized rocks scattered in the vicinity. Associated with a very large magnetic anomaly (10218nT) indicating its construction and/or cargo involves a large amount of ferrous metal. Although there is no UKHO record at this location, previous assessments (WA 2005; WA 2007 and WA 2009) have interpreted it as possibly being the *Nora*. The UKHO recorded position for this wreck lies approximately 1.2km to the northwest, outside the development area.		
Build	**Type**	Danish steam cargo ship	
	Construction	Steel construction, one triple expansion engine, two single boilers	
	Dimensions	63.4m x 9.5m x 3.9m	
	Shipyard	Built 1910, Antwerp Engineering Co. Ltd., Hoboken, Antwerp	
Loss	**Cause**	Struck a mine and sank, 10/12/1916	
Extent of Survival		No superstructure is visible and the shape of the hull cannot be discerned indicating that the wreck has significantly degraded. Fragmented pieces of debris remain with one particular object possessing considerable height suggesting that it is a substantial item of wreckage.	



Magnetometer profile



Multibeam bathymetry oblique view, facing east-southeast with x6 vertical exaggeration



Sidescan sonar image

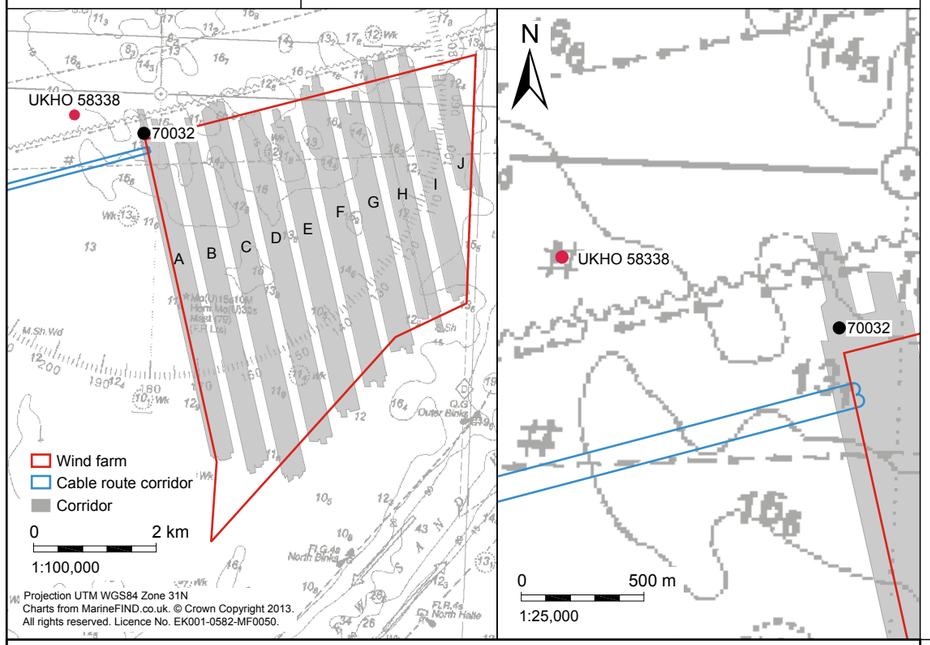


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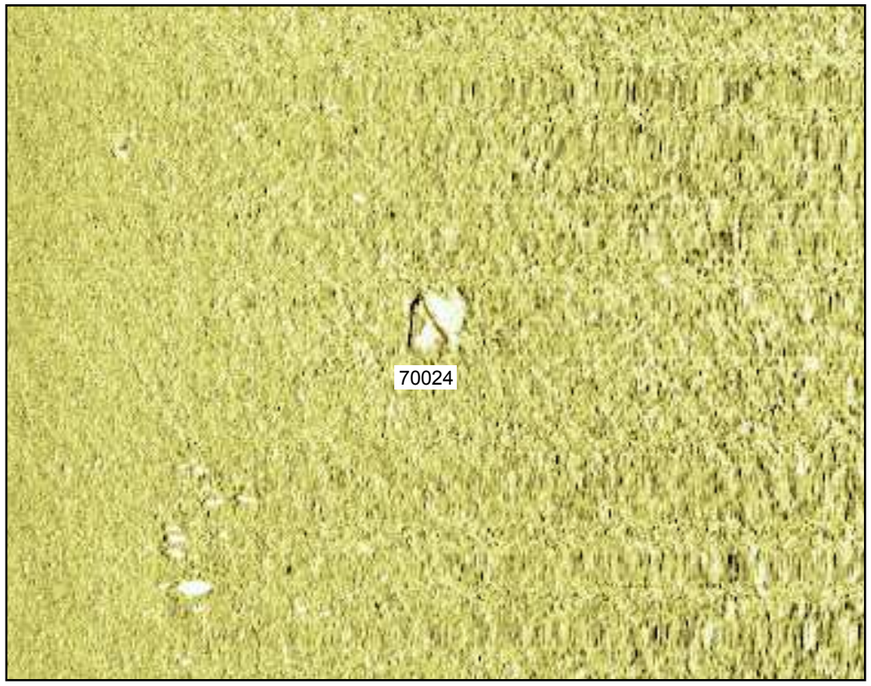
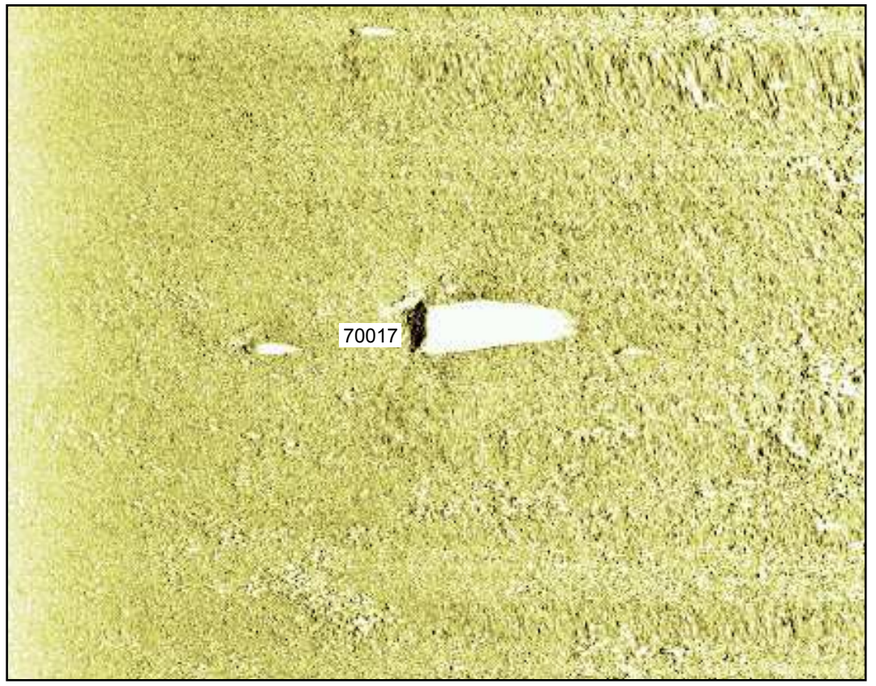
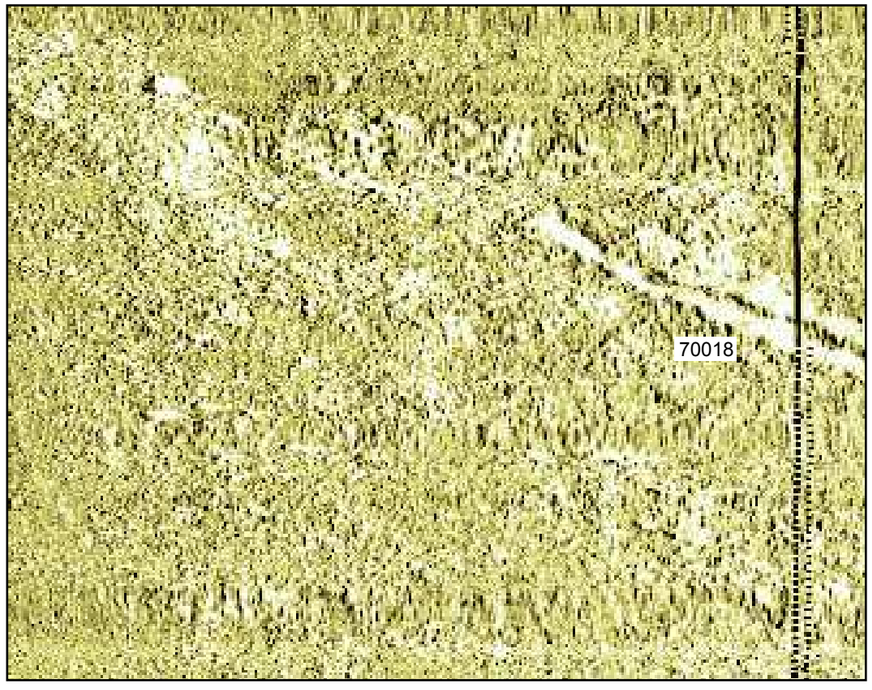
Figure 8



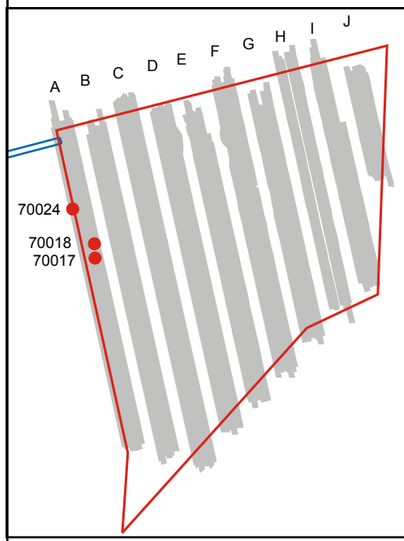
70024 - V-shaped item of debris measuring 2.4m x 1.5m x 0.2m. Located in an area of flat rocky seabed with occasional rocks scattered in the vicinity



70017 - Rectangular shaped item of debris measuring 4.6m x 1.1m x 1.1m. Located in an area of flat seabed with rocks scattered in the vicinity



70018 - Straight linear dark reflector measuring 13.5m x 1.3m x 0m. May represent a section of rope or cable but its form is quite indistinct. Located in an area of flat seabed with many small rocks



Wind farm

Export cable corridor

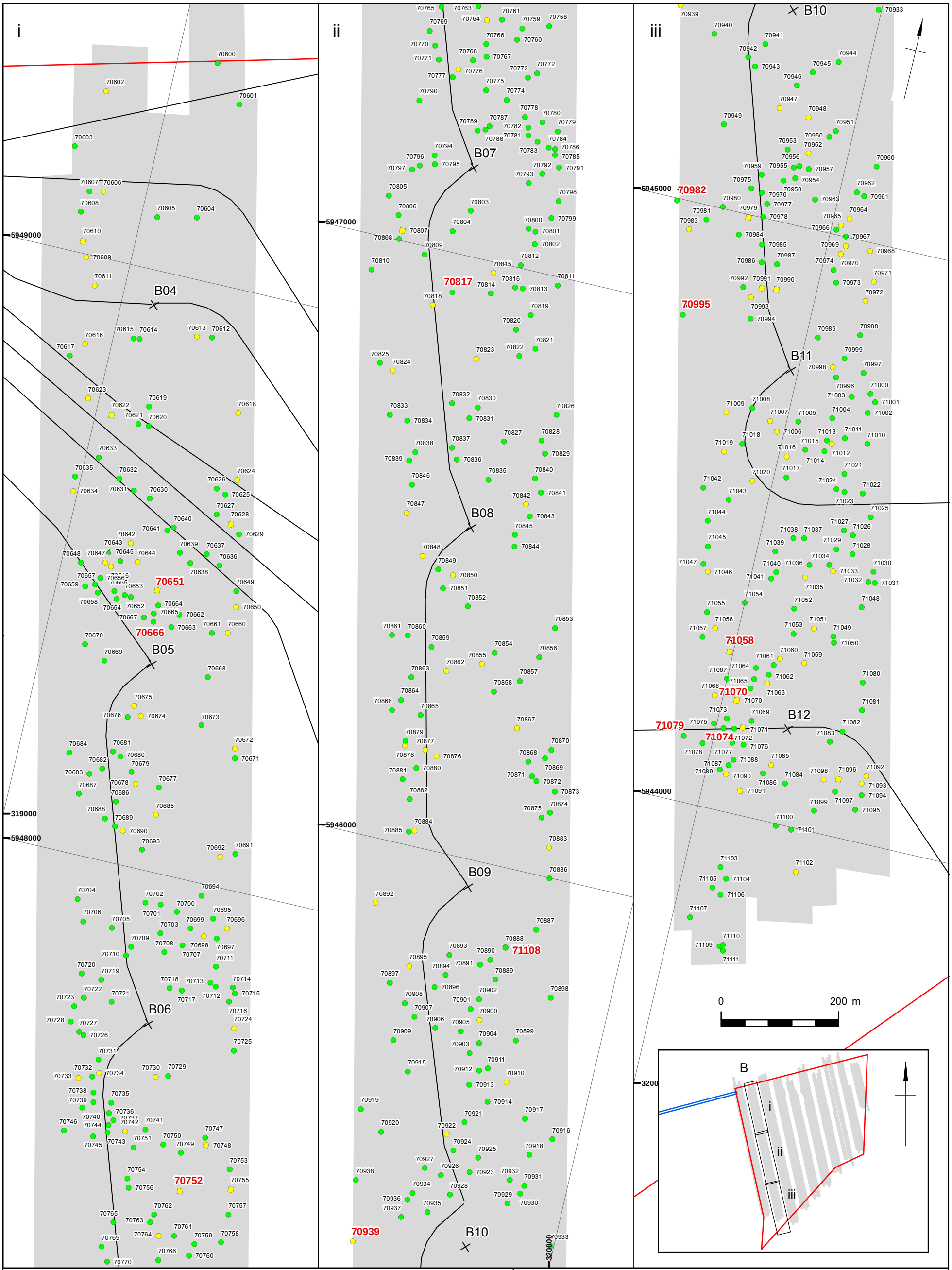
Corridors

Projection UTM WGS84 Zone 31N

Date:	11/11/2013
Revision Number:	0
Scale:	n/a
Illustrator:	KL
Path:	W:\Projects\85770\DO\Report figs
\Geophys Assessment\2013_11\seabed_features.dwg	

Examples of seabed features in Corridor A (taken from the sidescan sonar waterfall display and hence not to scale)

Figure 9



Wind farm

Export cable corridor

Inter-array cable route

Turbines

Sidescan sonar coverage

Archaeological anomalies

A1: Anthropogenic origin of archaeological interest (suspect)

A2: Uncertain origin of possible archaeological interest (suspect)

A2: Uncertain origin of possible archaeological interest (not suspect)

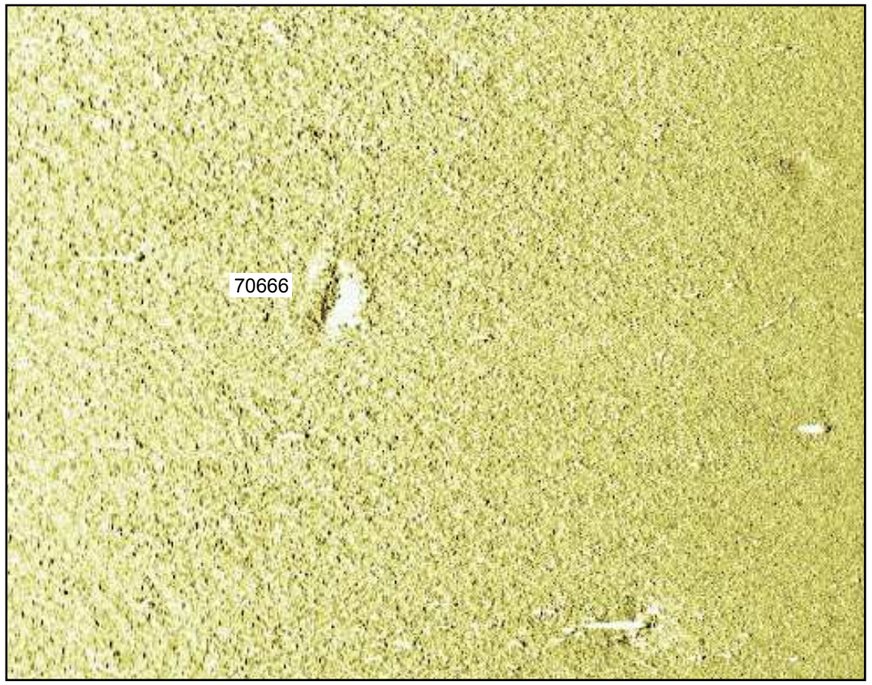
A3: Historic record of possible archaeological interest (not suspect)

70020 Anomalies discussed in text

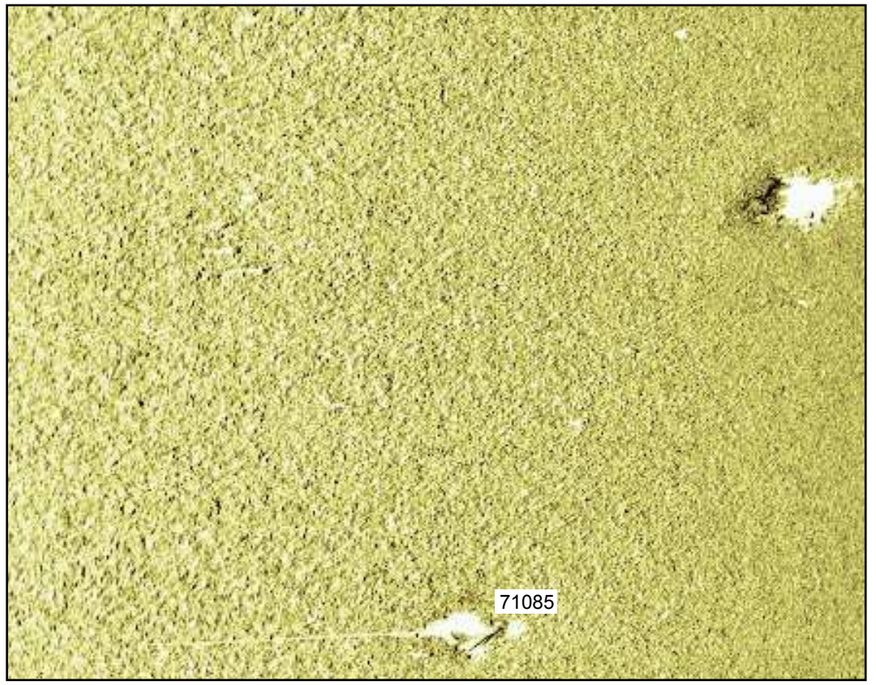
Date:	14/11/2013	Revision Number:	0
Scale:	1:6250 at A3	Illustrator:	KJF/KL
Path:	W:\Projects\85770\DO\Report figs\Geophys Assessment\2013_11\Fig10.mxd		

Sites of potential archaeological interest in Corridor B

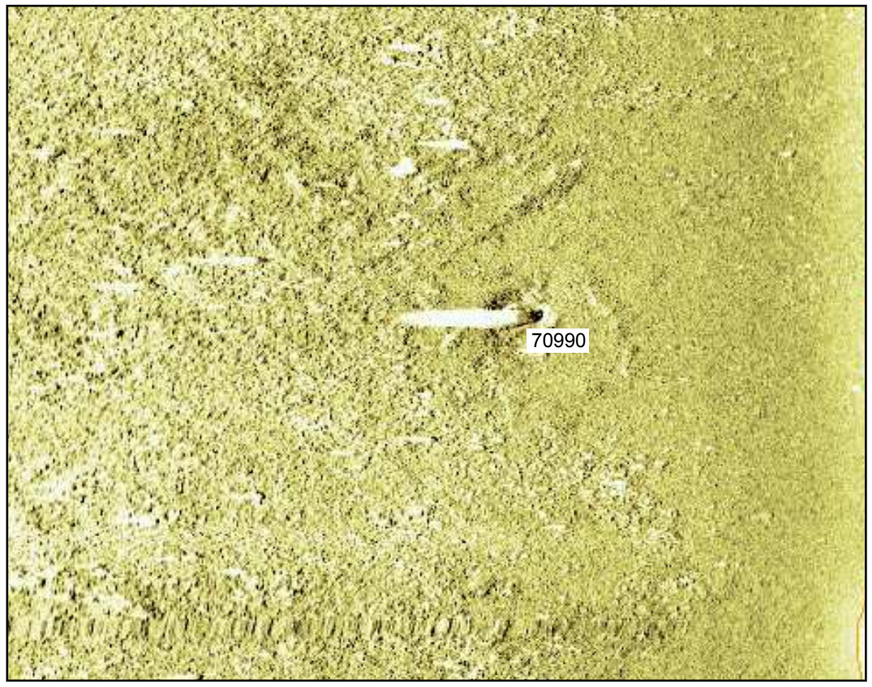
Figure 10



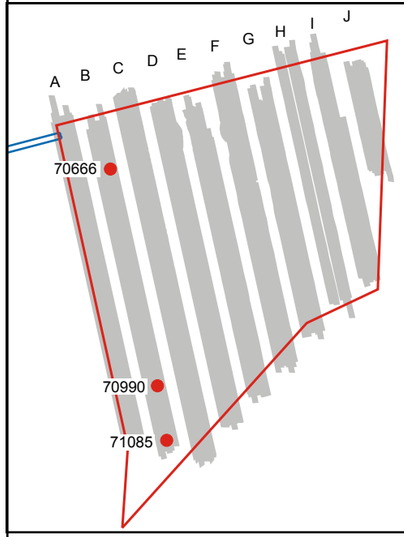
70666 - Sub-oval shaped area of seafloor disturbance measuring 7.4m x 2.5m x -0.2m. Located in an area of flat seabed with abundant small rocks in the vicinity. No associated magnetic anomaly



71085 - Elongate object with shadow, measuring 2.9m x 0.5m x 1.5m, and associated medium magnetic anomaly of 83nT. Possible piece of ferrous debris. Located just to the south of an area of disturbance caused by geotechnical operations at BH7, and could be related debris



70990 - Angular object with large shadow, measuring 1.8m x 1.4m x 0.8m, and an associated scour in an area of coarse sediment and boulders. Associated with a magnetic anomaly of 101nT it is possibly ferrous debris



Wind farm

Export cable corridor

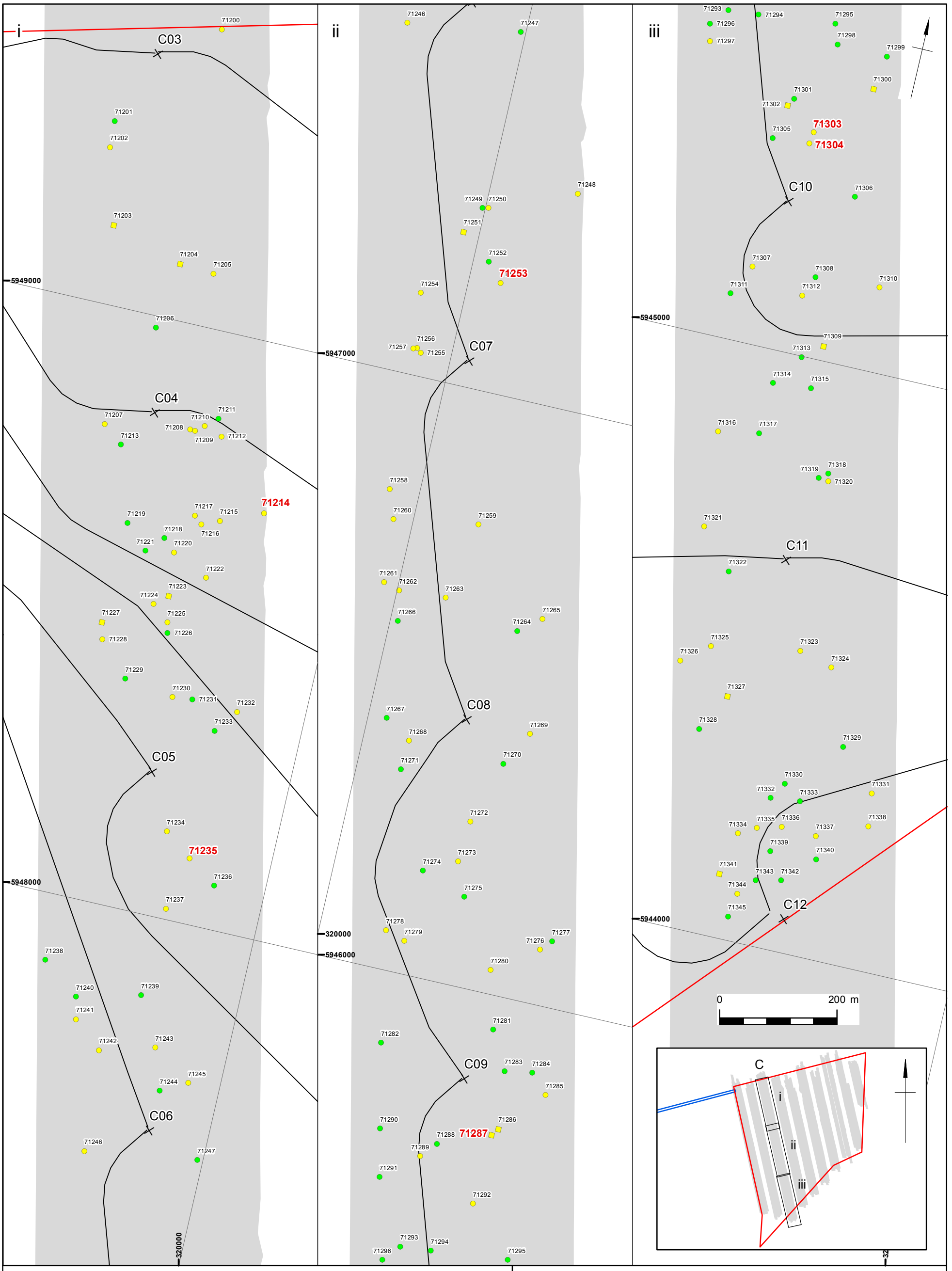
Corridors

Projection UTM WGS84 Zone 31N

Date:	11/11/2013
Revision Number:	0
Scale:	n/a
Illustrator:	KL
Path:	W:\Projects\85770\DO\Report figs
\Geophys Assessment\2013_11\seabed_features.dwg	

Examples of seabed features in Corridor B (taken from the sidescan sonar waterfall display and hence not to scale)

Figure 11



Wind farm
Export cable corridor
Inter-array cable route
Turbines
Sidescan sonar coverage

Archaeological anomalies

A1: Anthropogenic origin of archaeological interest (suspect)
A2: Uncertain origin of possible archaeological interest (suspect)
A2: Uncertain origin of possible archaeological interest (not suspect)
A3: Historic record of possible archaeological interest (not suspect)
70020 Anomalies discussed in text

Date:	14/11/2013	Revision Number:	0
Scale:	1:6250 at A3	Illustrator:	KJF/KL
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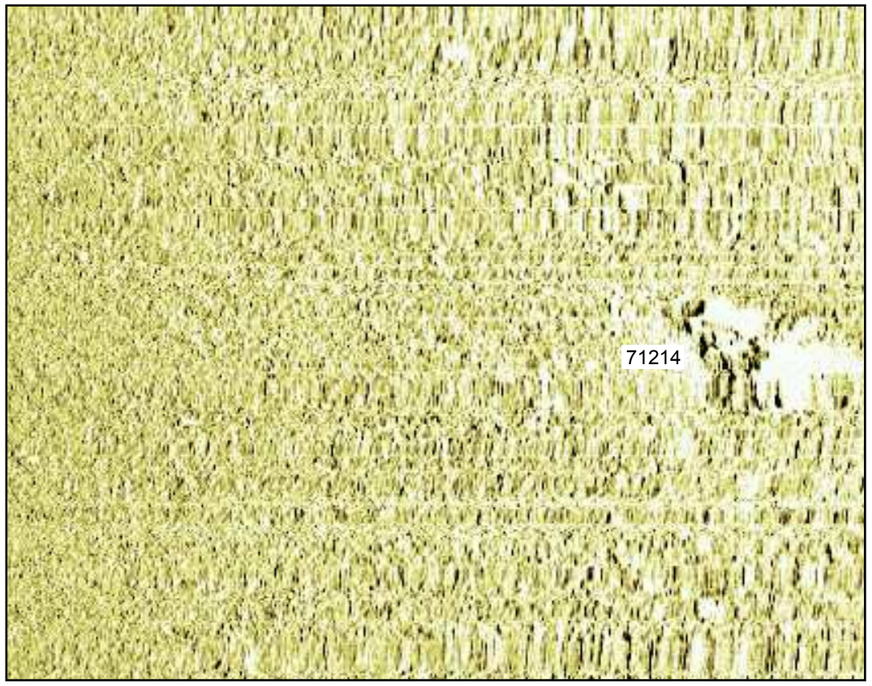
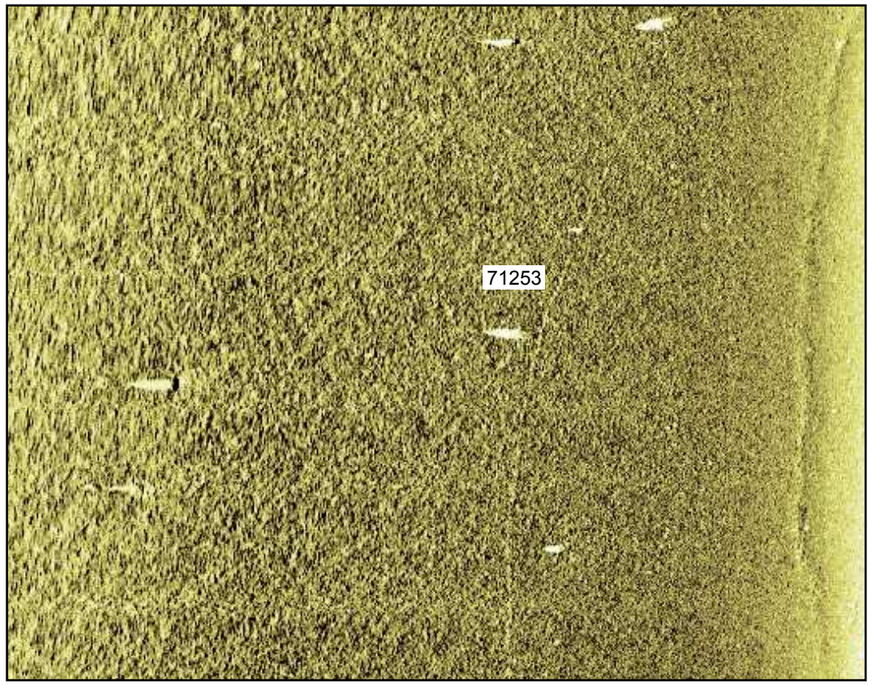
Sites of potential archaeological interest in Corridor C

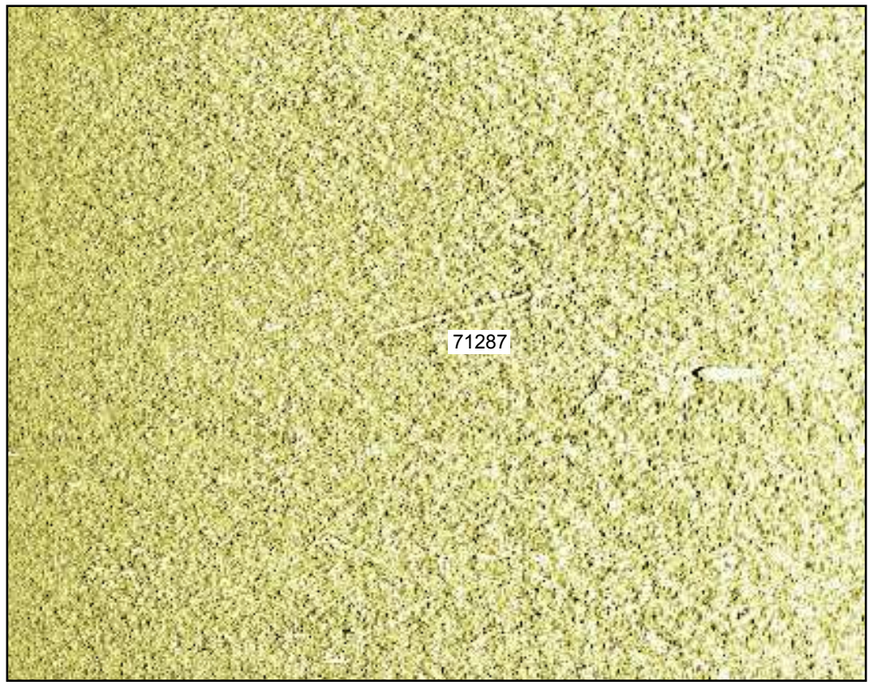
Figure 12



71214 - Small, irregular seabed mound, measuring 5.1m x 1.7m x 0.3m, comprising a number of dark reflectors with shadows. No associated magnetic anomaly. May be an area of non-ferrous debris



71253 - Curvilinear object with small shadow measuring 44.0m x 0.3m x 0.1m but no associated magnetic anomaly. Possible length of rope or chain. Small dark reflectors with shadows identified along its length, could also be fishing gear



71287 - Linear object measuring 10.6m x 0.9m x 0m. Associated with a large magnetic anomaly of 170nT identified on numerous survey lines. Possible piece of ferrous debris and the size of the magnetic anomaly indicates there may be further buried ferrous debris at the location

Wind farm

Export cable corridor

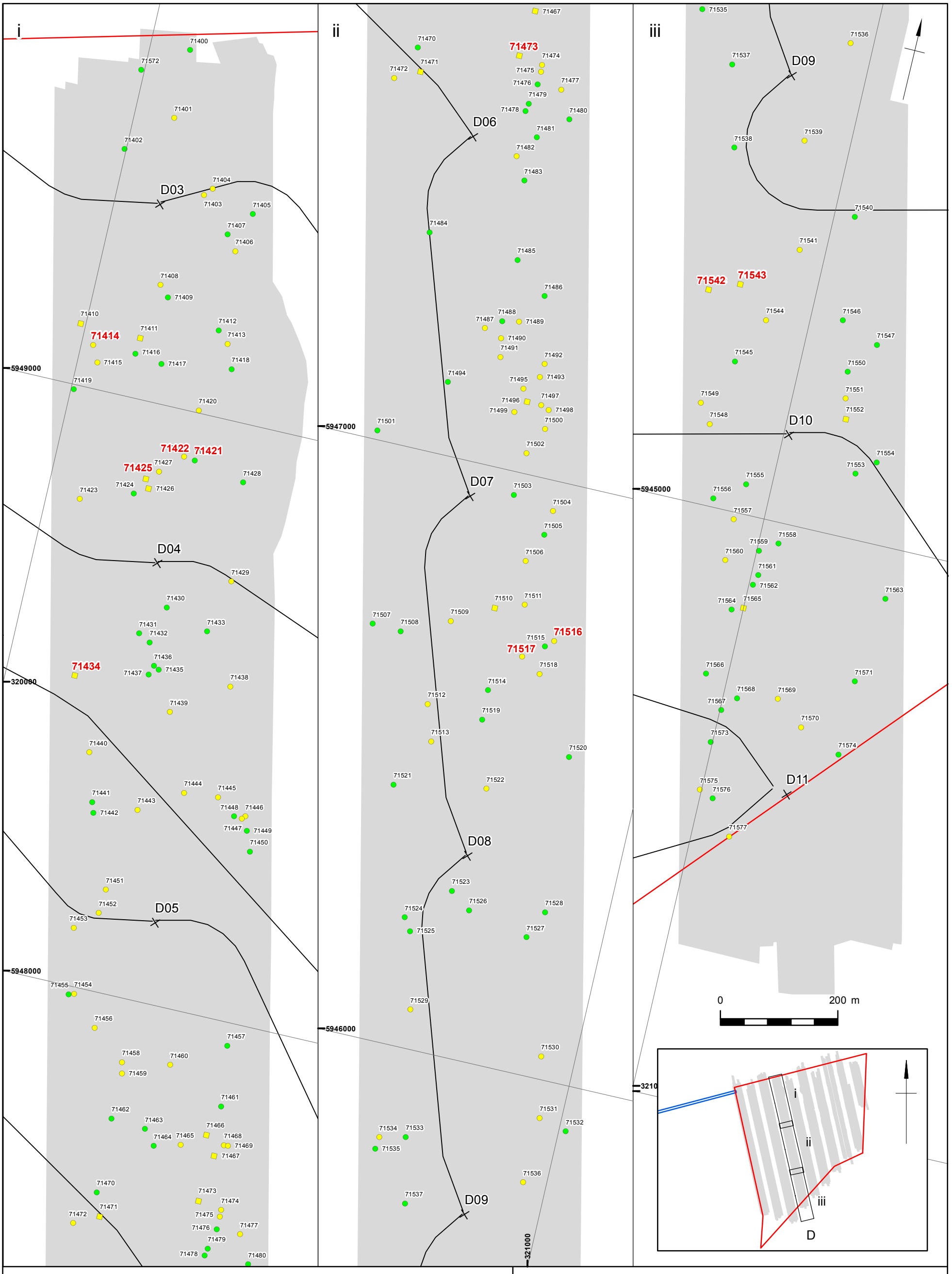
Corridors

Projection UTM WGS84 Zone 31N

Date:	14/11/2013
Revision Number:	0
Scale:	n/a
Illustrator:	KL
Path:	W:\Projects\85770\DO\Report figs
\Geophys Assessment\2013_11\seabed_features.dwg	

Examples of seabed features in Corridor C (taken from the sidescan sonar waterfall display and hence not to scale)

Figure 13



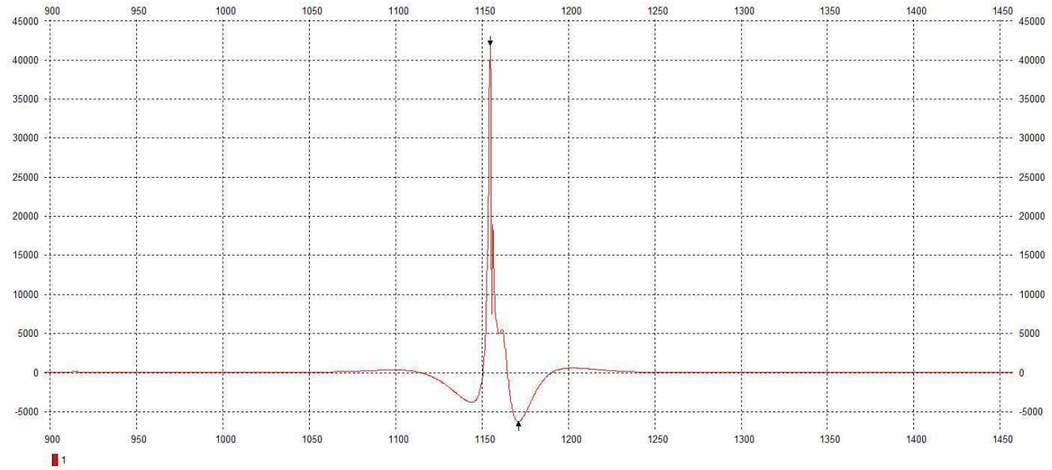
Date:	14/11/2013	Revision Number:	0
Scale:	1:6250 at A3	Illustrator:	KJF/KL
Path:	W:\Projects\85770\DO\Report figs\Geophys Assessment\2013_11\Fig14.mxd		

Sites of potential archaeological interest in Corridor D

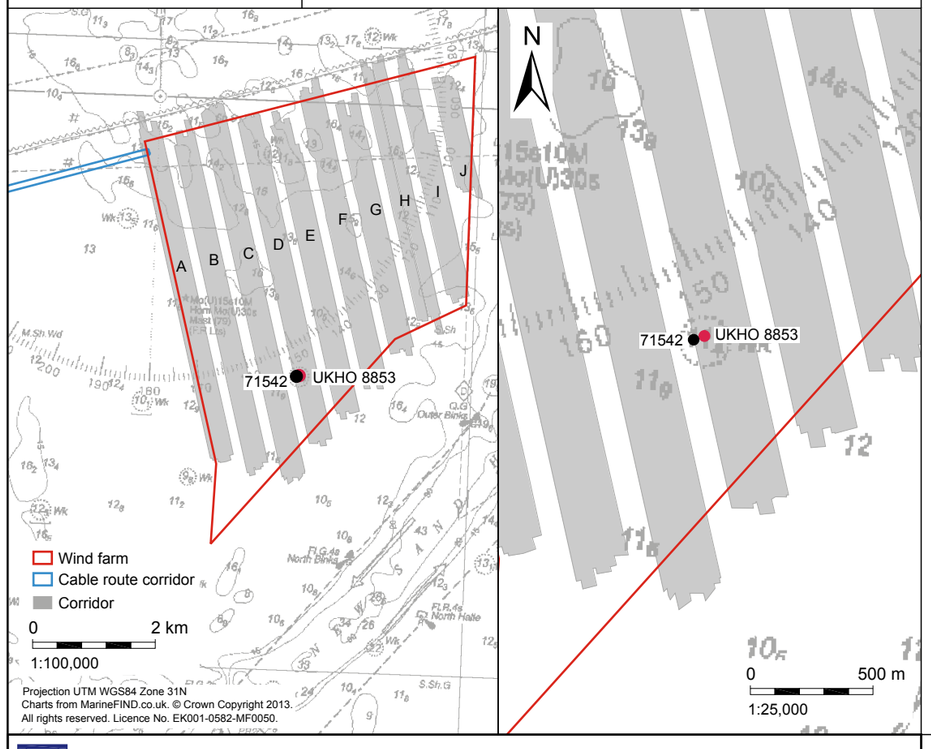
Figure 14

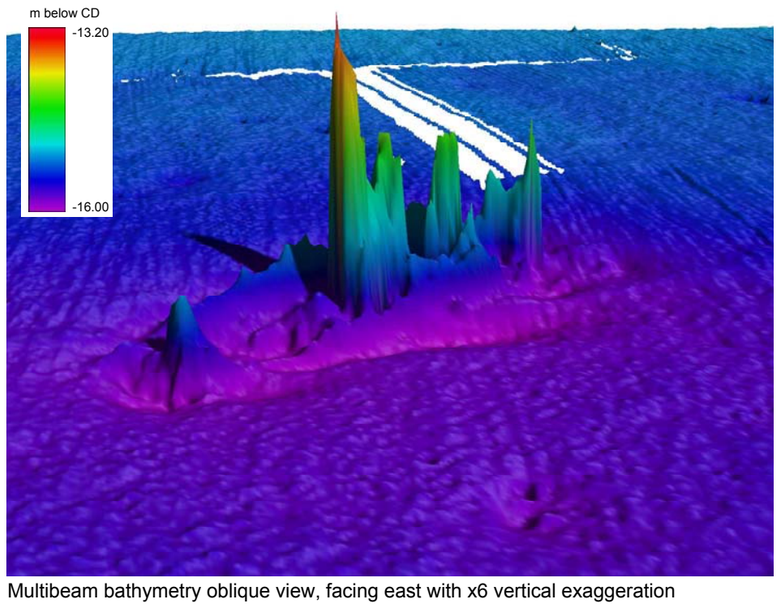
WA ID 71542 - *Ionic* (probably) - UKHO 8853

Location	320820 E, 5945359 N (UTM31N)	**Area**	Corridor D
Archaeological Importance	High		
Geophysical survey dimensions and notes	Dimensions: 30.9m x 6.5m x 2.5m. Wreck appears upright and mostly intact, with some structure clearly visible. An elliptical hull can be identified with significant height variation. Two small linear anomalies identified a short distance from the southeastern end are possibly related debris, though no significant debris field has been identified. A very large magnetic anomaly (48487nT) is associated with the wreck, which suggests a mostly ferrous construction.		
Build	**Type**	Steam trawler	
	Construction	Iron construction, 1 triple expansion engine, 1 single boiler	
	Dimensions	30.8m x 6.2m x 3.2m	
	Shipyard	Built 1890, Earles Shipbuilding & Engineering Co. Ltd, Kingston-Upon-Hull	
Loss	**Cause**	Sank 4 miles northeast of Spurn Head whilst in tow after a collision with the Hull Trawler *Hornbill*, 07/03/1928	
Extent of Survival	A clear elliptical hull appears to be mainly intact. Significant height suggests that some standing structure remains and that the vessel is upright. Some internal structure can be identified but the acoustic shadows obscure some areas. The bow of the vessel appears to be partially buried in the seabed to the southeast.		



Magnetometer profile

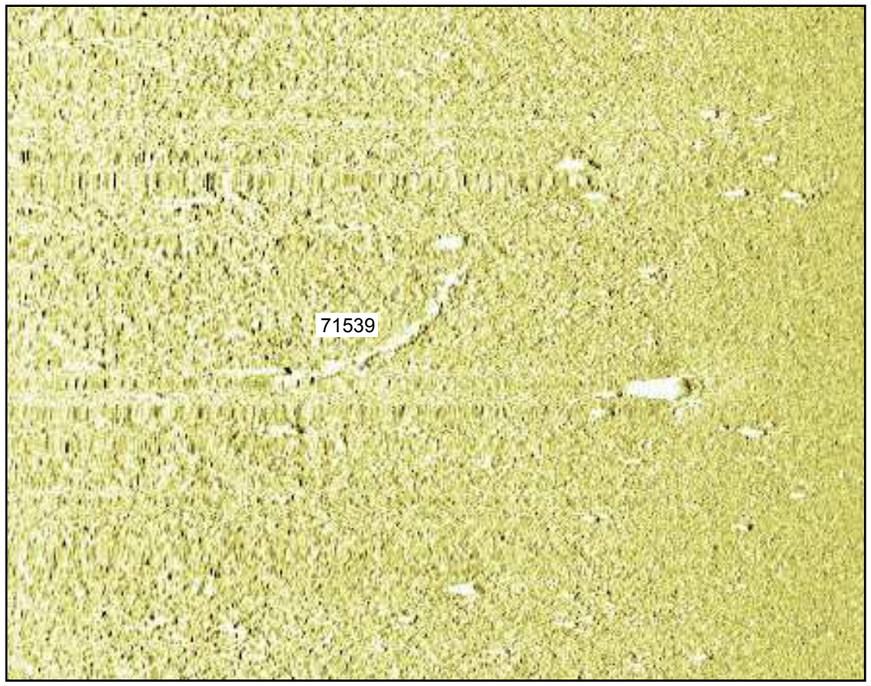




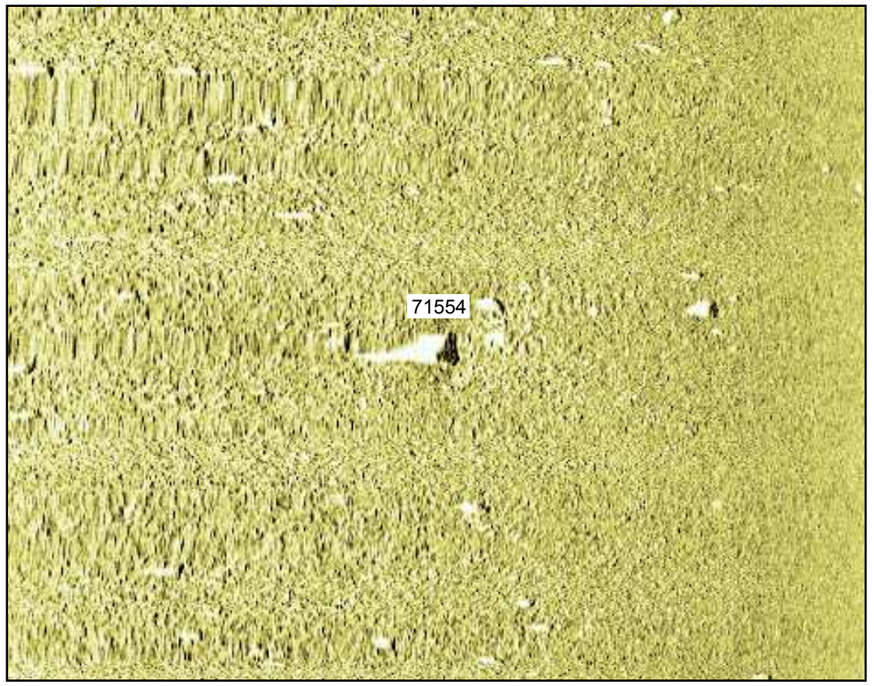
Multibeam bathymetry oblique view, facing east with x6 vertical exaggeration

Sidescan sonar image

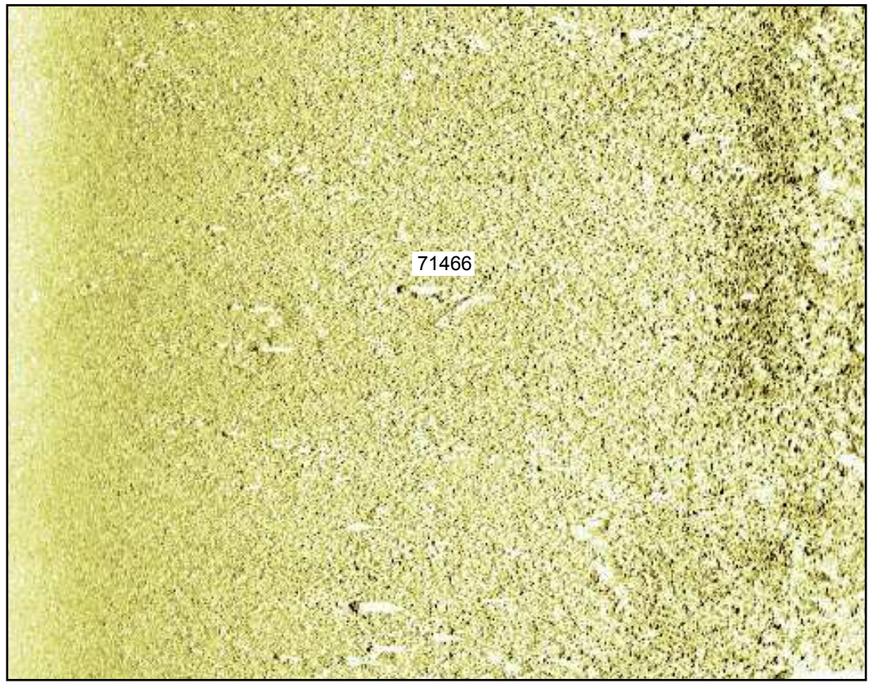
Date:	14/11/13	Revision Number:	0	Illustrator:	KL
Path:	W:\Projects\85770\DrawingOffice\Report figs\Geophys Assessment\2013_11\Fig15.dwg				



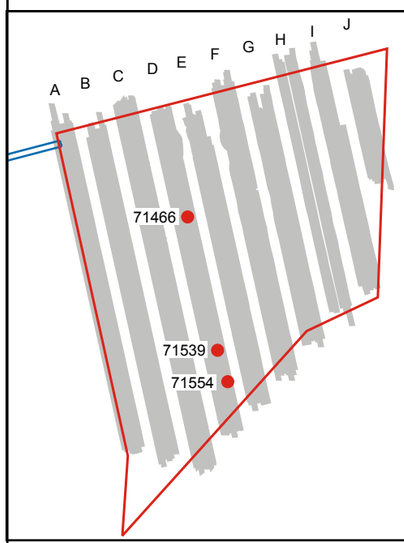
71539 - Irregular curvilinear object with small shadow, measuring 11.4m x 0.6m x 0.1m, associated with a magnetic anomaly of 30nT. Possible piece of ferrous debris



71554 - Irregular dark reflector with shadow, measuring 2.1m x 0.9m x 0.5m, located within an area of coarse seabed sediment. No associated magnetic anomaly so may be a piece of non-ferrous debris



71466 - Short, linear object with small shadow, measuring 3.2m x0.3m x 0.2m, associated with a large magnetic anomaly of 752nT identified across numerous survey lines. Possible piece of ferrous debris. The identified object is unlikely to have created such a large magnetic anomaly, so there is potential for a significant amount of buried ferrous debris to be present at this location



Wind farm

Export cable corridor

Corridors

Projection UTM WGS84 Zone 31N

Date:	14/11/2013
Revision Number:	0
Scale:	n/a
Illustrator:	KL
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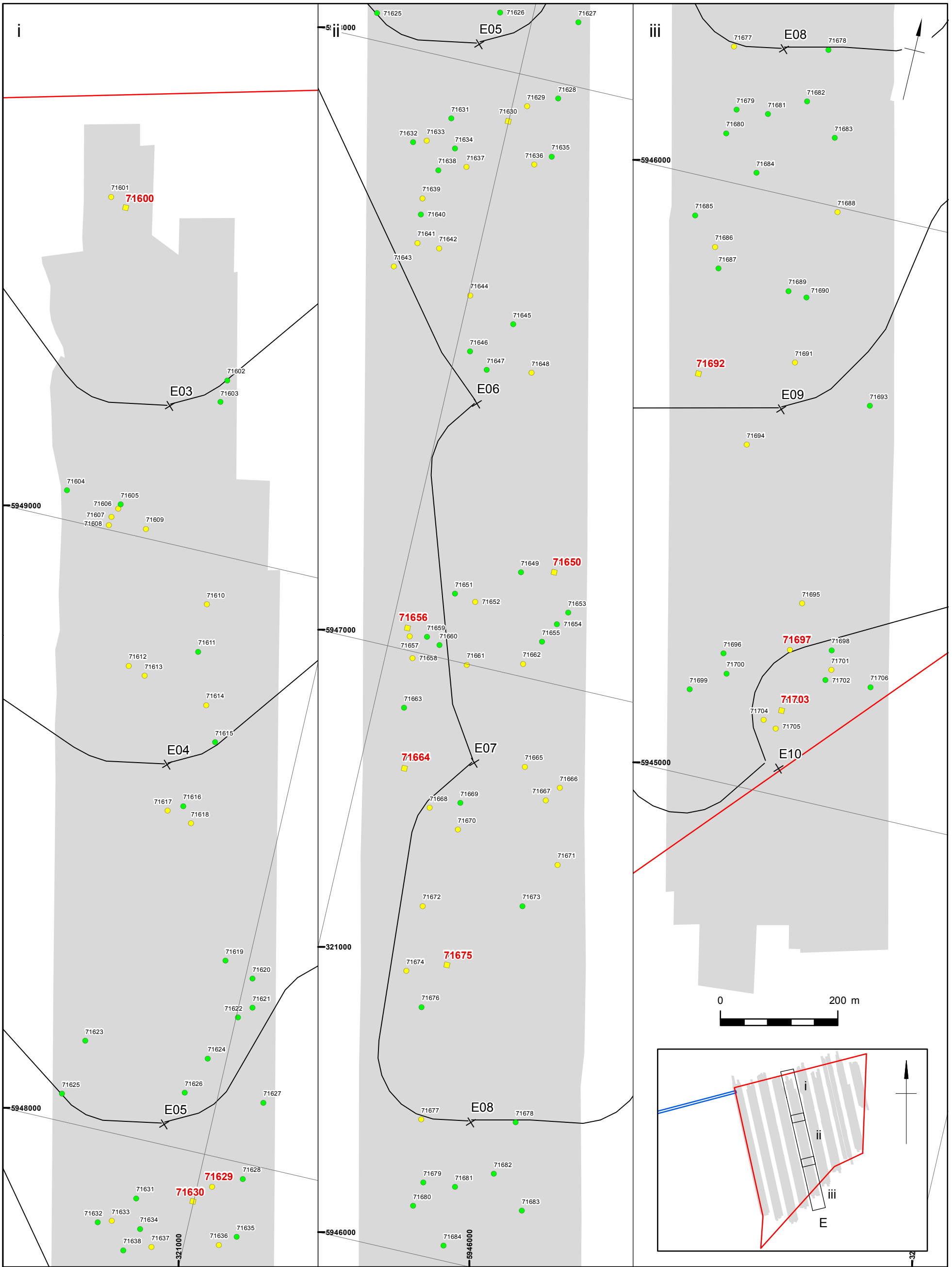
\Geophys Assessment\2013_11\seabed_features.dwg	

Examples of seabed features in Corridor D (taken from the sidescan sonar waterfall display and hence not to scale)

Figure 16



Wind farm
Export cable corridor
Inter-array cable route
Turbines
Sidescan sonar coverage

Archaeological anomalies

A1: Anthropogenic origin of archaeological interest (suspect)
A2: Uncertain origin of possible archaeological interest (suspect)
A2: Uncertain origin of possible archaeological interest (not suspect)
A3: Historic record of possible archaeological interest (not suspect)
70020 Anomalies discussed in text

Date:	08/11/2013	Revision Number:	0
Scale:	1:6250 at A3	Illustrator:	KJF/KL
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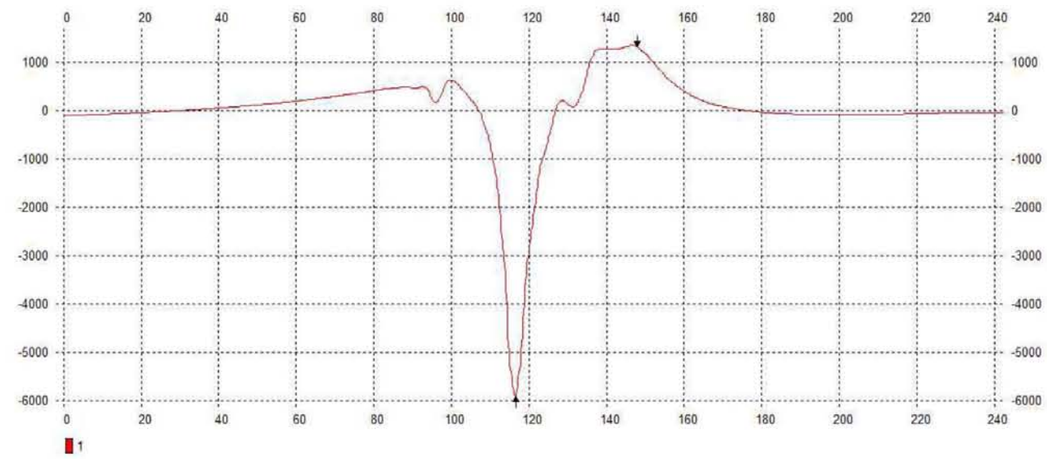
Sites of potential archaeological interest in Corridor E

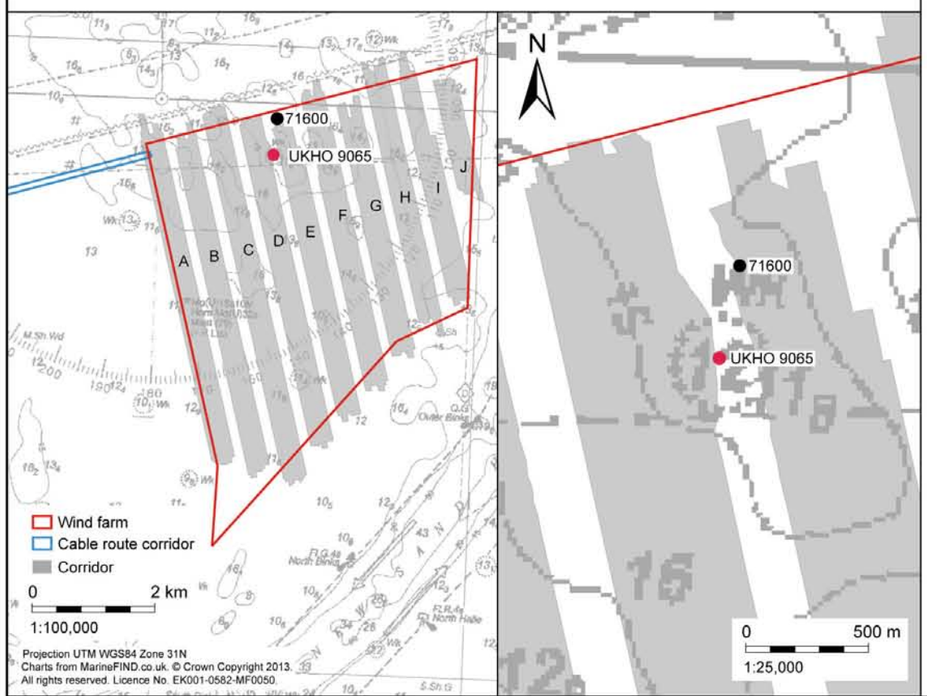
Figure 17

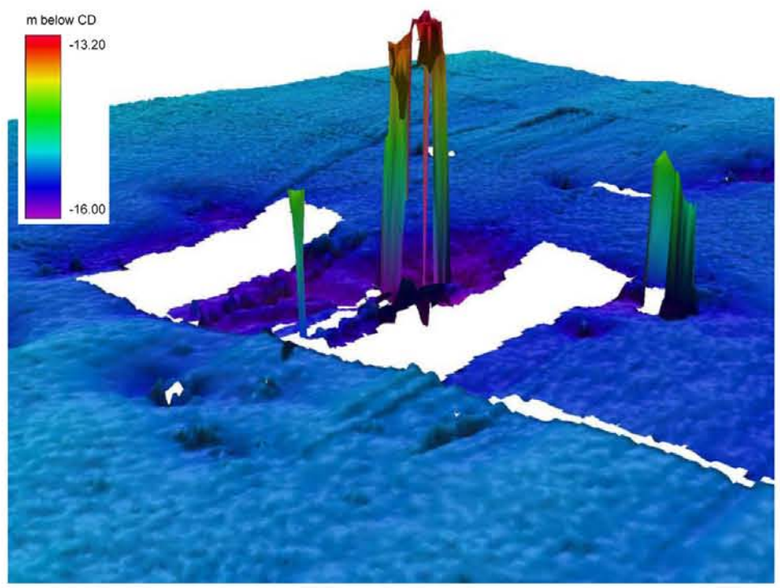
WA ID 71600 - *Marshall* (probably) - UKHO 9065

Location		320506 E, 5949542 N (UTM31N)	**Area**	Corridor E
Archaeological Importance		High		
Geophysical survey dimensions and notes		Dimensions: 38m x 13.7m x 1.8m. Clustered remains of fragmented debris with significant height but with no discernible structure visible. Numerous elongated dark reflectors of various sizes with distinct height visible. One small piece of debris has become detached and lies a short distance (approx 2m) from the remains of the main structure. Feature 71601 lies approx. 30m to the northwest and is possibly a debris field, or may be some debris interspersed with boulders. A very large magnetic anomaly (7293nT) associated with the wreck suggests the presence of metallic structure or cargo. This wreck may be that of the *Marshall*. The UKHO record is located 550m to the south and is not covered by interpreted data. However; the 2005 and 2009 assessment of earlier geophysical data (WA 2005, WA 2009) found no evidence for the wreck at the UKHO position and placed it approximately 40m northwest of the current position, near 71601.		
Build	**Type**	Steam passenger/cargo ship		
	Construction	Iron construction, steam compound, single boiler		
	Dimensions	Unknown		
	Shipyard	Built 1846, Shields		
Loss	**Cause**	Collided with the barque *Woodhouse* and sank, 26/11/1853		
Extent of Survival		Wreck is badly broken up and probably partially buried. Numerous features have significant height which suggests that some structure remains.		

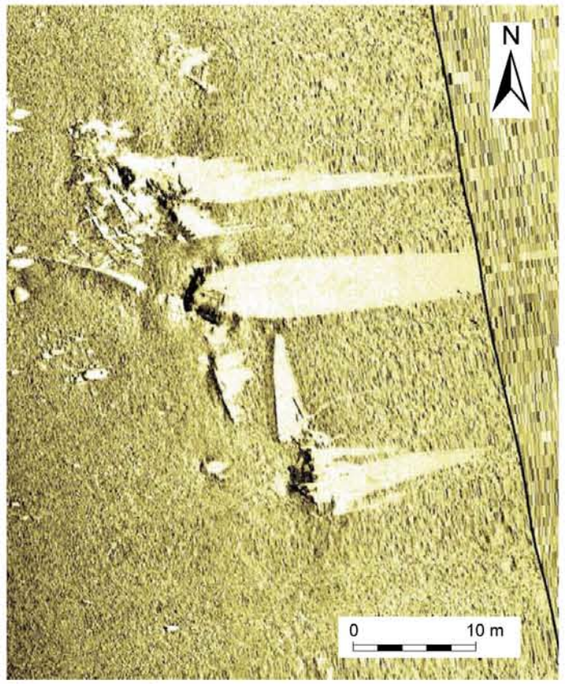


Magnetometer profile





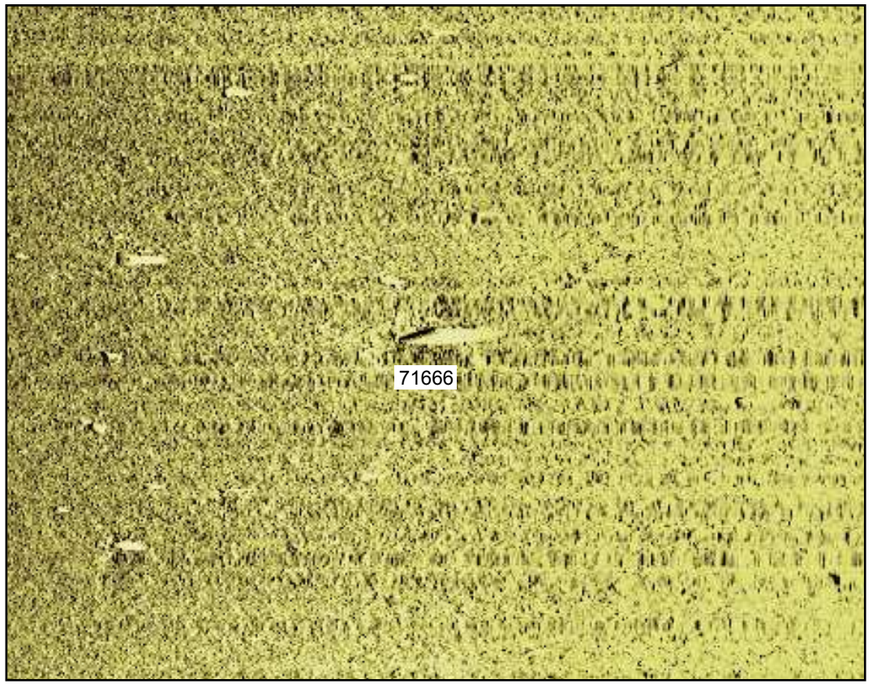
Multibeam bathymetry oblique view, facing north-east with x6 vertical exaggeration



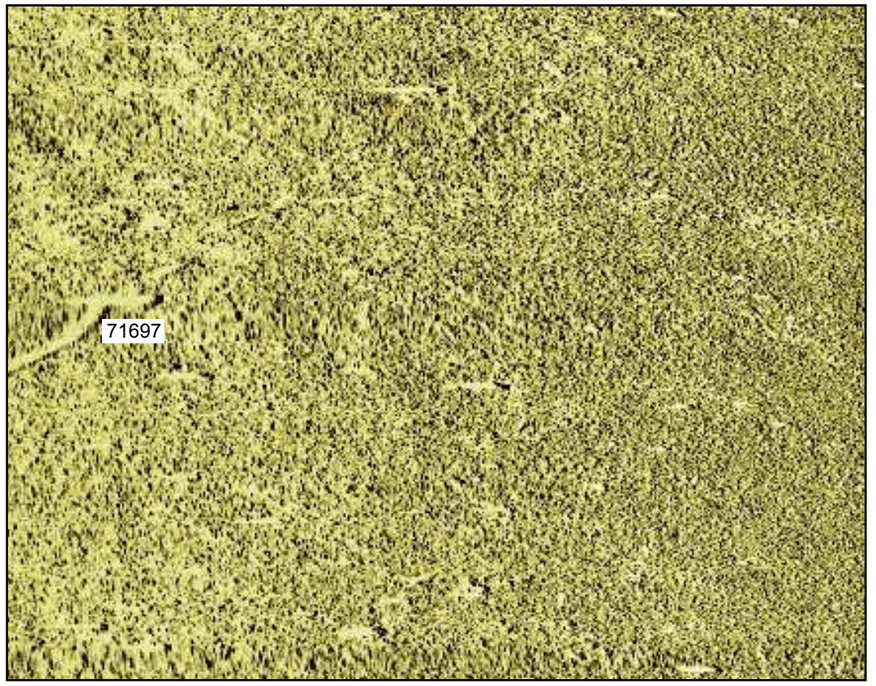
Sidescan sonar image

Date:	14/11/13	Revision Number:	0	Illustrator:	KL
Path:	W:\Projects\85770\DrawingOffice\Report figs\Geophys Assessment\2013_11\Fig18.dwg				

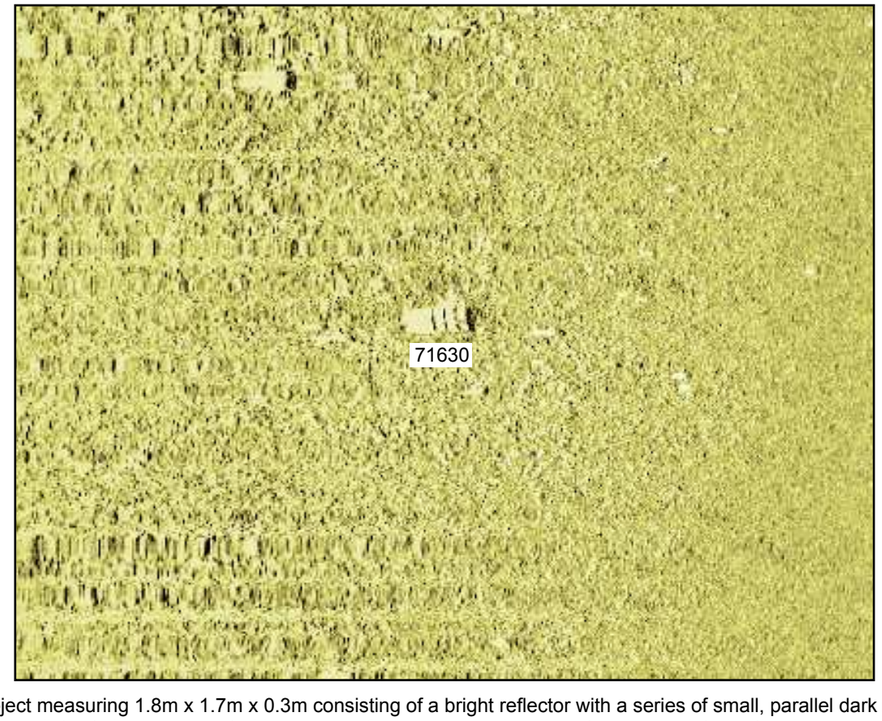
Figure 18



71666 - Elongate object with shadow, measuring 2.1m x 0.6m x 0.5m, located in an area of coarse seabed sediment. Possibly associated with a small magnetic anomaly of 30nT and may be a piece of ferrous debris



71697 - Curvilinear object with small shadow, measuring 18.0m x 0.6m x 0.1m, but no associated magnetic anomaly. Located in an area of coarse seabed sediment. Possible length of rope or chain



71630 - Object measuring 1.8m x 1.7m x 0.3m consisting of a bright reflector with a series of small, parallel dark reflectors running across it and a distinct shadow. Located in an area of coarse seabed sediment and associated with a large magnetic anomaly of 246nT. Probable piece of ferrous debris

Wind farm

Export cable corridor

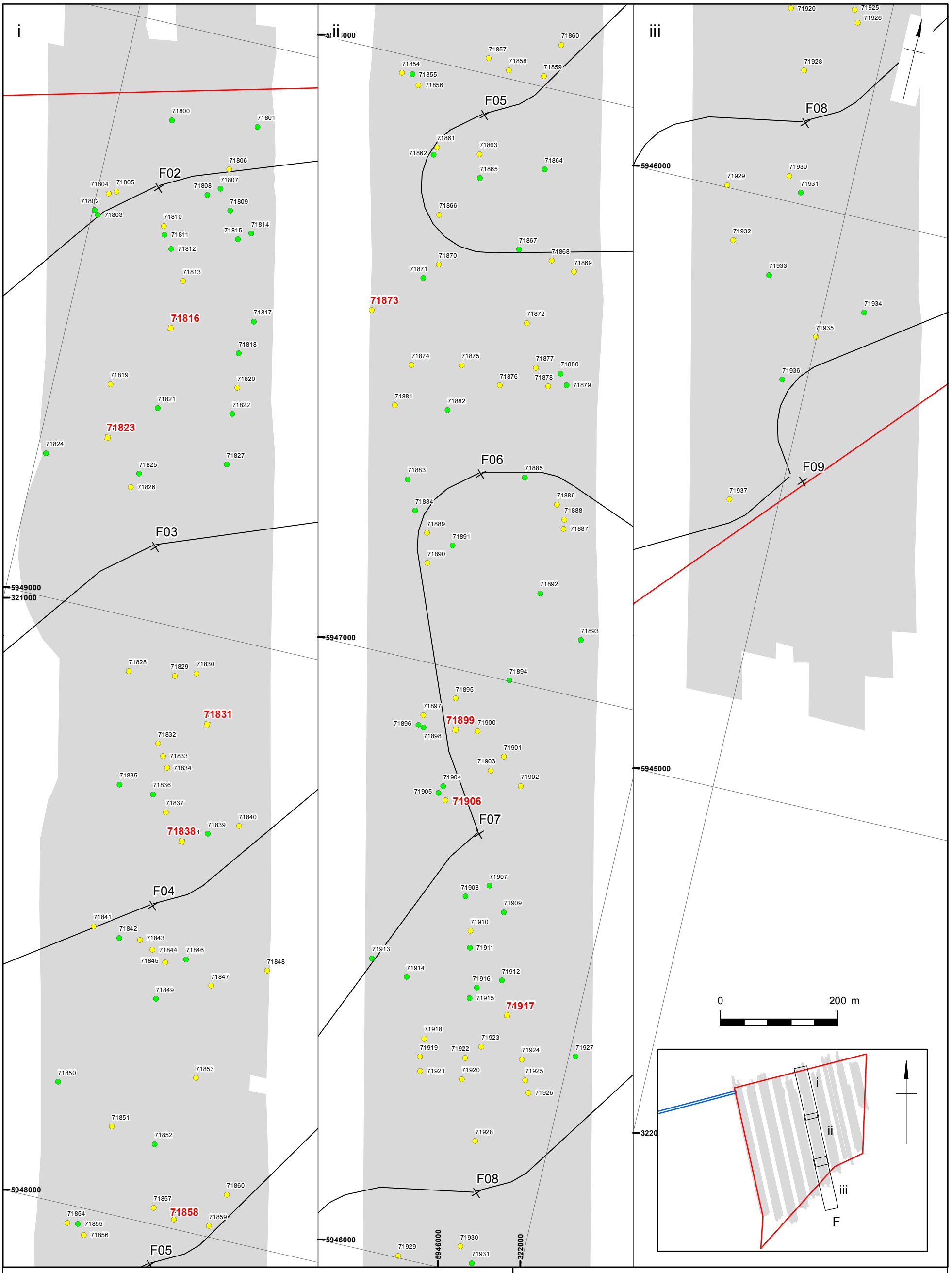
Corridors

Projection UTM WGS84 Zone 31N

Date:	11/11/2013
Revision Number:	0
Scale:	n/a
Illustrator:	KL
Path:	W:\Projects\85770\DO\Report figs
\Geophys Assessment\2013_11\seabed_features.dwg	

Examples of seabed features in Corridor E (taken from the sidescan sonar waterfall display and hence not to scale)

Figure 19



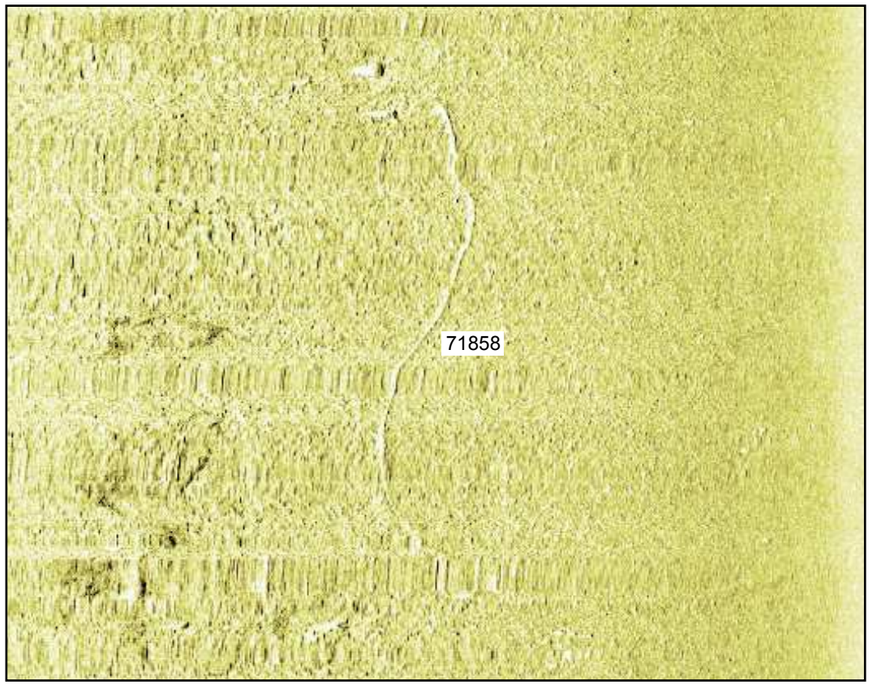
Wind farm
Export cable corridor
Inter-array cable route
Turbines
Sidescan sonar coverage

Archaeological anomalies
A1: Anthropogenic origin of archaeological interest (suspect)
A2: Uncertain origin of possible archaeological interest (suspect)
A2: Uncertain origin of possible archaeological interest (not suspect)
A3: Historic record of possible archaeological interest (not suspect)
70020 Anomalies discussed in text

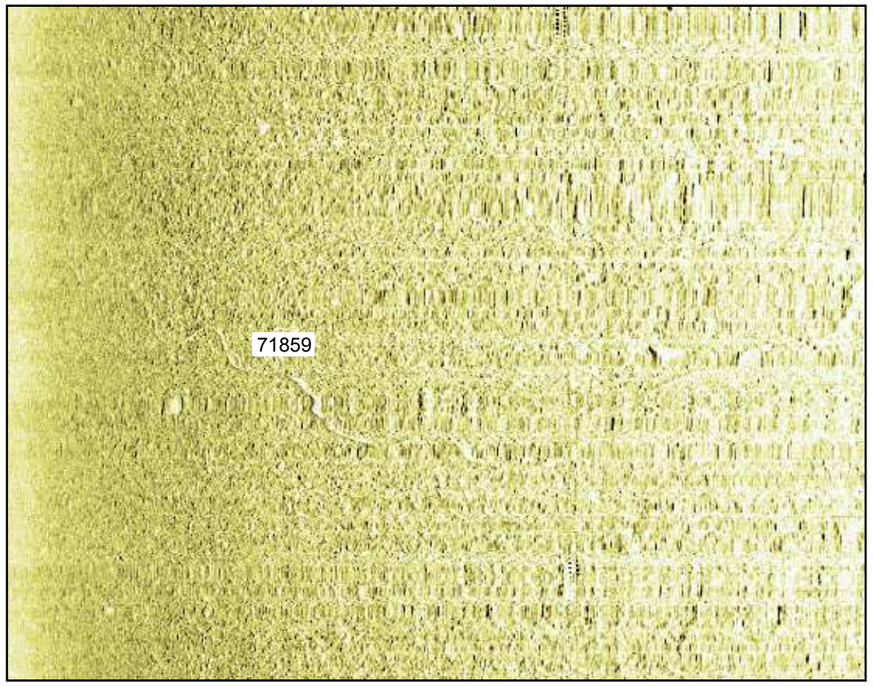
Date:	08/11/2013	Revision Number:	0
Scale:	1:6250 at A3	Illustrator:	KJF/KL
Path:	W:\Projects\85770\DO\Report figs\Geophys Assessment\2013_11\Fig20.mxd		

Sites of potential archaeological interest in Corridor F

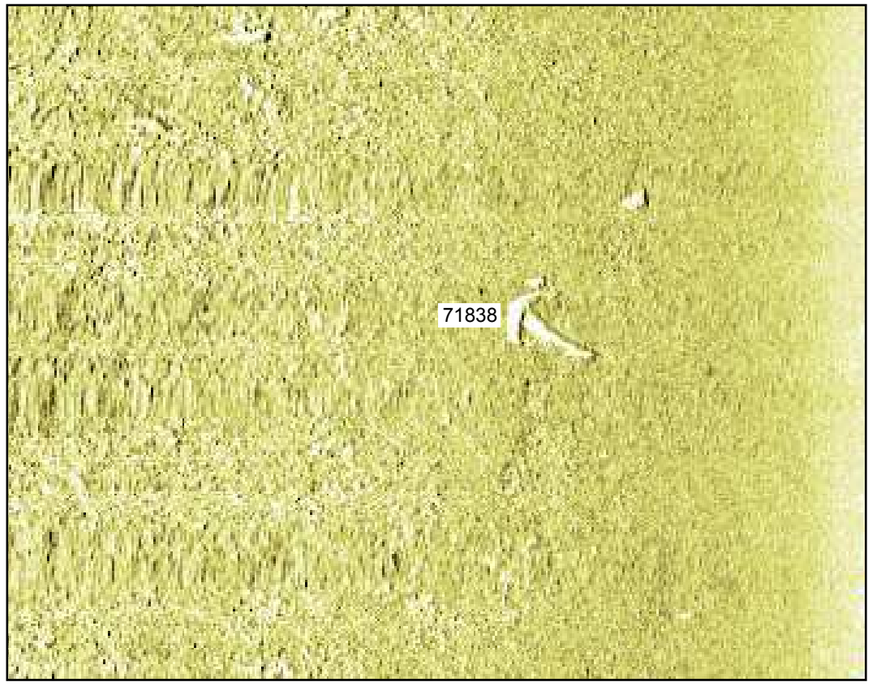
Figure 20



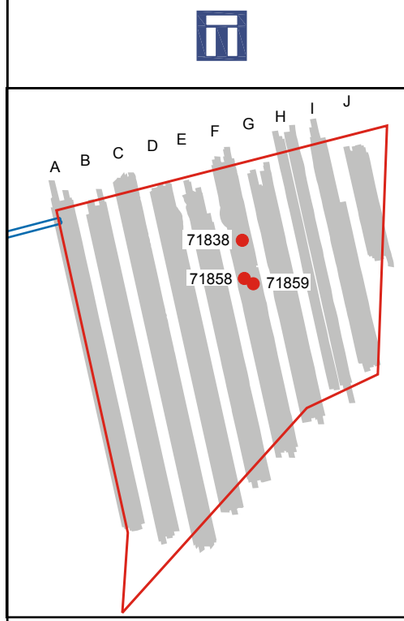
71858 - Curvilinear object with small shadow, measuring 24.4m x 0.5m x 0.1m, associated with a magnetic anomaly of 62nT, identified in an area of coarse seabed sediment. Possible length of rope or chain



71859 - Curvilinear object with small shadow, measuring 33.9m x 0.4m x 0.2m, but no associated magnetic anomaly, identified in an area of coarse seabed sediment. Possible length of rope or chain



71838 - Two short, linear objects with small shadows lying at an angle to each other and measuring 4.6m x 0.4m x0.2m within an area of coarse seabed sediment. Associated with a large magnetic anomaly of 530nT. Probable ferrous debris. It is possible that the identified objects do not wholly account for the large magnetic anomaly, suggesting there may be further buried ferrous debris within the vicinity



Wind farm

Export cable corridor

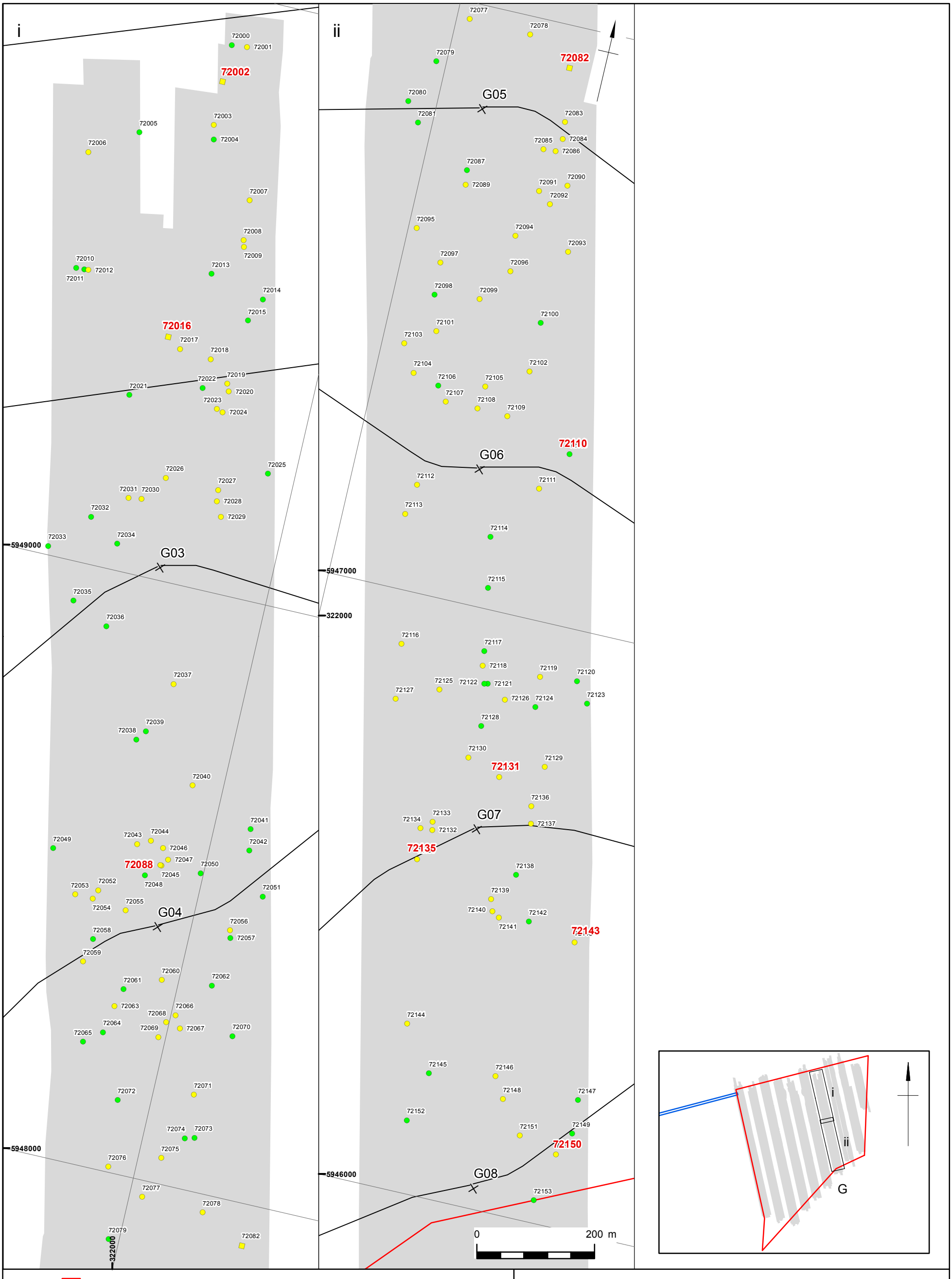
Corridors

Projection UTM WGS84 Zone 31N

Date:	11/11/2013
Revision Number:	0
Scale:	n/a
Illustrator:	KL
Path:	W:\Projects\85770\DO\Report figs
\Geophys Assessment\2013_11\seabed_features.dwg	

Examples of seabed features in Corridor F (taken from the sidescan sonar waterfall display and hence not to scale)

Figure 21



Wind farm
Export cable corridor
Inter-array cable route
Turbines
Sidescan sonar coverage

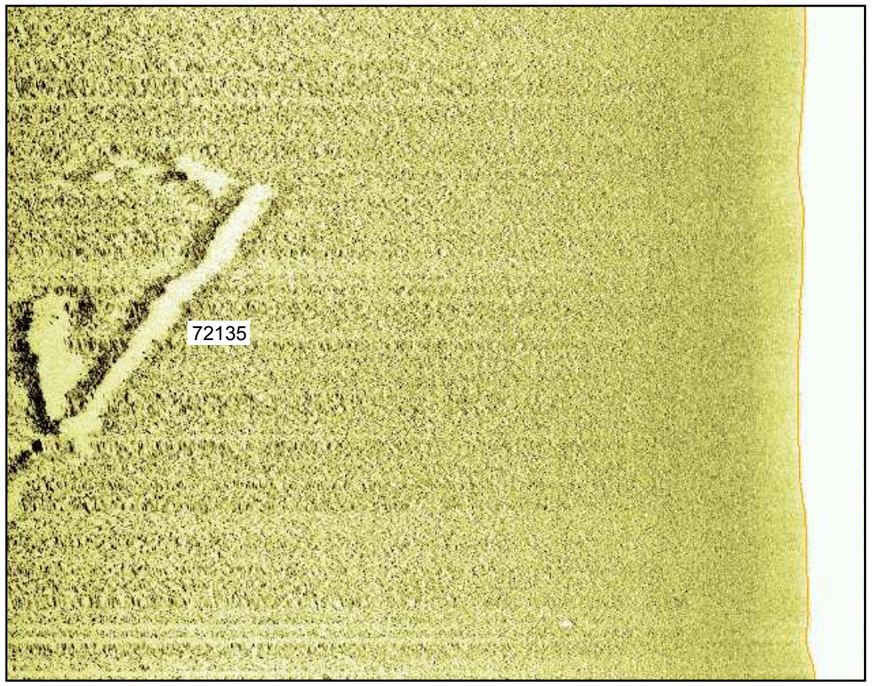
Archaeological anomalies

A1: Anthropogenic origin of archaeological interest (suspect)
A2: Uncertain origin of possible archaeological interest (suspect)
A2: Uncertain origin of possible archaeological interest (not suspect)
A3: Historic record of possible archaeological interest (not suspect)
70020 Anomalies discussed in text

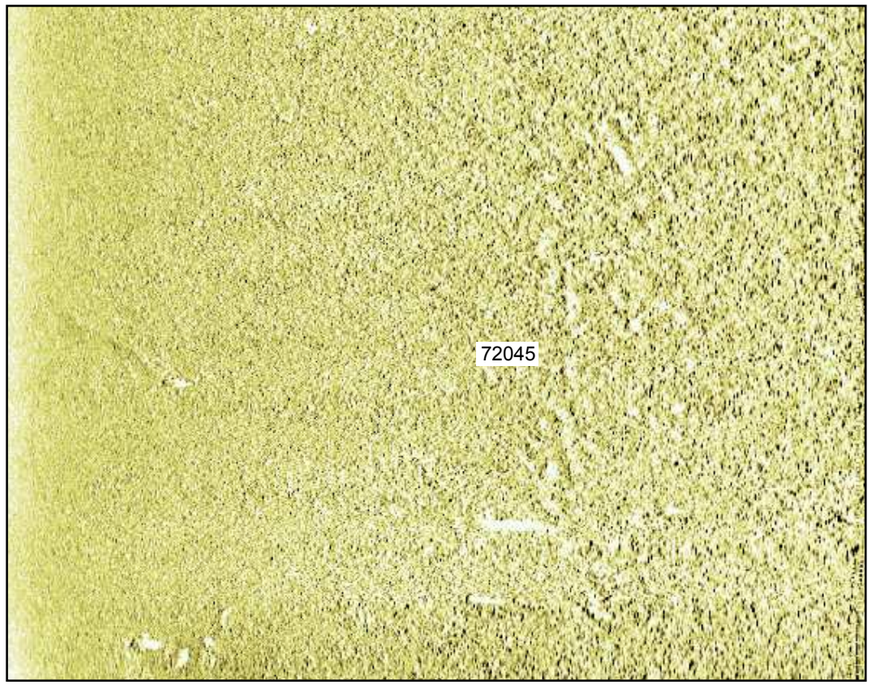
Date:	14/11/2013	Revision Number:	0
Scale:	1:6250 at A3	Illustrator:	KJF/KL
Path:	W:\Projects\85770\DO\Report figs\Geophys Assessment\2013_11\Fig22.mxd		

Sites of potential archaeological interest in Corridor G

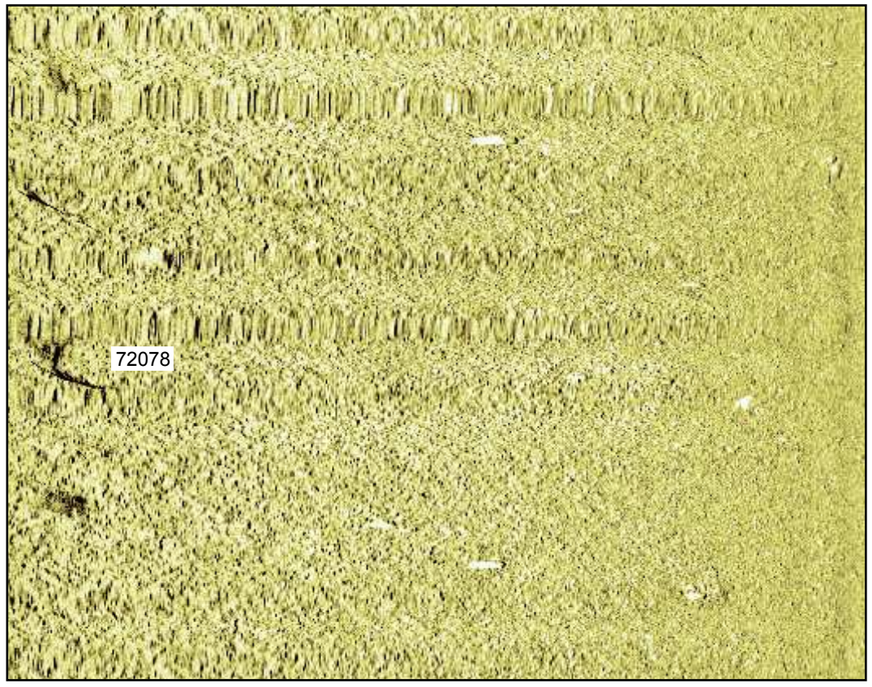
Figure 22



72135 - Area of seafloor disturbance containing seabed scars, measuring 43.6m x 14.5m x 0m, without an associated magnetic anomaly. Could indicate buried ferrous debris, or be the result of geotechnical work undertaken at nearby location BH12



72045 - Rectangular bright reflector, measuring 3.5m x 0.9m x 0m, located close to an area of irregular seabed and surrounded by coarse seabed sediment. Associated with a large magnetic anomaly of 203nT. Possible piece of ferrous debris, which may be partially buried



72078 - Curvilinear dark reflector without a shadow or associated magnetic anomaly, measuring 5.6m x 0.5m x 0m, located in an area of coarse seabed sediment. Could possibly be a piece of non-ferrous debris.

N

Wind farm

Export cable corridor

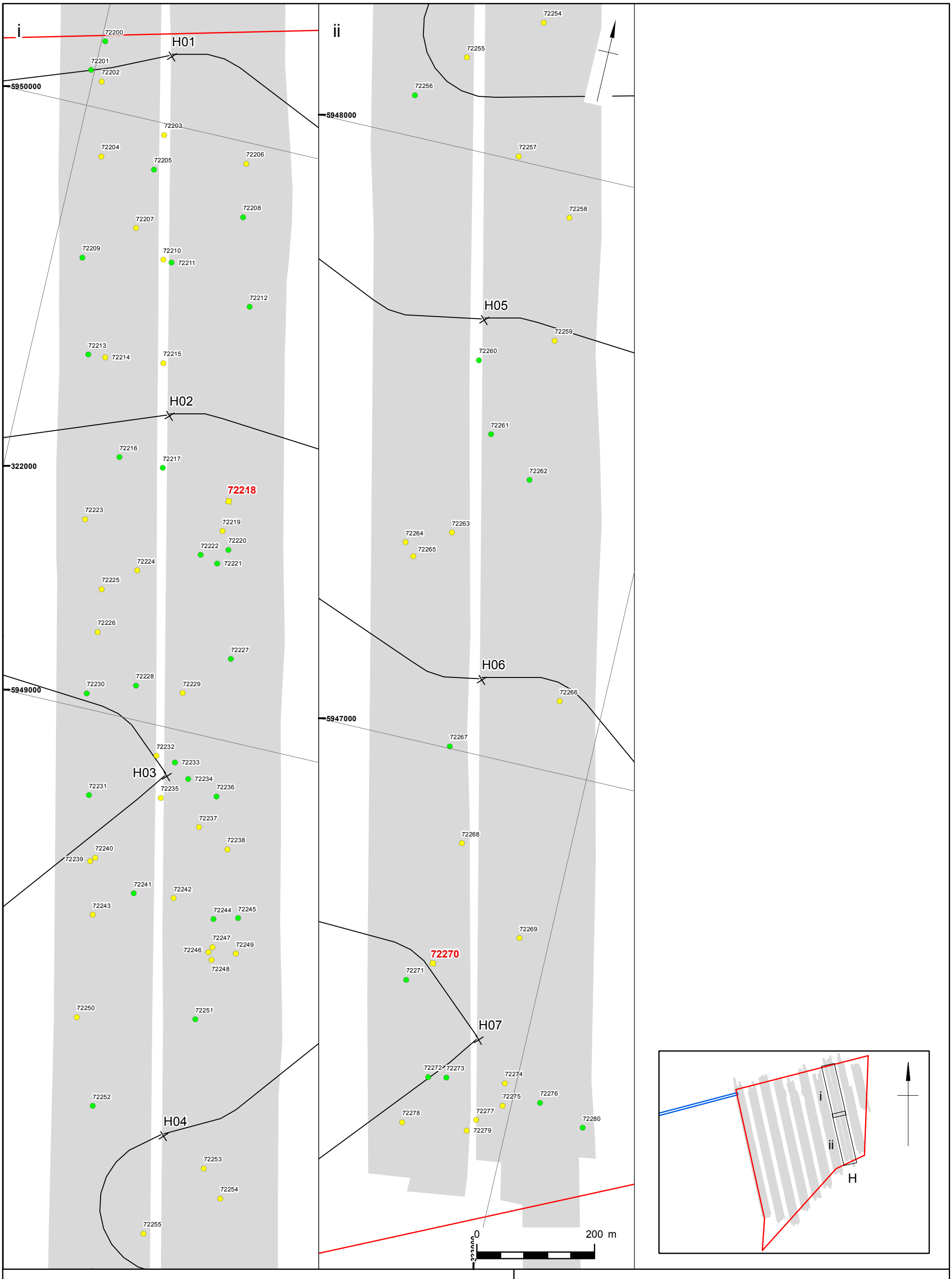
Corridors

Projection UTM WGS84 Zone 31N

Date:	11/11/2013
Revision Number:	0
Scale:	n/a
Illustrator:	KL
Path:	W:\Projects\85770\DO\Report figs
\Geophys Assessment\2013_11\seabed_features.dwg	

Examples of seabed features in Corridor G (taken from the sidescan sonar waterfall display and hence not to scale)

Figure 23



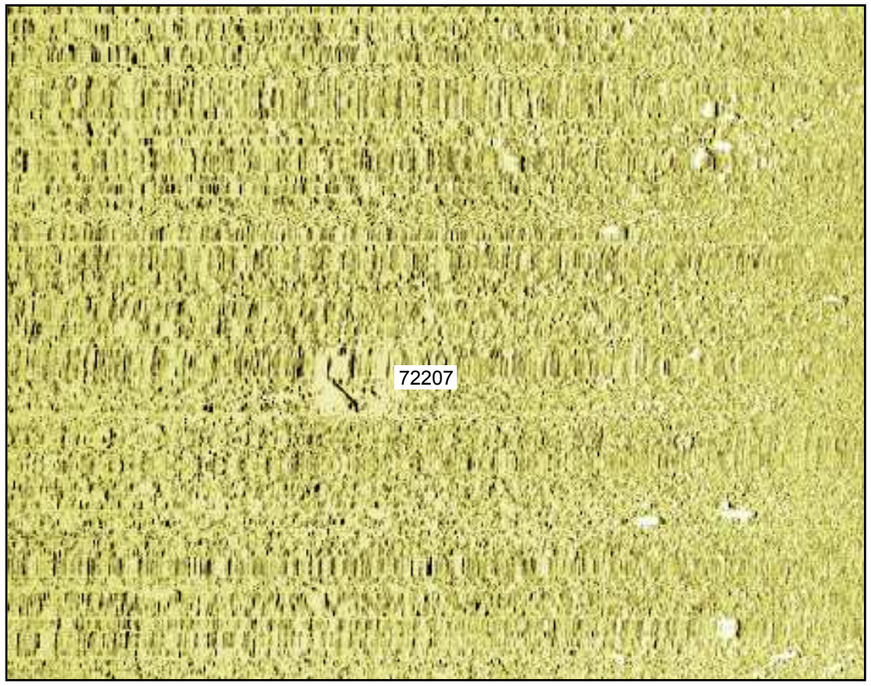
Wind farm
Export cable corridor
Inter-array cable route
Turbines
Sidescan sonar coverage

Archaeological anomalies
A1: Anthropogenic origin of archaeological interest (suspect)
A2: Uncertain origin of possible archaeological interest (suspect)
A2: Uncertain origin of possible archaeological interest (not suspect)
A3: Historic record of possible archaeological interest (not suspect)
70020 Anomalies discussed in text

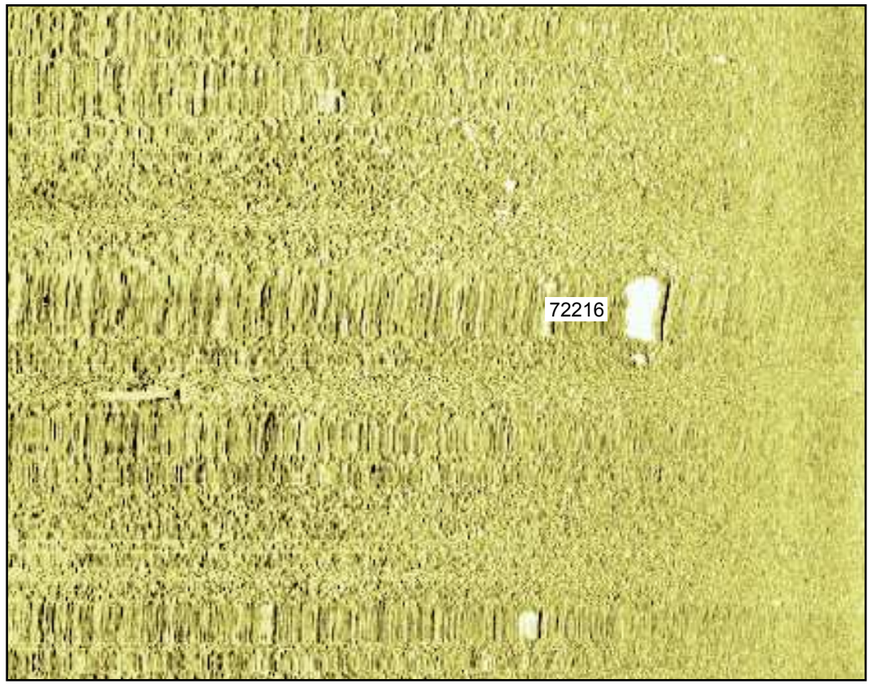
Date:	08/11/2013	Revision Number:	0
Scale:	1:6250 at A3	Illustrator:	KJF/KL
Path:	W:\Projects\85770\DO\Report figs\Geophys Assessment\2013_11\Fig24.mxd		

Sites of potential archaeological interest in Corridor H

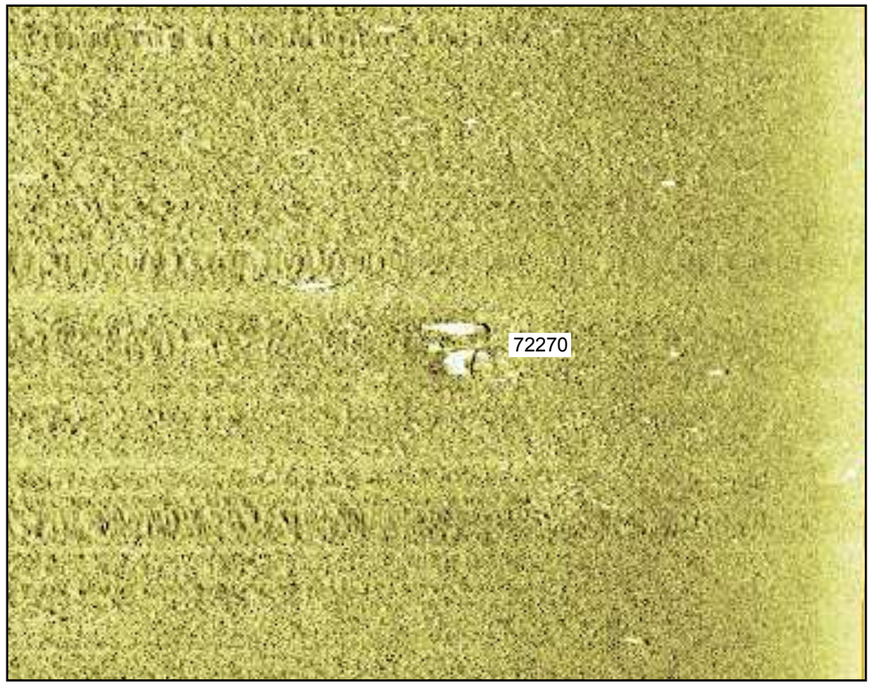
Figure 24



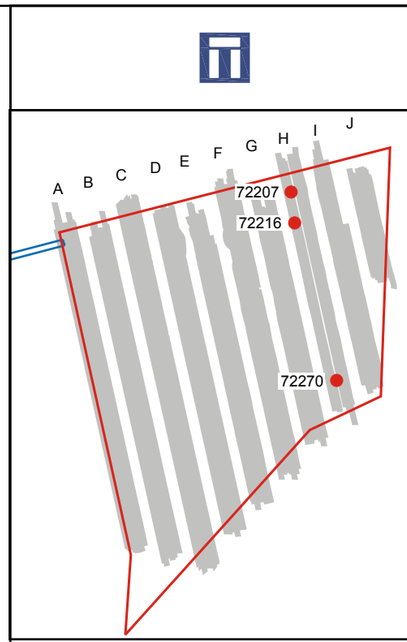
72207 - Irregular object with shadow, measuring 1.2m x 0.6m x 0.1m, located within an area of coarse seabed sediment. Associated with a magnetic anomaly of 103nT. Possible piece of ferrous debris



72216 - Elongate dark reflector with shadow, measuring 3.0m x 0.4m x 0.4m, but no associated magnetic anomaly. Located in an area of coarse seabed sediment. Could be a piece of non-ferrous debris



72270 - Irregular object with shadow, measuring 4.7m x 0.6m x 0.3m, located within an area of coarse seabed sediment. Associated with a large magnetic anomaly of 563nT. Possible piece of ferrous debris. The visible object may not have solely caused the large magnetic anomaly observed, so there is potential for further buried ferrous debris to be present within the immediate vicinity



Wind farm

Export cable corridor

Corridors

Projection UTM WGS84 Zone 31N

Date:	11/11/2013
Revision Number:	0
Scale:	n/a
Illustrator:	KL
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\Geophys Assessment\2013_11\seabed_features.dwg	

Examples of seabed features in Corridor H (taken from the sidescan sonar waterfall display and hence not to scale)

Figure 25

i

ii

I01

I02

I03

I04

I05

I06

5950000

5949000

5948000

5947000

323000

72300 72301 72302 72303 72304 72305 72306 72307 72308 72309 72310 72311 72312 72313 72314 72315 72316 72317 72318 72319 72320 72321 72322 72323 72324 72325 72326 72327 72328 72329 72330 72331 72332 72333 72334 72335 72336 72337 72338 72339 72340 72341 72342 72343 72344 72345 72346 72347 72348 72349 72350 72351 72352 72353 72354 72355 72356 72357 72358 72359 72360 72361 72362 72363 72364 72365 72366 72367 72368 72369 72370 72371 72372 72373 72374

0 200 m

i ii I

Wind farm
Export cable corridor
Inter-array cable route
Turbines
Sidescan sonar coverage

Archaeological anomalies
A1: Anthropogenic origin of archaeological interest (suspect)
A2: Uncertain origin of possible archaeological interest (suspect)
A2: Uncertain origin of possible archaeological interest (not suspect)
A3: Historic record of possible archaeological interest (not suspect)
70020 Anomalies discussed in text

Date:	14/11/2013	Revision Number:	0
Scale:	1:6250 at A3	Illustrator:	KJF/KL
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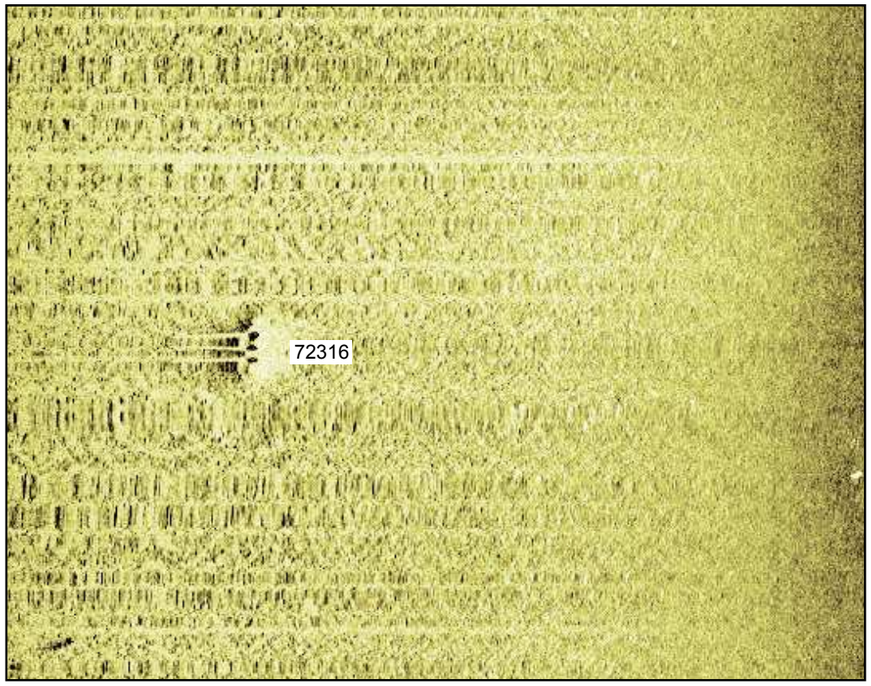
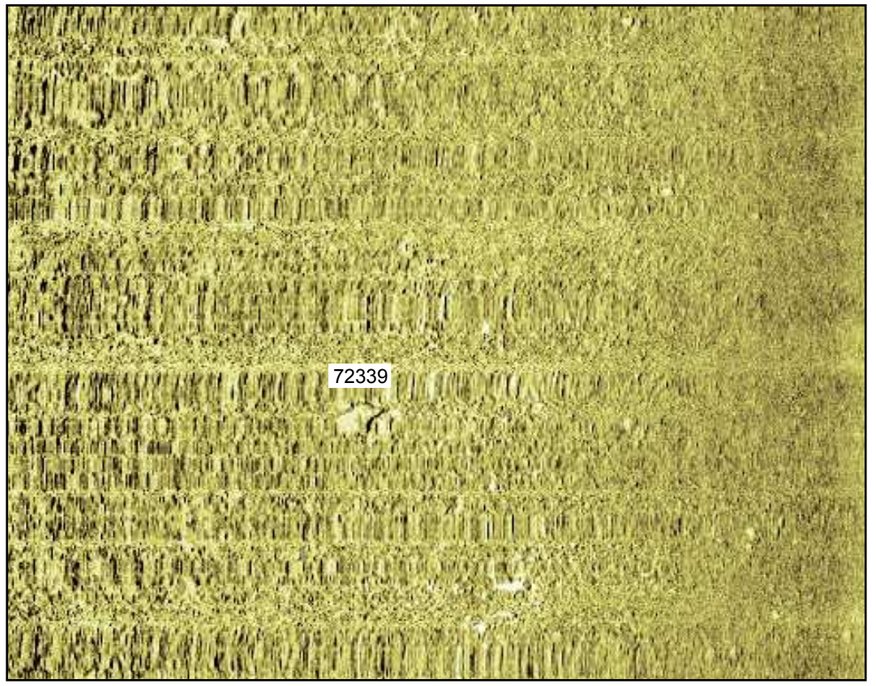
Sites of potential archaeological interest in Corridor I

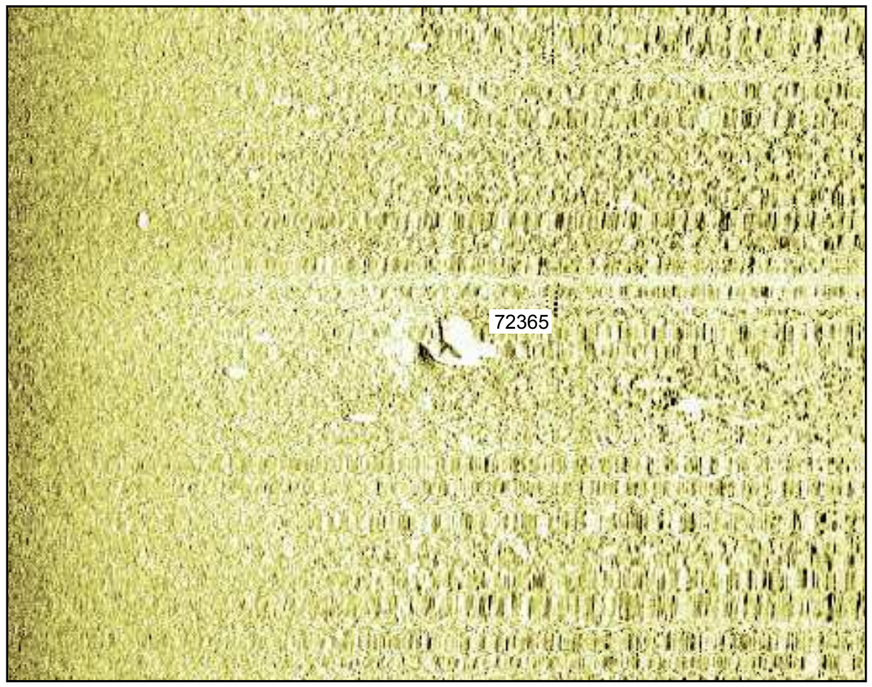
Figure 26



72316 - Seafloor disturbance measuring 5.2m x 2.9m x 0m containing three dark reflectors with shadows, the largest measuring 0.7 x 0.5 x 0.3m. No associated magnetic anomaly. Could be an area of non-ferrous debris



72339 - Irregular, elongate dark reflector measuring 1.5m x 0.2m x 0.2m without an associated magnetic anomaly, located in an area of coarse seabed sediment. Could be a piece of non-ferrous debris



72365 - Small area, measuring 3.5m x 3.1m x 0.2m, of distinct, irregular objects with shadows associated with a large magnetic anomaly of 238nT. Possible ferrous debris

Wind farm

Export cable corridor

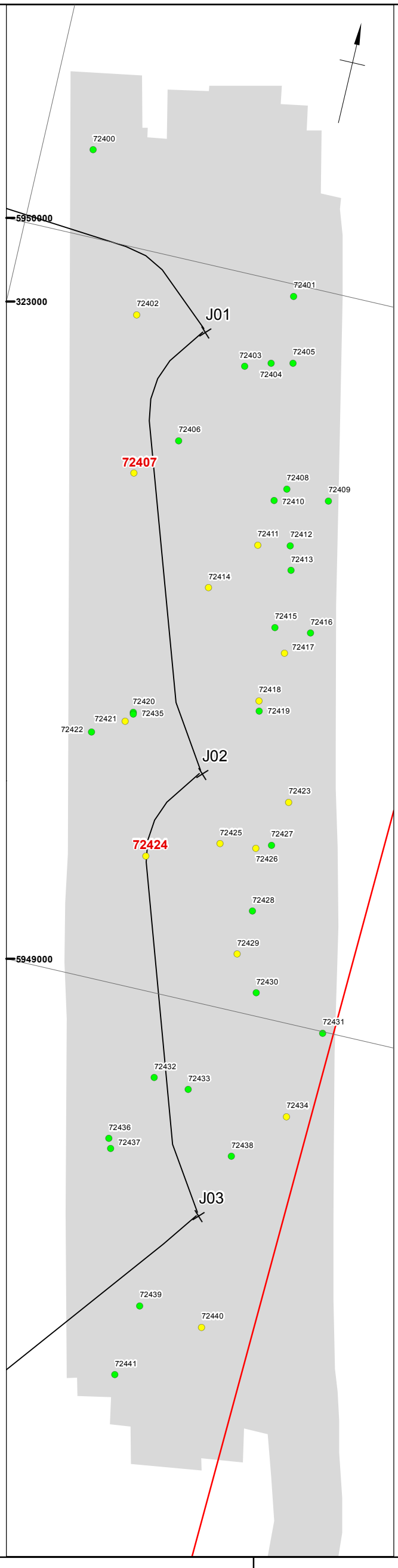
Corridors

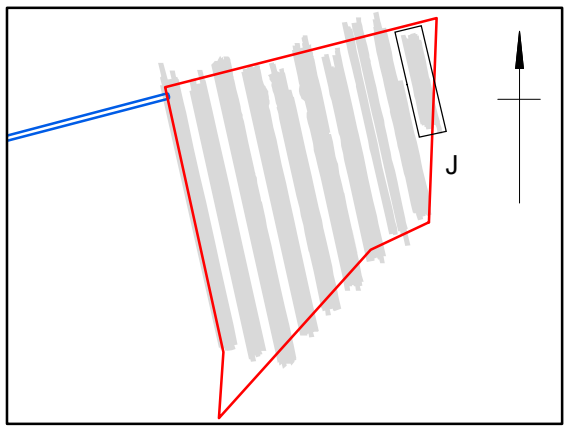
Projection UTM WGS84 Zone 31N

Date:	11/11/2013
Revision Number:	0
Scale:	n/a
Illustrator:	KL
Path:	W:\Projects\85770\DO\Report figs
\Geophys Assessment\2013_11\seabed_features.dwg	

Examples of seabed features in Corridor I (taken from the sidescan sonar waterfall display and hence not to scale)

Figure 27





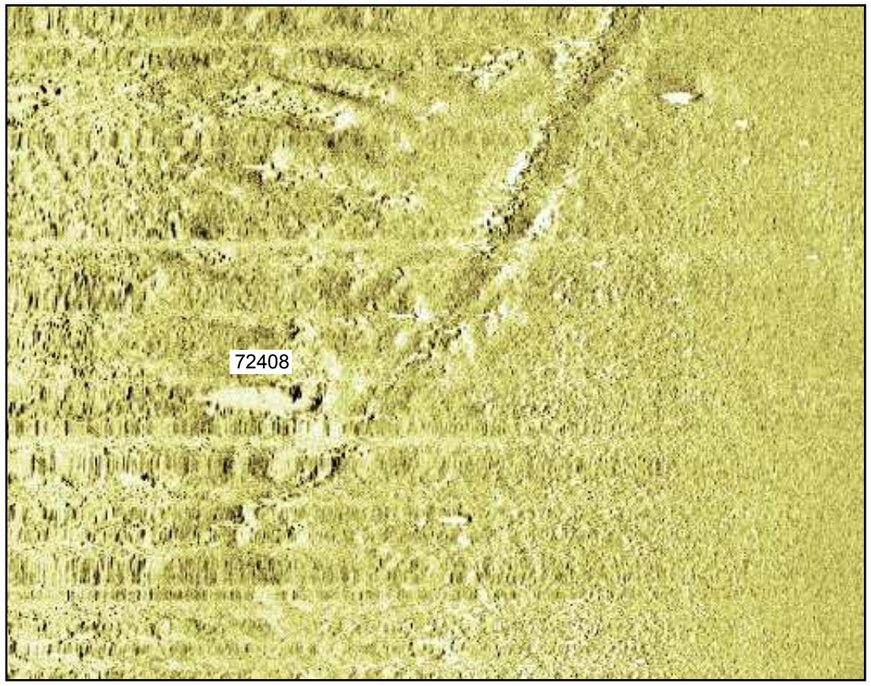
Wind farm
Export cable corridor
Inter-array cable route
Turbines
Sidescan sonar coverage

Archaeological anomalies
A1: Anthropogenic origin of archaeological interest (suspect)
A2: Uncertain origin of possible archaeological interest (suspect)
A2: Uncertain origin of possible archaeological interest (not suspect)
A3: Historic record of possible archaeological interest (not suspect)
70020 Anomalies discussed in text

Date:	08/11/2013	Revision Number:	0
Scale:	1:6250 at A3	Illustrator:	KJF/KL
Path:	W:\Projects\85770\DO\Report figs\Geophys Assessment\2013_11\Fig28.mxd		

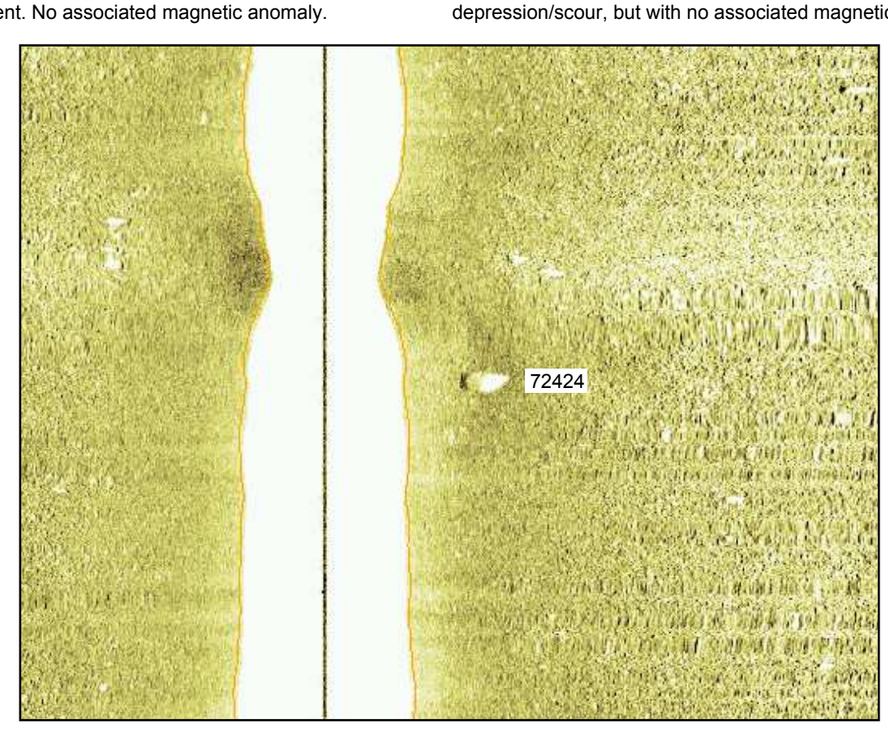
Sites of potential archaeological interest in Corridor J

Figure 28

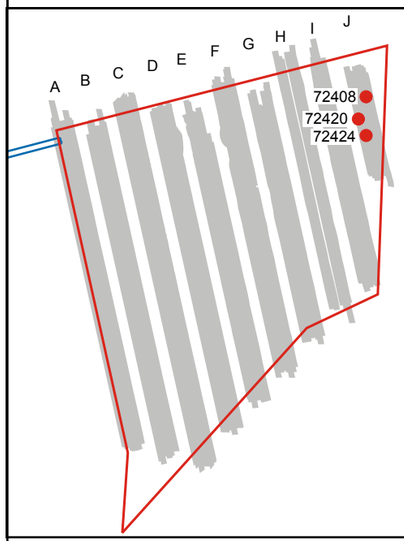


72408 - Irregular dark reflector with large shadow, measuring 1.7m x 0.6m x 0.6m, located close to a seabed scar in an area of coarse seabed sediment. No associated magnetic anomaly.

72420 - Distinct dark reflector with large shadow, measuring 2.4m x 1.3m x 1.0m, situated within a small depression/scour, but with no associated magnetic anomaly. Located in an area of coarse seabed sediment



72424 - Object with shadow, measuring 1.2m x 0.4m x 0.9m, located in an area of coarse seabed sediment. Associated with a magnetic anomaly of 79nT. Possible piece of ferrous debris



Wind farm

Export cable corridor

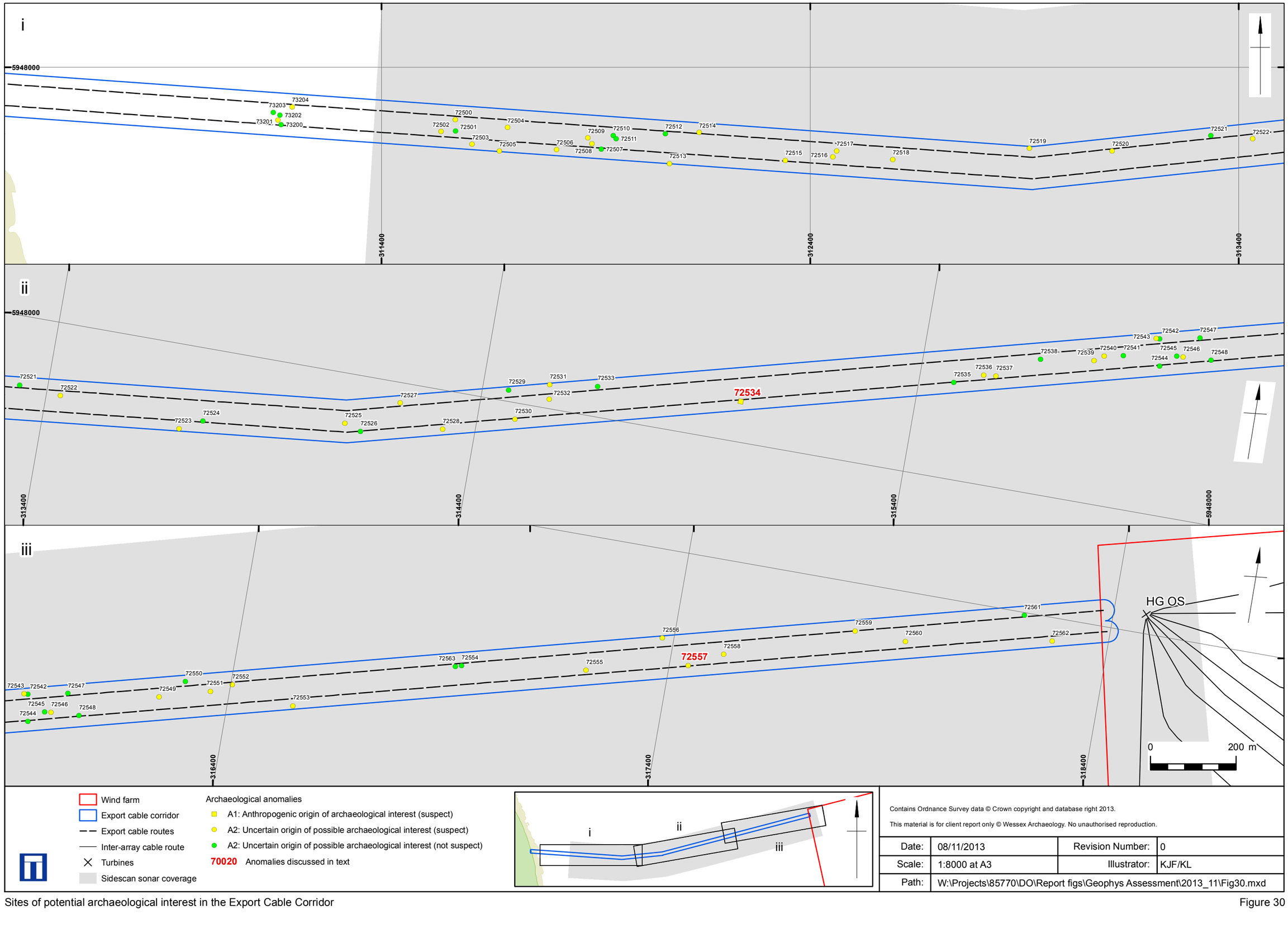
Corridors

Projection UTM WGS84 Zone 31N

Date:	11/11/2013
Revision Number:	0
Scale:	n/a
Illustrator:	KL
Path:	W:\Projects\85770\DO\Report figs
\Geophys Assessment\2013_11\seabed_features.dwg	

Examples of seabed features in Corridor J (taken from the sidescan sonar waterfall display and hence not to scale)

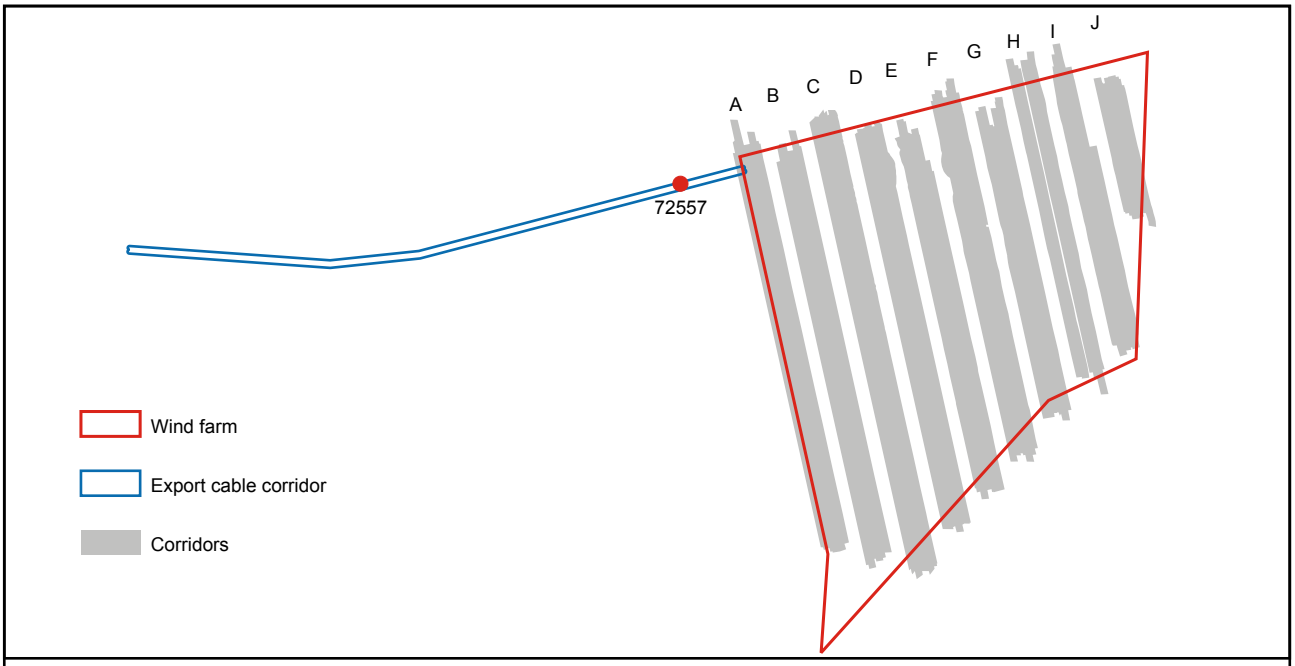
Figure 29

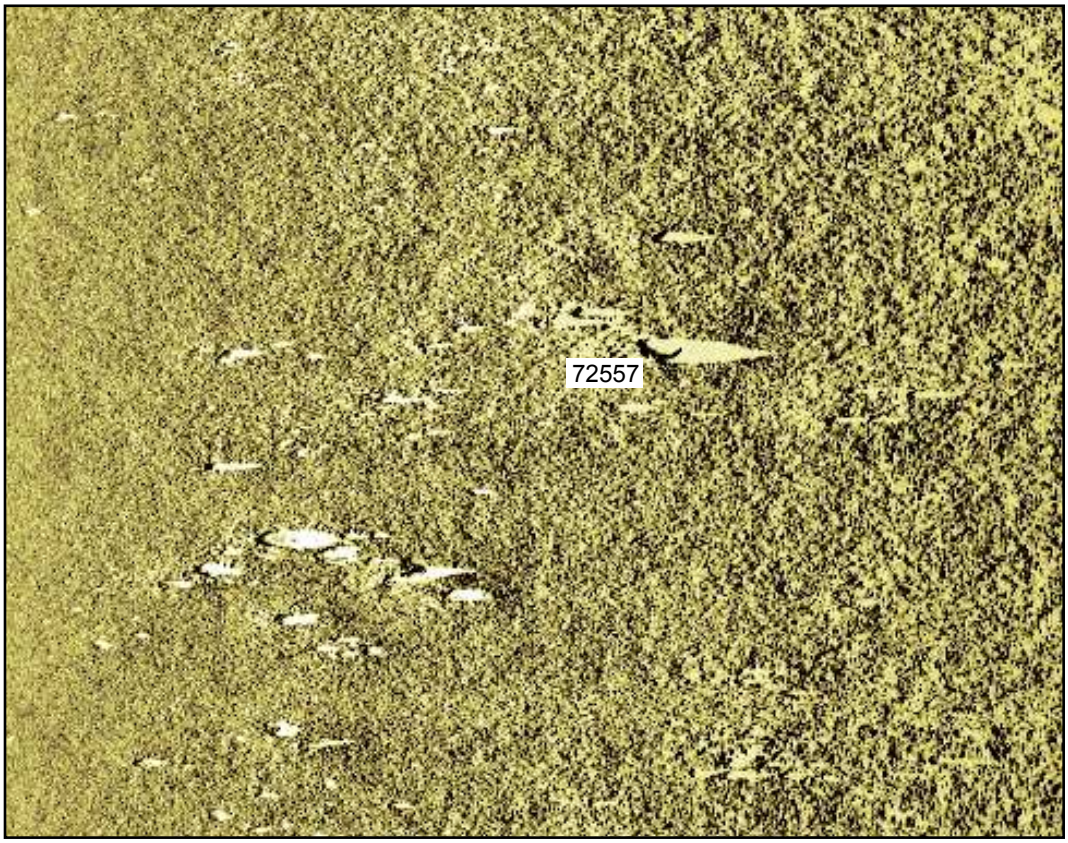


Date:	08/11/2013	Revision Number:	0
Scale:	1:8000 at A3	Illustrator:	KJF/KL
Path:	W:\Projects\85770\DO\Report figs\Geophys Assessment\2013_11\Fig30.mxd		

Sites of potential archaeological interest in the Export Cable Corridor

Figure 30





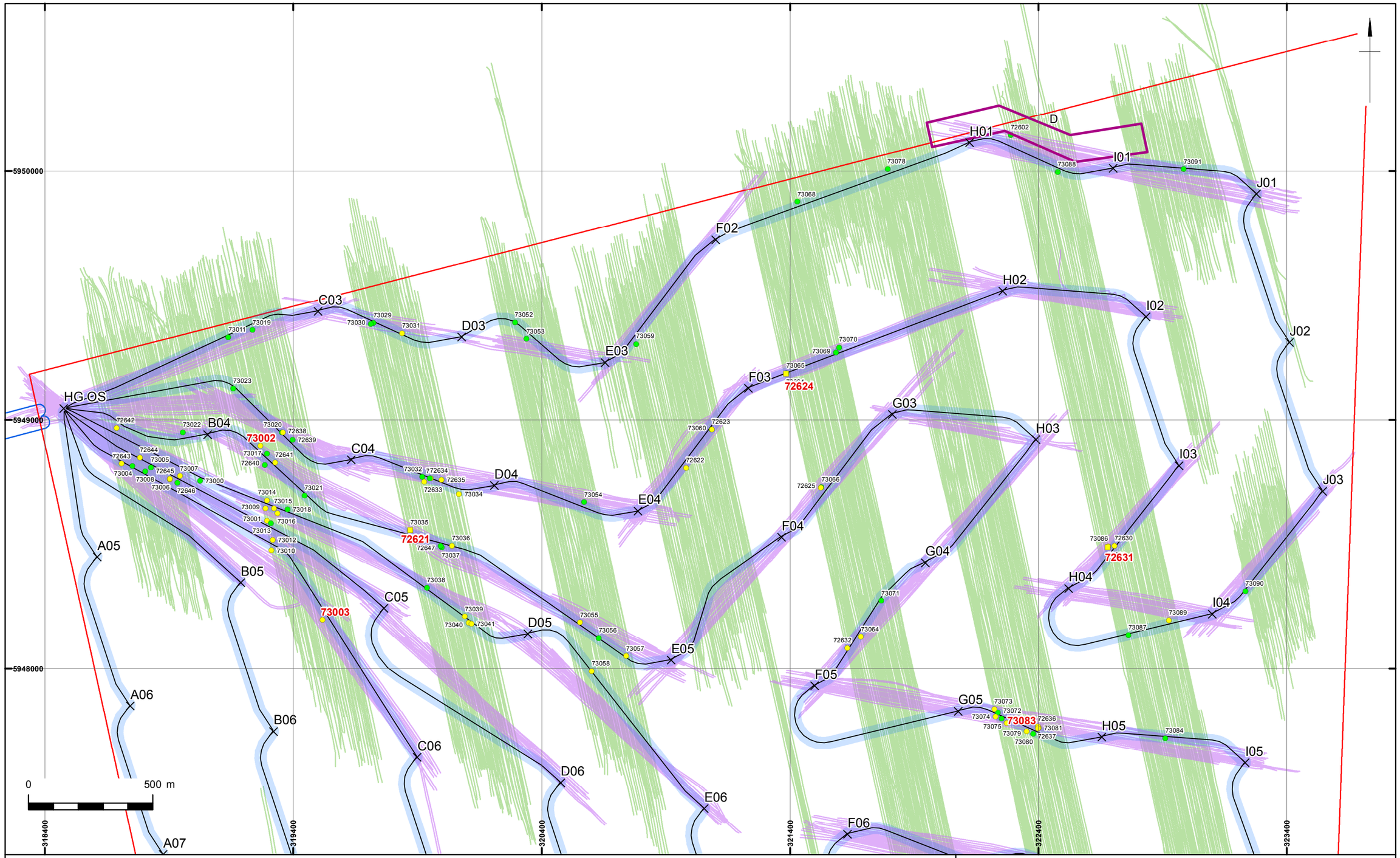
72557 - Irregularly shaped dark reflector with a projection on the far side, measuring 2.5m x 1.4m x 0.4m, associated with a magnetic anomaly of 78nT. Possible piece of ferrous debris

Projection UTM WGS84 Zone 31N

Date:	11/11/2013	Revision Number:	0
Scale:	n/a	Illustrator:	KL
Path:	W:\Projects\85770\DO\Report figs\Geophys Assessment\2013_11\seabed_features.dwg		

Examples of seabed features in the Export Cable Corridor (taken from the sidescan sonar waterfall display and hence not to scale

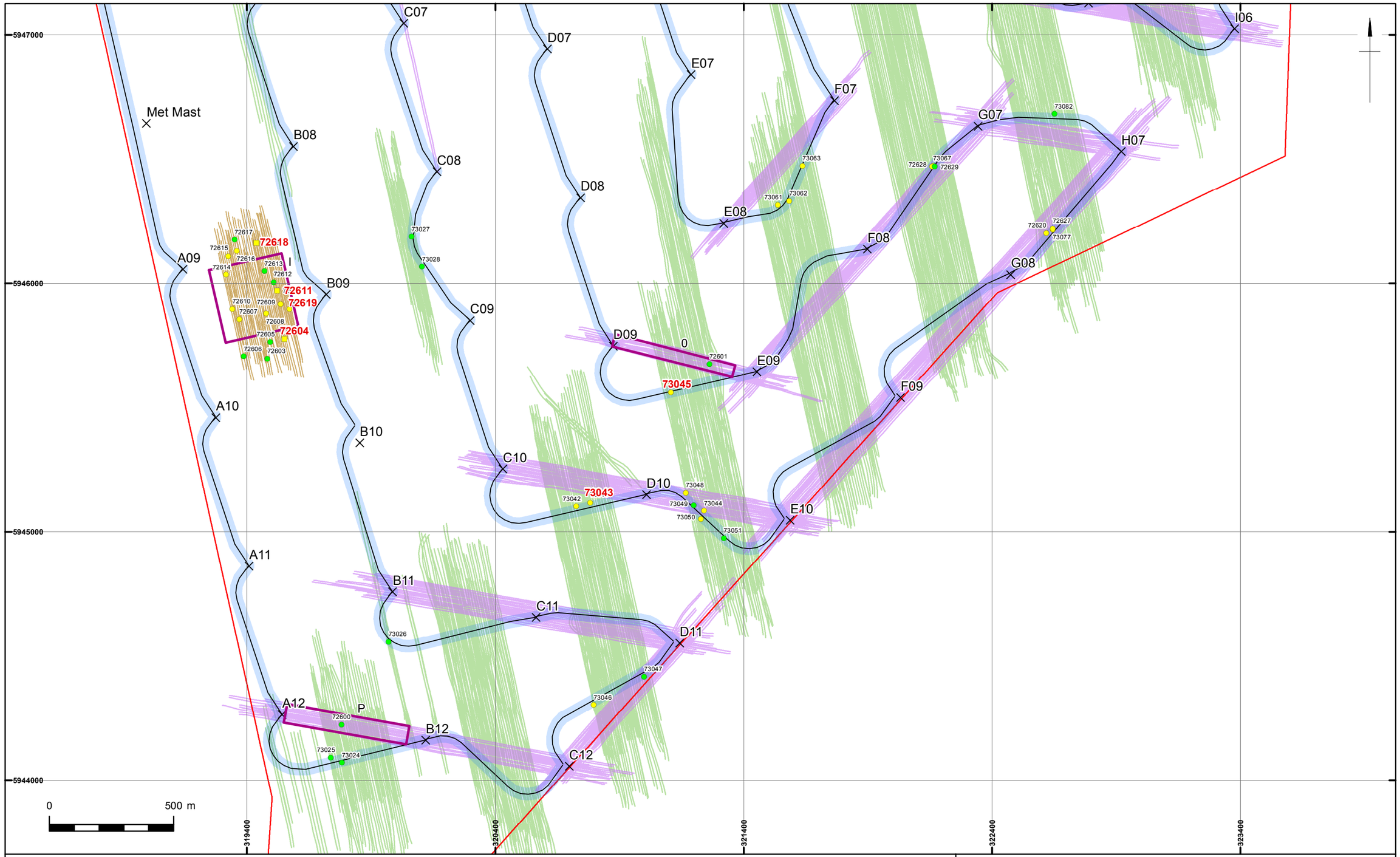
Figure 31



Date:	08/11/2013	Revision Number:	0
Scale:	1:15,000 at A3	Illustrator:	KJF/KL
Path:	W:\Projects\85770\DO\Report figs\Geophys Assessment\2013_11\Fig32.mxd		

Sites of potential archaeological interest in the Inter-Array Cable Corridors (north)

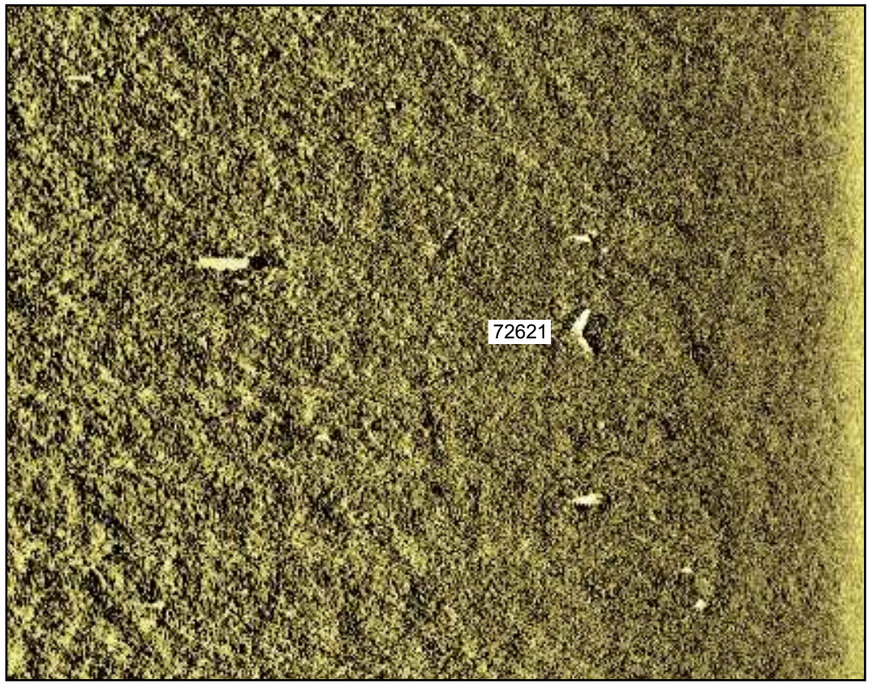
Figure 32



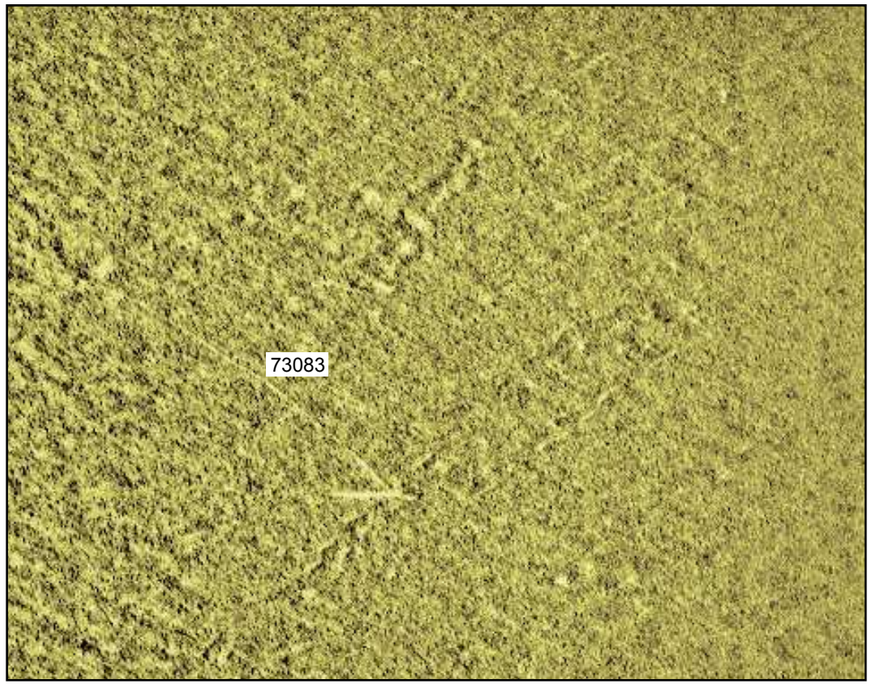
Date:	14/11/2013	Revision Number:	0
Scale:	1:15,000 at A3	Illustrator:	KJF/KL
Path:	W:\Projects\85770\DO\Report figs\Geophys Assessment\2013_11\Fig33.mxd		

Sites of potential archaeological interest in the Inter-Array Cable Corridors (south)

Figure 33

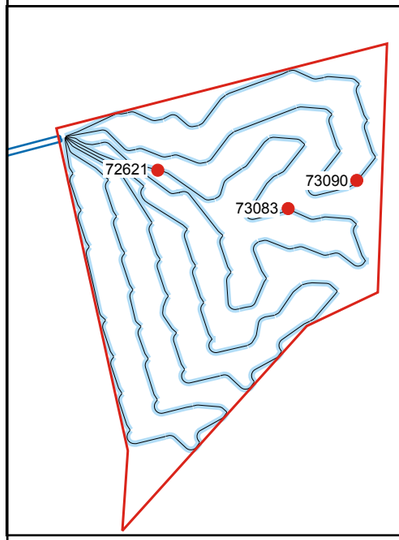


72621 - Angled dark reflector with height, 4.2m x 0.6m x 0.2m, associated with a large magnetic anomaly of 603nT, identified on several lines. Probable ferrous debris



73083 - Possible rope or chain, measuring 27.6m x 0.6m x 0.3m, which may be attached to object on seabed. Located in a sandy area with some boulders nearby

73090 - Small angled object with shadow, 1.3m x 0.4m x 0.3m, possible debris. No associated magnetic anomaly suggests non-ferrous material



Wind farm

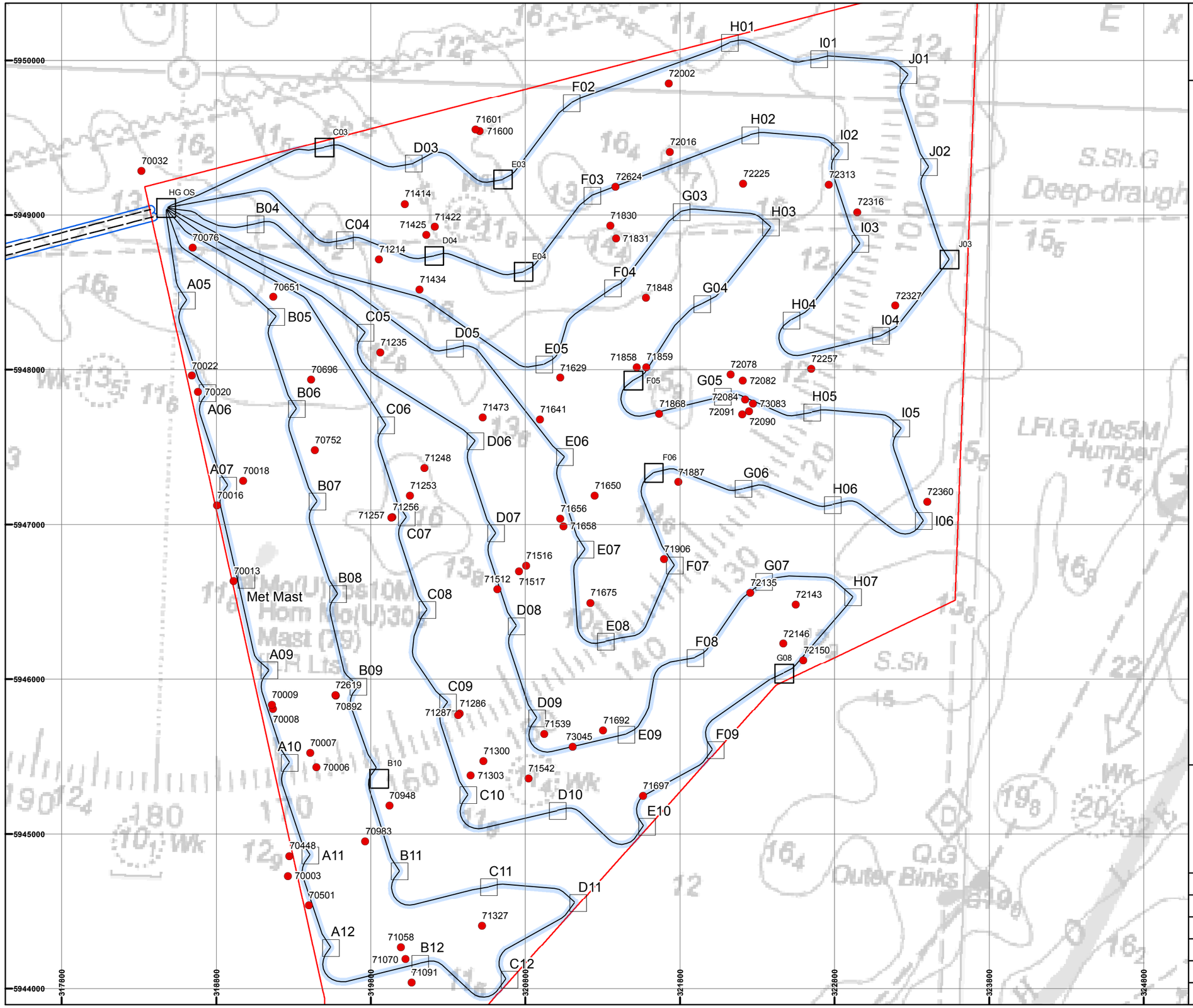
Inter-Array Cable corridors

Projection UTM WGS84 Zone 31N

Date:	11/11/2013
Revision Number:	0
Scale:	n/a
Illustrator:	KL
Path:	W:\Projects\85770\DO\Report figs
\Geophys Assessment\2013_11\seabed_features.dwg	

Examples of seabed features in the Inter-Array Cable Corridors (taken from the sidescan sonar waterfall display and hence not to scale)

Figure 34



Date:	08/11/2013
Revision Number:	0
Scale:	1:25,000 at A3
Illustrator:	KJF/KL
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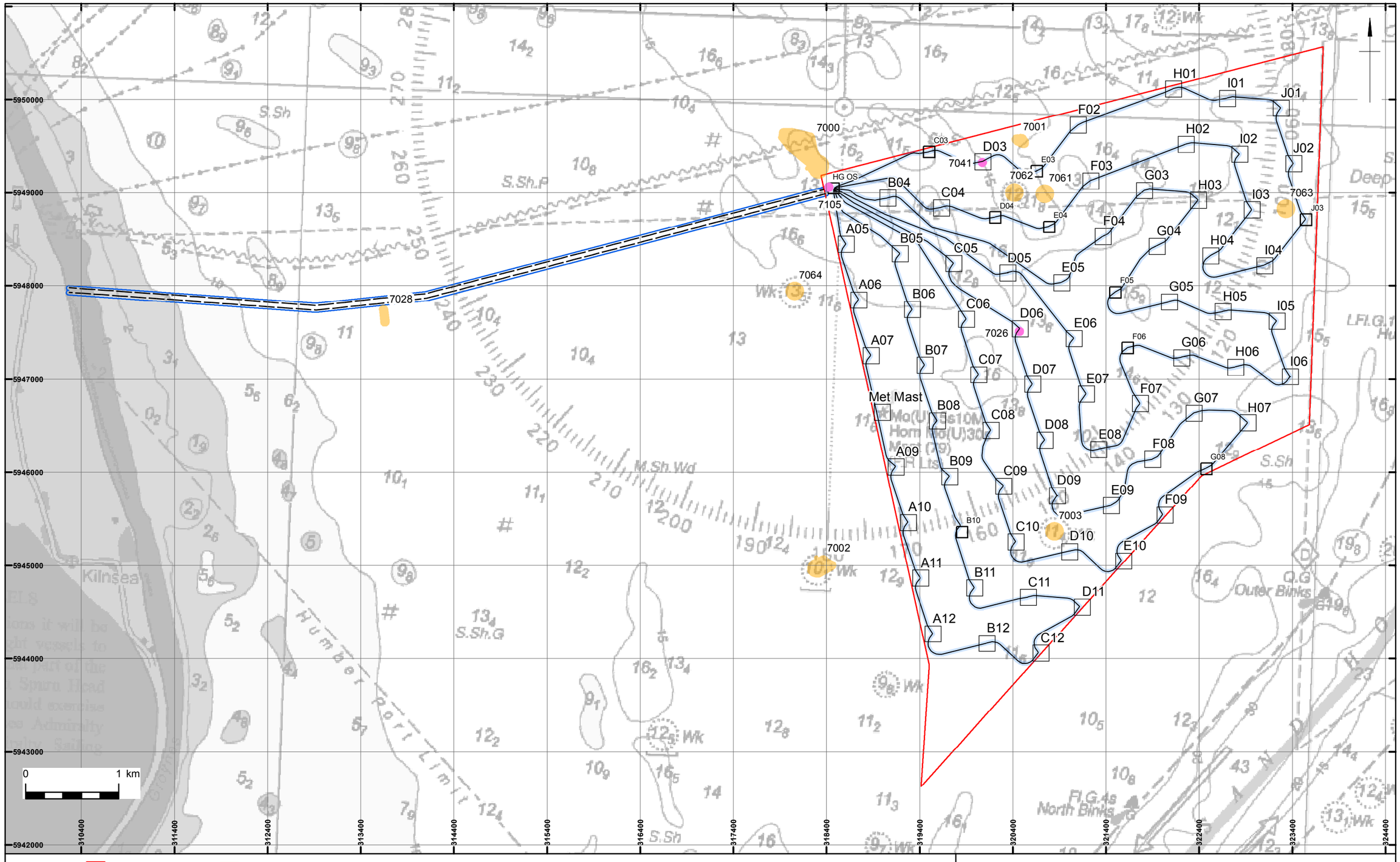
Report figs\Geophys Assess\2013_11\Fig35.mxd	

Archaeological targets to be dived

Figure 35



Wind farm
Export cable corridor
Export cable routes
Inter-array cable route
Inter-array cable corridor
Turbine locations
2009 Archaeological Exclusion Zones
2012 Buffer zones

Date:	22/01/2014	Revision Number:	0
Scale:	1:40,000 at A3	Illustrator:	KJF/KL
Path:	W:\Projects\85770\DO\Report figs\Geophys Assessment\2013_11\Fig36.mxd		

Archaeological Exclusion Zones and buffer zones, current in 2013

Figure 36

wessex archaeology

salisbury rochester sheffield edinburgh

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