MORAY EAST
OFFSHORE WINDFARM

Marine Archaeological Reporting Protocol (MARP) and Written Scheme of Investigation (WSI)

Telford, Stevenson and MacColl Offshore Wind Farms and Associated Offshore Transmission Infrastructure

June 2018

Moray Offshore Windfarm (East) Limited

Produced by Royal HaskoningDHV on behalf of Moray Offshore WindFarm (East) Limited	
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Moray East
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List of Abbreviations

The following terms and abbreviations are used in this document:

Abbreviation	Description
AEZ	Archaeological Exclusion Zone
ECoW	Ecological/Environmental Clerk of Works
ES	Environmental Statement
HER	Historic Environment Record
HES	Historic Environment Scotland
ISA	Inner Study Area
JNAPC	Joint Nautical Archaeology Policy Committee
MARP	Marine Archaeological reporting Protocol
MLWS	Mean Low Water Springs
TI	Transmission Infrastructure
MS-LOT	Marine Scotland Licensing and Operation Team
NMRS	National Monuments Record of Scotland
OfTI	Offshore Transmission Infrastructure
OnTI	Onshore Transmission Infrastructure
ORPAD	Offshore Renewables Protocol for Archaeological Discoveries
OSA	Outer Study Area
OSP	Offshore Substation Platform
OWF	Offshore Wind Farm
PAD	Protocol for Archaeological Discovery
RCAHMS	Royal Commission on the Ancient and Historical Monuments of Scotland
ROV	Remotely Operated Vehicle
RoW	Receiver of Wreck
SSSI	Site of Special Scientific Interest
WSI	Written Scheme of Investigation

Definitions

The following definitions have been used throughout this document with respect to the company, the consented wind farms and how these definitions have changed since submission of the Moray East Environmental Statement (ES) in 2012 and the Moray East Modified Transmission Infrastructure ES in 2014.

- **Moray Offshore Windfarm (East) Limited (formerly known as Moray Offshore Renewables Limited)** - the legal entity submitting this Marine Archaeology Reporting Protocol and Written Scheme of Investigation on behalf of Telford Offshore Windfarm Limited, Stevenson Offshore Windfarm Limited and MacColl Offshore Windfarm Limited.;
- **Moray East Offshore Wind Farm** - the wind farm to be developed in the Moray East site;
- **The Moray East site** - the area in which the Moray East Offshore Wind Farm will be located. Section 36 Consents and associated Marine Licences to develop and operate up to three generating stations on the Moray East site were granted in March 2014. At that time the Moray East site was known as the "Eastern Development Area" and was made up of three sites known as the Telford, Stevenson and MacColl Offshore Wind Farm sites. The Section 36 Consents and Marine Licences were subsequently varied in March 2018;
- **Telford, Stevenson and MacColl wind farms** – these names refer to the three consented offshore wind farm sites located within the Moray East site as shown in Figure 1-1;
- **Transmission Infrastructure (TI)** - includes both offshore and onshore electricity transmission infrastructure for the consented Telford, Stevenson and MacColl wind farms. Includes connection to the national electricity transmission system near New Deer in Aberdeenshire encompassing AC offshore substation platforms (OSPs), AC OSP interconnector cables, AC export cables offshore to landfall point at Inverboyndie continuing onshore to the AC collector station (onshore substation) and the additional regional Transmission Operator substation near New Deer. A Marine Licence for the offshore TI was granted in September 2014 and a further Marine Licence for two additional distributed offshore substation platforms (OSPs) was granted in September 2017. The onshore Modified TI was awarded Planning Permission in Principle in September 2014 by Aberdeenshire Council and Planning Permission in Principle under Section 42 in June 2015;
- **Offshore Transmission Infrastructure (OfTI)** – the offshore elements of the transmission infrastructure, comprising AC OSPs, AC OSP inter-connector cables and AC export cables offshore to landfall (for the avoidance of doubts some elements of the OfTI will be installed in the Moray East site);
- **Moray East ES 2012** – The ES for the Telford, Stevenson and MacColl wind farms and Associated Transmission Infrastructure, submitted August 2012;
- **Moray East Modified TI ES 2014** – the ES for the Modified Transmission Infrastructure works (revised export cable route) in respect to the Telford, Stevenson and MacColl wind farms, submitted June 2014;
- **The Development** – the Moray East Offshore Wind Farm and Offshore Transmission Infrastructure (OfTI);
- **Design Envelope** - the range of design parameters used to inform the assessment of impacts;
- **OfTI Corridor** – the export cable route corridor, i.e. the OfTI area excluding the Moray East site.
- **OfTI 2018 Archaeology Study Area –** the OfTI geophysical and geotechnical survey area which was focus of an archaeological assessment by Wessex Archaeology during 2018 (Technical Report included as Appendix 3 to this report).

- **Moray East Offshore Wind Farm Consents** – are comprised of the following:

  Section 36 Consents:

  - Section 36 consent for the Telford Offshore Wind Farm (as varied) – consent under section 36 of the Electricity Act 1989 for the construction and operation of the Telford Offshore Wind Farm
  - Section 36 consent for the Stevenson Offshore Wind Farm (as varied) – consent under section 36 of the Electricity Act 1989 for the construction and operation of the Stevenson Offshore Wind Farm
  - Section 36 consent for the MacColl Offshore Wind Farm (as varied) – consent under section 36 of the Electricity Act 1989 for the construction and operation of the MacColl Offshore Wind Farm

  Marine Licences

  - Marine Licence for the Telford Offshore Wind Farm (as varied) – Licence Number: 04629/18/0 – consent under the Marine (Scotland) Act 2010 & Marine and Coastal Access Act 2009, Part 4 marine licensing for marine renewables construction works and deposits of substances or objects in the Scottish Marine Area and the United Kingdom Marine Licensing Area
  - Marine Licence for the Stevenson Offshore Wind Farm (as varied) – Licence Number: 04627/18/0 – consent under the Marine (Scotland) Act 2010 & Marine and Coastal Access Act 2009, Part 4 marine licensing for marine renewables construction works and deposits of substances or objects in the Scottish Marine Area and the United Kingdom Marine Licensing Area
  - Marine Licence for the MacColl Offshore Wind Farm (as varied) – Licence Number: 04628/18/0 (as varied) - consent under the Marine (Scotland) Act 2010 & Marine and Coastal Access Act 2009, Part 4 marine licensing for marine renewables construction works and deposits of substances or objects in the Scottish Marine Area and the United Kingdom Marine Licensing Area

- **OfTI Licences** – are comprised of the following:
  - Marine Licence for the Offshore Transmission infrastructure – Licence Number 05340/14/0 – consent under the Marine (Scotland) Act 2010 & Marine and Coastal Access Act 2009, Part 4 marine licensing for marine renewables construction works and deposits of substances or objects in the Scottish Marine Area and the United Kingdom Marine Licensing Area (referred to as the "OfTI Marine Licence")
  - Marine Licence for two additional distributed OSPs – Licence Number 06347/17/1 – consent under the Marine (Scotland) Act 2010 & Marine and Coastal Access Act 2009, Part 4 marine licensing for marine renewables construction, operation and maintenance works and the deposit of substances or objects in the Scottish Marine Area and the United Kingdom Marine Licensing Area (referred to as the "OSP Marine Licence")

Executive Summary

Royal HaskoningDHV have been commissioned by Moray Offshore Windfarm (East) Ltd (Moray East) to prepare a Marine Archaeological Reporting Protocol (MARP) and Written Scheme of Investigation (WSI) for the offshore elements of the Moray East Offshore Wind Farm (comprised of the Stevenson, MacColl and Telford Offshore Wind Farms) and associated Offshore Transmission Infrastructure (OfTI) (collectively referred to as the Development).

This document provides an overview of the archaeology and cultural heritage baseline environment as set out in the Environmental Statement (ES) submitted to the Scottish Minsters to accompany the Section 36 and Marine Licence applications for the Moray East Offshore Wind Farm (Moray Offshore Renewables Limited, 2012, referred as Moray East ES 2012) and an ES prepared for the modified Offshore Transmission Infrastructure cable corridor (Moray Offshore Renewables Limited, 2014, or Moray East Modified TI ES 2014). It further provides a summarised account of the impact assessment presented, including a review of potential impacts and an outline of the proposed mitigation strategy which has been designed to avoid, reduce or offset impact upon the offshore archaeological and cultural heritage resource arising as a result of the proposed development. A draft Protocol for Archaeological Discoveries (PAD) was previously submitted alongside the Moray East ES, this document takes into consideration the draft PAD as well as information gathered from more recent studies.

The WSI as presented in this document adheres to methodologies set out in the Model Clauses for Archaeological Written Schemes of Investigation: Offshore Renewables Projects (The Crown Estate, 2010). The respective responsibilities of Moray East, their Contractors, the Environmental Clerk of Works (ECoW), the Client Representative and the Archaeological Consultant prior to and during the Project are outlined and the commitment of the project to undertake elements of archaeological work (where relevant and necessary) in a manner consistent with the Model Clauses is underlined, with reference made to key project-specific elements where appropriate.

Specific reference is made to the implementation of Archaeological Exclusion Zones (AEZs) which form the principal means used to preserve in situ any features or deposits of potential or known archaeological interest as outlined in the ESs. The general methodology underpinning the application of the mitigation procedures, and the commitment to the application of this mitigation, as set out in this document, will remain relevant throughout the project lifespan. Any additional recommendations arising as a result of further archaeological assessments, if undertaken as part of the pre-construction phase, will be reported on separately.

The implementation of a MARP (also known as a Protocol for Archaeological Discoveries, PAD) is required in accordance with the wind farm Section 36 consent conditions (condition 35 for the Telford and MacColl Wind Farms and condition 36 for Stevenson Wind Farm) and the OfTI Marine Licence conditions (conditions 3.2.2.16 of the OfTI and OSP Marine Licences). To this end, the project will adhere to the Offshore Renewables Protocol for Archaeological Discoveries (ORPAD) (The Crown Estate, 2014). This document outlines key matters in relation to the implementation of ORPAD and refers the reader to the full Protocol document for additional detail, as appropriate.

1 Introduction

1.1 Project Background

Royal HaskoningDHV have been commissioned by Moray Offshore Windfarm (East) Ltd (Moray East) to prepare a Marine Archaeological Reporting Protocol (MARP) and Written Scheme of Investigation (WSI) for the Moray Offshore Wind Farm and associated Offshore Transmission Infrastructure (OfTI). The MARP as presented in this document will be implemented through the mechanism of the Offshore Renewables Protocol for Archaeological Discoveries (ORPAD) (The Crown Estate, 2014).

This document follows on from two Environmental Statements (ESs) submitted as part of the consenting process (Moray East ES 2012 and Moray East Modified TI ES 2014). An ES was first submitted to the Scottish Minsters as part of the Section 36 and Marine Licence application process in 2012 for the Moray East Offshore Wind Farm (comprising of the Telford, Stevenson and MacColl Offshore Wind Farms) and associated OfTI (Moray East ES 2012). Since the submission of this ES, Moray East received a modified grid connection at New Deer, Aberdeenshire and the proposed cable route area has been altered with the landfall location at Inverboyndie. A further ES was therefore prepared regarding the modified transmission infrastructure (TI) (Moray East Modified TI ES 2014).

Moray East were granted consent for the construction of up to 1,116 MW within the Moray East site under Section 36 of the Electricity Act 1989 from the Scottish Ministers on 19th March 2014. A Marine Licence for the Modified TI was awarded on the 25th September 2014 and a further Marine Licence for two additional distributed Offshore Substation Platforms (OSPs) (OSP Marine Licence) was awarded on the 14th September 2017. This document has been prepared to meet the requirements of the Section 36 Consents and the Marine Licences conditions as described under Section 1.2.1).

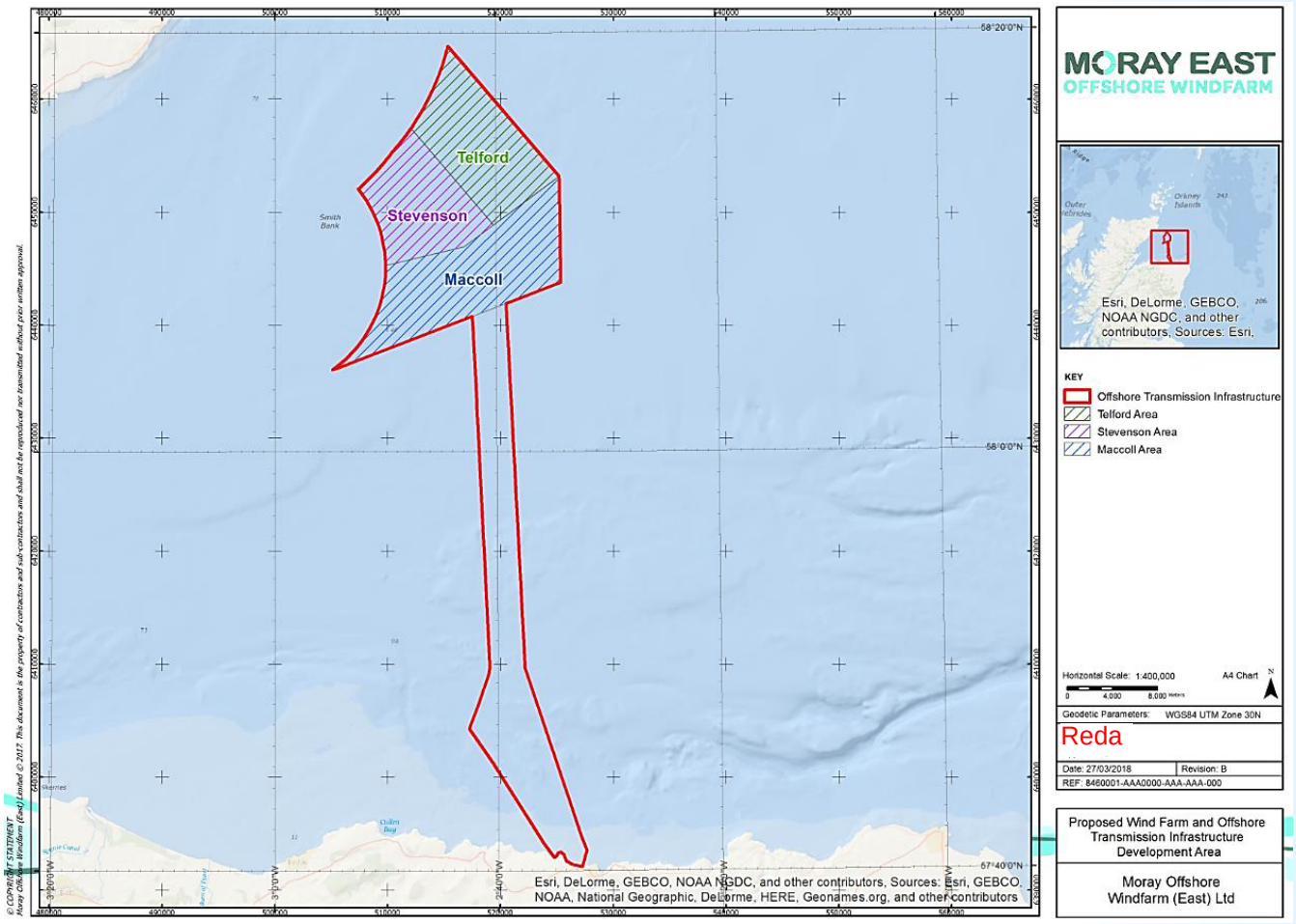

Figure 1-1: Moray East site (Stevenson, Telford and MaCcoll offshore wind farms and OfTI).

1.2 Legal Context

1.2.1 Consent Conditions

The relevant consent conditions for this document are outlined in Table 1-1.

Table 1-1: Consent Conditions

Consent Document	Condition Reference	Condition Text
Section 36 consents for Telford, Stevenson and MacColl Offshore Wind Farms (OWFs) as varied	Condition 35 (Telford OWF) Condition 36 (Stevenson OWF) Condition 35 (MacColl OWF)	The Company must, no later than 6 months prior to the Commencement of the Development, submit a Reporting Protocol which sets out what the Company must do on discovering any marine archaeology during the construction, operation, maintenance and monitoring of the Development, in writing, to the Scottish Ministers for their written approval. Such approval may be given only following consultation by the Scottish Ministers with any such advisors as may be required at the discretion of the Scottish Ministers. The Reporting Protocol must be implemented in full, at all times, by the Company. **Reason**: to ensure any discovery of archaeological interest is properly and correctly reported.
Marine Licences	3.2.2.16 (OfTI Marine Licence 05340/14/0)	The Licensee must, no later than 6 months prior to the Commencement of the Works, submit a Marine Archaeological Reporting Protocol (MARP) which sets out what the Licensee must do on discovering any marine archaeology during the construction, operation, maintenance and monitoring of the Works, in writing, to the Licensing Authority for their written approval. Such approval may be given only following consultation by the Licensing Authority with Historic Scotland and any such other advisors as may be required at the discretion of the Licensing Authority. The MARP must be implemented in full, at all times, by the Licensee.
	3.2.2.16 (OSP Marine Licence 06347/17/1)	The Licensee must, no later than 6 months prior to the Commencement of the Works, submit a MARP to the Licensing Authority for their written approval, which sets out what the Licensee must do on discovering any marine archaeology during the construction, operation, maintenance and monitoring of the Works, in writing. Such approval may be given only following consultation by the Licensing Authority with Historic Scotland and any such other advisors as may be required at the discretion of the Licensing Authority. The MARP must be implemented in full, at all times, by the Licensee. Reason: To mitigate the effects of the activity on the Site, in accordance with s.29(3)(c) of the 2010 Act and s.71 (3)(c) of the 2009 Act.

In order to provide consistency, for the purposes of this document, the Reporting Protocol specified in the Section 36 consents and the MARP referred to in the OfTI and OSP Marine Licences are collectively referred to as the MARP, which will be adhered to through the application of ORPAD (The Crown Estate, 2014).

1.2.2 Standards and Guidance

This document has been prepared in a manner consistent with the following guidelines:

- *Model Clauses for Archaeological Written Schemes of Investigation: Offshore Renewables Projects* (included as Appendix 1) (The Crown Estate, 2010);

- *Code for Practice for Seabed Development* (Joint Nautical Archaeology Policy Committee (JNAPC), 2006);
- *Historic Environment Guidance for the Offshore Renewable Energy Sector* (COWRIE, 2007); and
- *Protocol for Archaeological Discoveries: Offshore Renewables Projects* (The Crown Estate, 2014).

1.3 Scope

This document has been prepared to meet the consent conditions for the offshore elements of the Moray East Offshore Wind Farm and associated TI (i.e. the Development). It includes consideration of archaeology and cultural heritage offshore, up to the Mean Low Water Springs (MLWS). Archaeological and cultural heritage considerations with respect to onshore and intertidal works are considered as part of the onshore planning consent and are not within the scope of this document. A separate WSI is being prepared for the onshore development to MLWS and includes a consideration of intertidal heritage assets.

This document comprises a project-specific WSI and a MARP and has been prepared to set out the mitigation procedures that seek to avoid, reduce or off-set impact upon known and potential archaeology and cultural heritage assets as a result of the project in order to safeguard the archaeological and historic environment resource.

As part of these mitigation procedures, the implementation of a MARP achieved through the application of ORPAD is proposed (The Crown Estate, 2014). OPRAD provides a means for mitigating effects upon currently unknown archaeological material that may be encountered as a result of the offshore elements of the Project. ORPAD will be implemented at all stages of the development process where archaeological information may be obtained, spanning the lifespan of the Project (pre-construction, construction, operation and decommissioning). This document sets out the protocols and procedures that must be followed in the event of encountering unexpected archaeological discoveries throughout the duration of the Development.

In addition, in relation to the mitigation measures proposed, this WSI sets out the respective responsibilities of Moray East, their Contractors, the ECoW, the Client Representative and the Archaeological Consultant prior to and during the Project, and formal lines of communication between these parties and the Marine Scotland Licensing and Operation Team (MS-LOT) and Historic Environment Scotland (HES).

1.4 Structure and References

Table 1-2: Document Structure

Document Structure Overview	
Section	**Details**
1: Introduction	This section sets out information relating to the project background, legal context and underlines the scope of the document.
2: Archaeological Background	This section underlines the archaeological assessment undertaken to date at the time this WSI was compiled. It includes a summary of the baseline environment as presented in the Environmental Statements and the archaeological assessment of geophysical and geotechnical data within the OfTI 2018 Archaeology Study Area (Appendix 3), where relevant.

Document Structure Overview	
Section	**Details**
3: Summary of Impact Assessment	This section summarises the Impact Assessment as presented in each of the ES chapters (Moray East, 2012 and 2014) and includes an overview of potential impacts and proposed mitigation tailored to avoid, reduce or off-set impact upon the cultural heritage resource as a result of the development.
4: Written Scheme of Investigation	In demonstrating adherence to industry good practice, the WSI has been compiled in accordance with Model Clauses for Archaeological Written Schemes of Investigation (Offshore Renewables Projects) (The Crown Estate, 2010). This section outlines the roles, responsibilities and communications relevant to the project and makes reference to the methodologies set out in the model clauses, with key elements discussed in a manner that is specific to the project.
5: Marine Archaeological Reporting Protocol	The project consent conditions set out a requirement for a reporting and recording protocol, including reporting of any wreck or wreck material during construction, operation and decommissioning of the project. In accordance with this requirement, the project will adhere to ORPAD (The Crown Estate, 2014). This section outlines key matters in relation to the implementation of ORPAD and refers the reader to the full Protocol document.
6: References	This section provides an exhaustive list of all documents referred to throughout the document.

2 Archaeological Background

To date, two ESs have been prepared and submitted to the Scottish Minsters as part of the Marine Licence application process (Moray East ES 2012 and Moray East Modified TI ES 2014). The Moray East ES 2012 included a summary of the baseline environment for archaeology and visual receptors (Volume 2, Chapter 5, Section 5.5), a summary of effects and mitigation with respect to archaeology and visual receptors in relation to the consented offshore wind farms (Volume 3, Chapter 8, Section 8.5) and the transmission infrastructure (Volume 4, Chapter 11, Section 11.5) (since superseded following the modification of the OfTI), with the overall assessment underpinned by an archaeological technical report prepared by Headland Archaeology Ltd (Volume 11, Technical Appendix 5.5 A). Due to an alteration of the landfall and grid connection location, a further ES was submitted in 2014 regarding the Modified TI (Moray East Modified TI ES 2014). Due to this modification, the baseline environment with respect to the historic environment within the OfTI corridor as outlined in the Moray East ES 2012 is no longer considered relevant and is not summarised below. Reference is confined to the TI, with the baseline environment summary based on the Moray East Modified TI ES 2014 and the subsequent archaeological assessment of geophysical and geotechnical survey data, the results of which are appended to this document (Appendix 3).

The archaeological technical report (Moray East ES 2012 - Volume 11, Technical Appendix 5.5 A) included an assessment of various source material with the purpose of locating all known cultural heritage assets within the constraints area and within the general location of the proposed wind farms and to identify the archaeological potential of the area. Sources included:

- Databases of designated cultural heritage assets maintained by Historic Scotland;
- Maritime records held by the Royal Commission on the Ancient and Historical Monuments of Scotland (RCAHMS);
- UK Hydrographic Office Wrecks and Obstructions Database (SeaZone);
- National Library (for historic charts and maps only);
- Ministry of Defence (military remains only);
- Receiver of Wreck (ROW);
- Relevant SEA reports and Coastal Survey Assessment reports;
- National Monuments Record of Scotland (NMRS);
- Vertical and oblique aerial photographs held by (RCAHMS);
- Aberdeenshire Council's Historic Environment Record (HER);
- Plans held by the National Archives of Scotland;
- Other readily available published sources and grey literature; and
- Marine geophysical and geotechnical survey data.

Cultural heritage assets within the Wind Farm Study Areas, as presented in the Moray East ES 2012, were divided into their respective Inner and Outer Study Areas (ISA and OSAs). These study areas were defined as follows:

- The Inner Study Area (ISA) (the previously proposed Telford, Stevenson and MacColl Wind Farms); and
- The Outer Study Area (OSA) (a 1km buffer around the previously proposed Telford, Stevenson and MacColl Wind Farms).

Cultural heritage assets within the OfTI, as presented in the Moray East Modified TI ES 2014, were assessed within an Archaeological Study Area (ASA), defined as follows:

- The OfTI, inclusive of the three consented wind farm areas (Telford, Stevenson and MacColl) in relation to the OSPs.

As part of the Moray East Modified TI ES 2014, it was further outlined that following consultation with HES, the assessment of geophysical and geotechnical data would be reviewed pre-construction in order to precisely define mitigation strategies for unknown cultural heritage receptors identified in the OfTI. To this end, Wessex Archaeology Ltd were commissioned by Moray East to undertake an archaeological assessment of available geophysical and geotechnical survey data acquired within the OfTI 2018 Archaeology Study Area (see Figure 2-1). Data were available for all geophysical sensors (sidescan sonar, magnetometer, multibeam bathymetry echosounder and sub-bottom profiler data) and included survey data acquired in 2014 for the OfTI alongside additional nearshore data acquired in 2017 (see Figure 2-1). Geotechnical data subject to archaeological review included geotechnical core logs for the OfTI acquired in 2014 and nearshore areas acquired in 2017. The full complement of data was subject to archaeological assessment in line with the methodology for 'Archaeological Interpretation of Further Geophysical Data' as set out in the model clauses (Appendix 1, Section 5.7) and the 'Archaeological Review of Geotechnical Logs' as set out in the model clauses (Appendix 2, Section 6.3). The results of the assessment were reported on in a manner consistent with the model clauses on reporting and are appended to this document (Appendix 3).

The results of the assessment relevant to the offshore environment as presented in each ES and any supporting documents (Appendix 3) are summarised in the following sections.

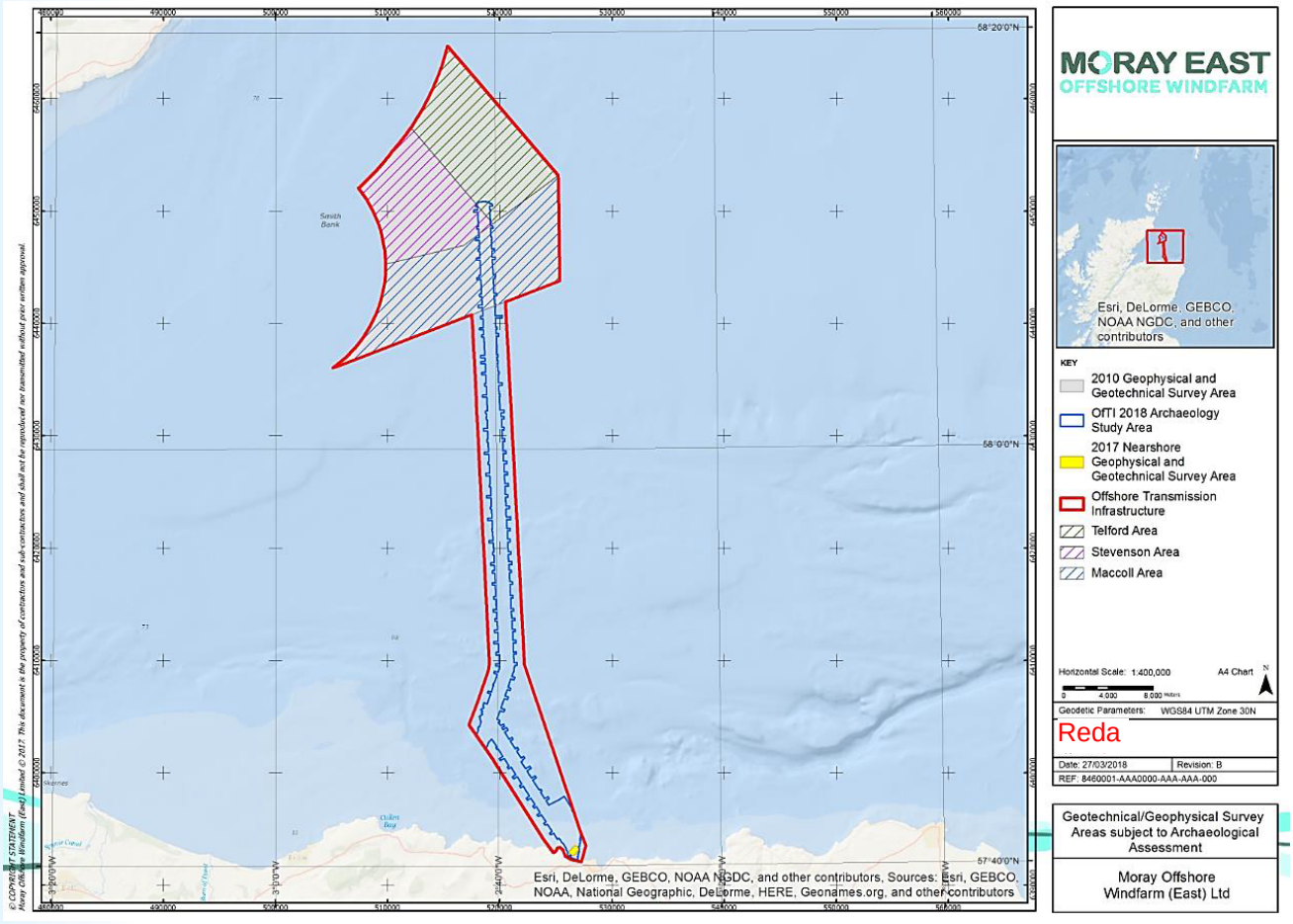

Figure 2-1 Geophysical survey area.

2.1 The Wind Farm

The following section outlines the baseline conditions relevant to archaeological and cultural heritage within the Moray East site (where the Moray East Wind Farm will be located and part of the OfTI) as presented in the Moray East ES 2012 and relevant results from archaeology analysis the OfTI 2018 Archaeology Study Area.

There are no designated archaeological or cultural heritage assets or targets within the Wind Farm Study Areas. The following archaeological / cultural heritage assets and targets were identified within the Wind Farm Study Areas (Moray East ES 2012):

- Six recorded wreck sites, comprising:
    - Four within the ISA (HW1001, HW1002, HW1003 and HW1004); and
    - Two within the OSA (HW1005 and HW1006).
- Two recorded obstructions, comprising:
    - One within the ISA (HW1014); and
    - One within the OSA (HW1015).
- 20 geophysical anomalies of archaeological potential, comprising:
    - Three anomalies of high archaeological potential (HW157, 158 and 159); and
    - 17 anomalies of medium archaeological potential (HW36, 44, 52, 61, 71, 72, 73, 74, 75, 76, 77, 78, 80, 100, 102, 108, and 117).

The northern most section of the 2018 archaeology study area extended into the Moray East site. The following additional targets of archaeology potential were also identified as being within the Moray East site during the recent archaeology assessment of geophysical and geotechnical survey data (Appendix 3):

- Ten geophysical anomalies classified as A2 (Uncertain origin of *potential archaeological potential*) (WA 7000- 7009); and
- Three simple cut and fill P2 classified paelolandscape features (WA 7125, 7126 & 7127).

Seabed features within the Moray East site from the 2012 ES and 2018 survey are are shown in Figure 2-2 below.

Of the recorded wrecks within the Wind Farm Study Areas, four are considered to be 'Live' with known locations, shown in bold type above (HW1001, HW1002, HW1004 and HW1005). HW1003 is recorded as a 'Dead' wreck. A review of the original record for this charted site indicates that it is better regarded as a recorded loss location rather than relating to tangible remains on the seafloor. On this basis, it is not considered to represent part of the known archaeological and cultural heritage resource, but rather as an indication on the potential for currently uncharted wreck remains to exist within the proposed development area.

With respect to the potential for submerged prehistoric archaeology to be present, the Moray East ES 2012 concluded that the organic bands present in the stratigraphic record, presented as laminae within a clay layer between 19.2-33m and an intercalated clay and sand layer between 33-40m, are potentially significant in terms of palaeoenvironmental and palaeoclimate data for possible Quaternary inter-stadial events. However, the absence of organic sediments such as peats within later sediments indicates that there is no potential for palaeoenvironmental data relating to the Holocene, although the presence of residual, scattered flints and lithic artefacts within the marine sediments remains a possibility.

From the 2018 geophysical survey data analysis, of the ten geophysical anomalies seven (WA 7000-7002 and WA 7004-7007) are recorded as 'dark reflectors' and three (WA 7003, 7008, and 7009) are recorded as 'debris' (Appendix 3, Annex 1). A total of 19 of 91 vibrocore logs were taken from within the Moray East site, of which 17 were classified as low priority and two (VC-28 and VC 28A) were classified as medium

priority. Three paeleolandscape features were identified within the Moray East Site, WA 7125 and 7127 were wholly within the Moray East site, whilst 7126 overlapped with the OfTI corridor.

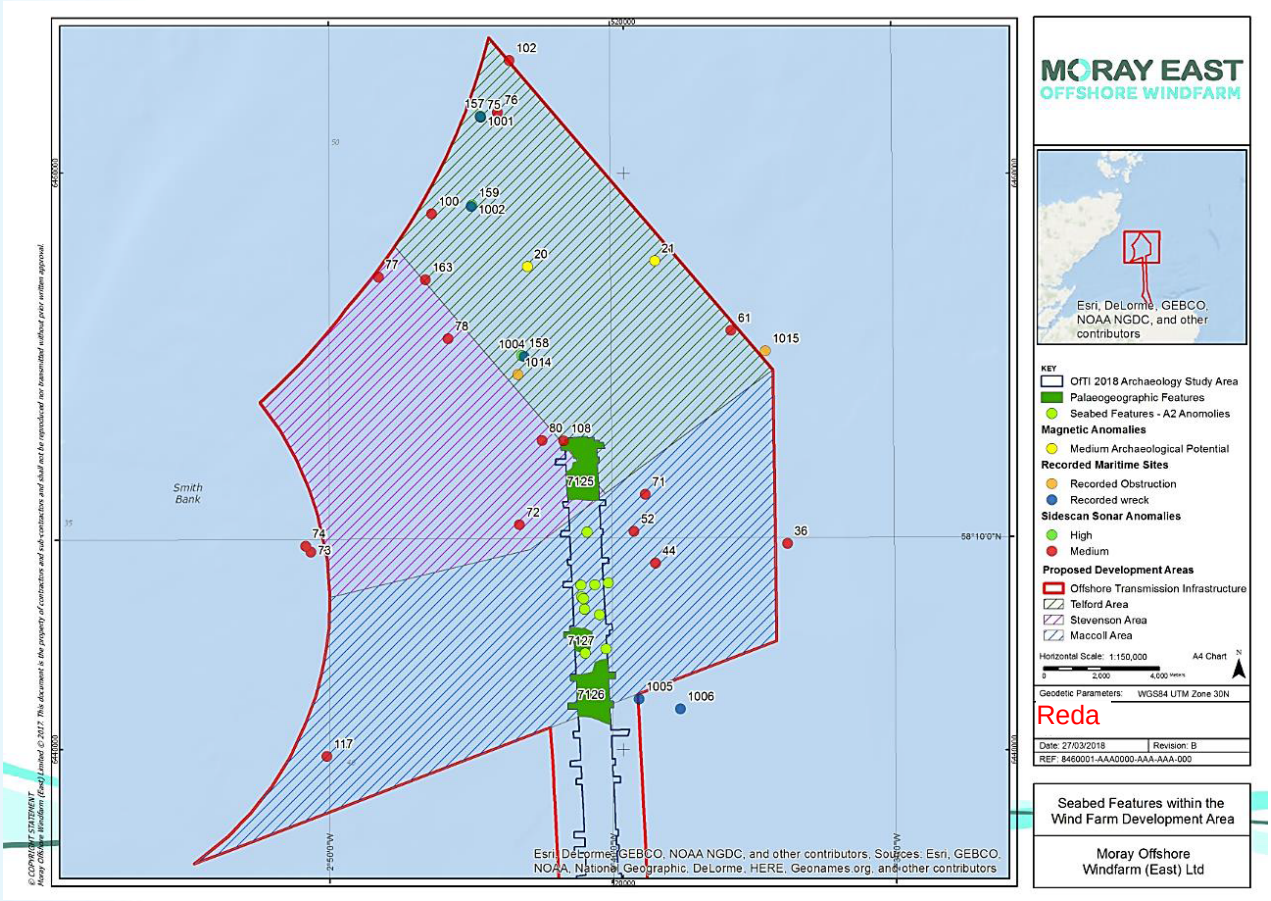

Figure 2-2: Recorded Maritime Sites and Anomalies within the Moray East Site.

2.2 The OfTI Corridor

The following section outlines the baseline conditions relevant to archaeological and cultural heritage based on the OfTI Corridor as presented in the Moray East Modified TI ES 2014 and subsequent archaeological assessment of geophysical and geotechnical survey data (Appendix 3).

There are no designated archaeological or cultural heritage assets or targets within the OfTI Corridor. The following archaeological / cultural heritage assets and targets were identified within the Modified TI corridor:

- 96 anomalies of uncertain origin of possible archaeological interest (classified as A2 anomalies by Wessex Archaeology - uncertain origin of possible archaeological interest); and
- 19 palaeogeographic features.

The Moray East Modified TI ES 2014 documented a further nine maritime sites within the OfTI Corridor (WA 2000-2007). These records were detailed as being based upon UKHO and NMRS records with substantial positional uncertainties. The location of three such records lie within the geophysical survey area subject to archaeological assessment (WA 2002, WA 2006 and WA 2008). An interrogation of the original documentation for these sites has indicated that they represent records of loss rather than tangible remains on the seafloor. These records have been assigned as recorded losses ('U3'). A review of the documentation for the remaining six maritime sites (WA 2000-1, 2003-5 and 2007) also indicates that

these records represent records of loss rather than charted wreck remains. As such, these records are also considered to be recorded losses and do not, except by chance, relate to tangible remains on the seafloor. In conclusion, WA 2000 – 2008 are not regarded as known archaeological / cultural heritage assets within the Modified TI corridor. Although considered to represent a recorded loss, it should be noted that WA 2008 relates to an unconfirmed report of an aircraft loss off Whitehills on 14th June 1943. If located, as this aircraft it likely to have crashed whilst in military service, its remains would be afforded statutory protection under the Protection of Military Remains Act 1986 (Figure .2-3).

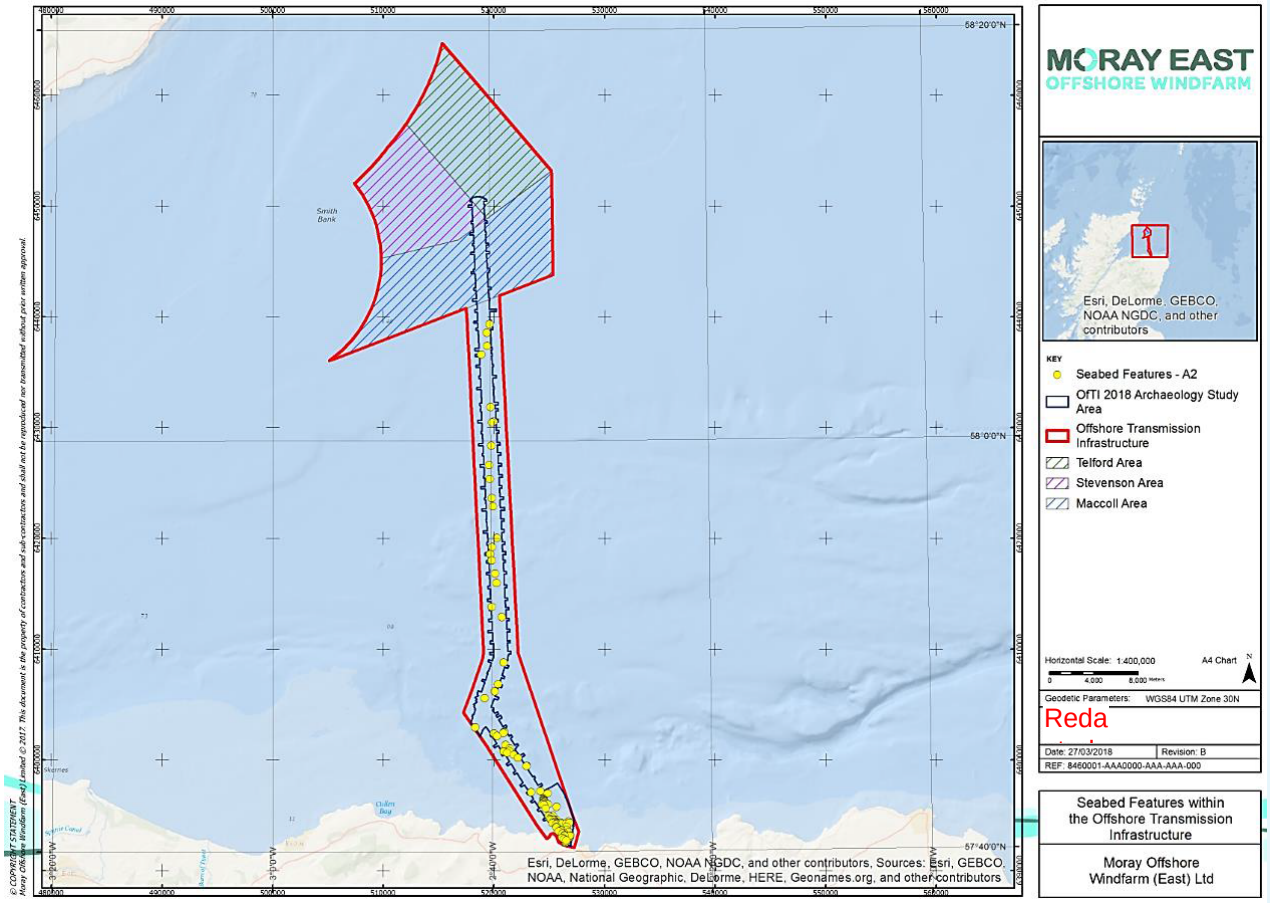

Figure 2-3: Seabed features within the OfTI

The geoarchaeological assessment based on an examination of 91 vibrocore logs from 49 locations within the TI Corridor revealed a stratigraphic sequence that can be summarised as comprising Holocene post-transgression marine deposits, underlain by Holocene-Pleistocene age deposits attributed to Unit 7 of BGS Inner Moray Firth stratigraphy, newly identified subunits (7A, 7B and 7C) of Unit 7, and occasional till deposits (Units 6, 5, 2 and 1). Organic material with the potential to preserve palaeoenvironmental information was identified within four vibrocores (VC-6, VC-15, VC-26A and VC-68). These vibrocores have been assigned high priority status and are recommended for further investigation (see Section 4.5). An additional three vibrocores (VC-53, VC-54 and VC-55) have been assigned medium priority status, with three vibrocores comprising a silt deposit of potential Holocene age that may have been deposited in a shallow water/intertidal environment (VC-53, VC-54 and VC-55) and one vibrocore (VC-26) comprises a grey sand of unknown depositional environment. These too are recommended for further investigation (see Section 4.5). The assessment of geophysical data further identified a 19 palaeolandscape features within the Modified TI corridor which have been designated with a P2 archaeological rating (feature of possible archaeological interest) (Figure 2-4).

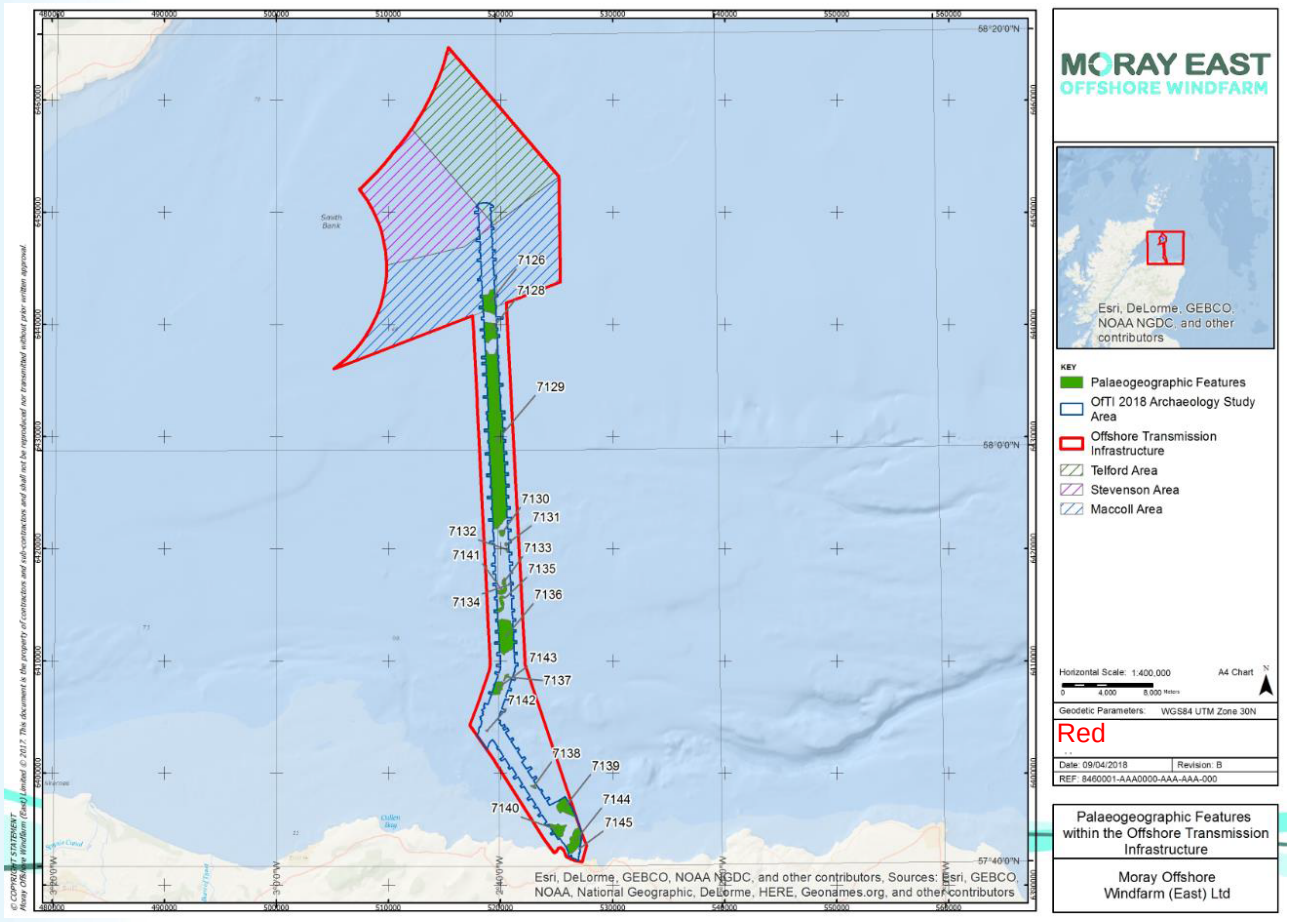

Figure 2-4 Paleogeographic features within the OfTI

3 Summary of Impact Assessment

The ESs Chapters describe and assess the likely significant effects of the proposed project upon both onshore and offshore archaeological and cultural heritage assets. These effects, as outlined in each chapter, are summarised in relation to the Moray East Offshore Wind Farm (Moray East ES 2012- Volume 3, Chapter 8, Section 8.5) and the OfTI (Moray East Modified TI ES 2014 - Chapter 5.4, Section 5.4.2) in the following sections.

3.1 Potential Impacts

3.1.1 The Wind Farm

The potential effects arising as a result of the wind farm elements of the project upon archaeology and the cultural heritage resource can be summarised as follows:

- Likely significant direct effects on archaeological sites and features (for example: damage to or burial of marine sites and features as a result of the proposed works).

Although assessed as potential impacts, the Moray East ES 2012 outlined that no significant indirect effects were identified from changes to seabed processes or to the setting of cultural heritage assets (e.g. where the visibility of wind turbines either causes loss of cultural significance or affects the degree to which significance may be appreciated).

3.1.2 The OfTI Corridor

The potential effects arising as a result of the OfTI elements of the project upon archaeology and the cultural heritage resource can be summarised as follows:

- Potential direct effects on archaeological sites and features arising as a result of:
  - Groundworks associated with OSP installation;
  - Burial of offshore export cables; and
  - Seabed contact by construction and / or inspection, maintenance and repair vessels.

Although assessed as potential impacts, the Moray East Modified TI ES 2014 outlined that no significant indirect effects were identified from changes to seabed processes or to the setting of cultural heritage assets as a result of the OfTI elements of the project.

3.2 Proposed Mitigation

3.2.1 The Wind Farm

The following mitigation strategies were proposed in relation to archaeology and cultural heritage in Volume 3, Chapter 8 (Section 8.5) (Moray East ES 2012).

The implementation of Archaeological Exclusion Zones (AEZs) around archaeology and cultural heritage assets that may be subject to direct impact as a result of the wind farm will serve to preserve *in situ,* any features or deposits of known or potential cultural heritage interest, thereby reducing post-mitigation effects. AEZs are defined as an area where activities that would disturb the seabed are prohibited. In order to mitigate against the discovery of previously unrecorded cultural heritage assets a protocol for unexpected archaeological discoveries will also be implemented.

Table 3-1: Wind Farm Impact Assessment Summary

Receptor	Pre-Mitigation Effect	Mitigation	Post-Mitigation Effect
Construction			
Recorded Sites such as Known Wrecks	Major	AEZs	Negligible
Sites of Medium or High Potential Identified in the Geophysical Survey Data	Moderate to Major	AEZs	Negligible
Unrecorded Offshore Cultural Heritage Assets	Unknown	Implementation of WSI and PAD	Negligible
Sites Affected through Changes in Sedimentary Regime	Negligible	None	Negligible
Operation			
Setting of Designated Onshore Receptors	Negligible	None	Negligible
Sites Affected through Changes in Sedimentary Regime	Negligible	None	Negligible
Decommissioning			
Effects arising from the decommissioning of the three proposed wind farm sites are considered to be analogous to, and of no greater significance than, those arising during construction.			

Ten A2 classified anomalies were identified within the Moray East site area of the 2018 OfTI archaeological study area. Key mitigation measures specific to the Moray East site, as informed by the updated archaeological assessment of geophysical survey data (Appendix 3), can be summarised as follows:

- Avoidance of ten A2 anomalies (uncertain origin of possible archaeological interest) by means of micrositing the scheme design;
- Production of a scheme-specific WSI; and
- The implementation of a reporting protocol for finds of archaeological interest.

3.2.2 The OfTI Corridor

Mitigation measures as outlined in the Moray East Modified ES 2014 were designed to mitigate the effect of the construction, operation and decommissioning phases upon known Cultural Heritage Receptors, and to establish the presence of, and appropriate mitigation for, unknown assets. Amongst the mitigation measures set out in the Moray East Modified ES 2014, it was recommended that geophysical and geotechnical datasets being acquired for the OfTI were subject to archaeological assessment, enhancing the WSI, with the OfTI design, and mitigation measures reported on pre-construction. This archaeological assessment of geophysical and geotechnical survey data has been completed, the results of which have been used to inform this document and are appended (Appendix 3) and any recommendations therein are included within the proposed mitigation as summarised in this document.

As with the approach for the Moray East site, key mitigation measures that will be implemented within the OfTI Corridor can be summarised as follows:

- Avoidance of A2 anomalies (uncertain origin of possible archaeological interest) by means of micrositing the scheme design;
- Production of a scheme-specific WSI; and

- The implementation of a reporting protocol for finds of archaeological interest.

3.2.2.1 Archaeological Exclusion Zones

The preferred method of mitigation is avoidance. AEZs placed around all discrete archaeological sites or more extensive areas identified within an EIA prohibit development related activities within their extents and have been widely applied in offshore contexts to sites and anomalies with known or potential archaeological significance. As the marine historic environment in Scottish and UK waters is still largely unknown and poorly documented, it is often not possible to fully assess the extent or importance of an archaeological site. In many instances, therefore, to assist developers with planning a scheme layout, the implementation of buffers around sites may be more appropriate.

It is proposed that all AEZs will be marked on the scheme masterplans, including contract documents. The final OfTI will take account of these buffers, which may evolve as the project progresses subject to scheme design and survey requirements. If effects cannot be avoided measures to reduce, remedy or offset disturbance will be set out in a WSI agreed with MS-LOT and HES as outlined below.

3.2.2.2 Written Scheme of Investigation

The Moray East Modified ES 2014 states that following completion of geophysical and geotechnical assessment, a WSI will be prepared in consultation with Aberdeenshire Council and Historic Scotland. The WSI will be compliant with existing archaeological guidance and should apply to all construction, operation and decommissioning activities with potential to have an effect upon cultural heritage receptors. It should be incorporated into the final environmental management plan for the OfTI. The WSI will set out:

- When, how, why and by whom archaeological mitigation measures are to be implemented (including AEZs and micrositing allowances); and
- Provide for the appointment of a retained archaeologist (see Section 4.1.3) to carry out and / or coordinate archaeological mitigation activities and to monitor compliance with the WSI during construction.

Section 4 of this document has been prepared to fulfil this requirement as set out in the ES.

3.2.2.3 Protocol for archaeological discoveries

All construction, operation and decommissioning activities will be subject to a scheme-specific protocol document for dealing with archaeological discoveries. This will be compliant with existing archaeological guidance (specifically The Crown Estate/Wessex Archaeology, 2010b) and incorporated into the WSI. Compliance with the protocol will be monitored by the retained archaeologist during construction and installation.

4 Written Scheme of Investigation

This document adheres to methodologies set out in the *Model Clauses for Archaeological Written Schemes of Investigation: Offshore Renewables Projects* (The Crown Estate, 2010) (see Appendix 1 below).

4.1 Roles, Responsibilities and Communication

4.1.1 Client Representative

Moray East will identify a Client Representative to act as a first point of contact for Project staff. It will be the responsibility of the Client Representative to liaise with the Environmental Clerk of Works (EcoW) in respect of the implementation of mitigation measures with respect to archaeology and cultural heritage. Overall responsibility for the implementation of this WSI lies with Moray East who will ensure that its agents and contractors are contractually bound to adhere to the terms of the WSI and to implement the PAD (Section 5 below). The key contact for the historic environment at Moray East is:

- Redacted
- Moray East Offshore Wind Farm, 4th Floor, 40 Princes Street Edinburgh EH2 2BY
- E-mail: Redacted
- Redacted

4.1.2 Environmental Clerk of Works (EcoW)

The EcoW is an independent representative who will be responsible for the liaison with the Archaeological Consultant and the Client Representative. The EcoW will be familiar with the requirements set out in the Archaeological WSI and MARP and will provide oversight that agreed mitigation and reporting protocols are being followed.

4.1.3 Archaeological Consultant/Retained archaeologist

Moray East will retain the services of a suitably qualified and experienced archaeological consultant or retained archaeologist. The archaeological consultant will be the initial point of contact for the EcoW, with responsibilities including ensuring the effective implementation of the MARP. Specific responsibilities include:

- Compiling, reviewing and updating this WSI following consultation with Moray East, the regulators (MS-LOT) and curators (HES);
- Advising Moray East on their responsibilities regarding the implementation of the MARP (Section 5 below);
- Compiling, agreeing and issuing any necessary method statements for archaeological contractors to adhere to, following consultation with the Moray East and the regulators and curators;
- Advising Moray East on the necessary interaction with the regulators, curators and other third parties;
- Supporting Moray East in procuring, monitoring the work of, and liaising with specialist archaeological contractors, where necessary;
- Monitoring the preparation and submission of archaeological reports as appropriate and making them available to the regulators and curators for review and approval; and

- Advising Moray East on any final requirements and arrangements for further assessment, analysis, archive deposition, publication and popular dissemination.

For each package of archaeological works considered necessary, as agreed the regulators and curators, Moray East or their agents will, as required, procure the services of specialist archaeological contractors with the requisite experience and expertise to undertake the necessary works.

4.1.4 Principal Contractor

It will be the responsibilities of the principal contractor engaged by Moray East to undertake the following;

- Familiarise themselves with the requirements of this document and make it available to their staff and sub-contractors, explaining the requirements and need for strict adherence;
- Ensure the implementation of and adherence to this document by their staff, including ensuring staff awareness of reporting protocols and making staff available for training through toolbox talks, as necessary;
- Assisting and affording access to the archaeological contractors and ECoW (where appropriate) as advised by Moray East and the archaeological consultant; and
- Inform the archaeological consultant and any archaeological contractors of any environmental or health and safety constraints of which they may be aware that is relevant to the archaeologist's activities on site.

4.1.5 Relevant Authorities

MS-LOT, acting on behalf of Scottish Ministers, is responsible for discharging / ensuring compliance Moray East's consent conditions. HES is the statutory body for archaeology and cultural heritage within Scotland including marine archaeology in waters adjacent to the Scottish coast up to the mean high water mark and out to 200 nautical miles.

In the event of a significant discovery, HES and MS-LOT will be informed of any archaeological or cultural heritage finds, and will as soon as reasonably practicable:

- Liaise with other relevant archaeological authorities;
- Advise on proposals to further evaluate any finds; and
- Advise on proposals to mitigate the effects of work activities upon any finds, if required.

4.2 Archaeological Recording, Reporting, Data Management and Archiving

The approach to archaeological recording, reporting, data management and archiving will be carried out in accordance with the agreed methodologies as specified in the model clauses. The model clauses sets out agreed methodologies for the following elements of archaeological works:

- Archaeological Method Statements;
- Indexing and Recording Systems;
- Data Management;
- Position-Fixing and Levelling;
- Reports;
- Post-Fieldwork Assessment;

- Analysis and Publication; and
- Archiving.

Key points relevant to various elements of archaeological recording, reporting, data management and archiving in relation to the project are discussed below.

4.2.1 Archaeological Method Statements

Any further archaeological works, if necessary, will be subject to an Archaeological Method Statement (Method Statement) that is consistent with this document and in accordance with the agreed methodologies as outlined in the model clauses. Additional archaeological work packages may be required in the event of an unexpected discovery reported through ORPAD or as a result of the incorporation of archaeological objectives into additional planned surveys and will be agreed in consultation with MS-LOT and HES.

Moray East are currently considering the requirement for the archaeological assessment of additional geophysical / geotechnical surveys undertaken and / or anticipated to take place in the pre-construction phase (see Section 4.5 below). The application of mitigation, including the locations of AEZs, may need to be updated should additional archaeological assessment be undertaken. If required, therefore, consideration will also be given to the preparation of a construction phase Method Statement, prepared in accordance with this WSI, to set out the details of construction specific AEZs, and any further mitigation which may be required, to be agreed in consultation with MS-LOT and HES.

4.2.2 Reporting

Following the completion of the construction phase, a report will be prepared so as to demonstrate the effective implementation of the MARP throughout the works. In the event that no discoveries are encountered, a 'nil discoveries' report will be produced outlining the application of the MARP throughout the duration of works. A final report will be prepared following the completion of any decommissioning works.

In the event that additional archaeological assessments are under consideration, each package of archaeological works will be accompanied by a final archaeological written report pursuant to the requirements of those works as outlined in the Method Statement, prepared in a manner which summarises the results of the investigations and demonstrates appropriate planning, recording and data management, commitment to archiving and public dissemination of results. Reports will be prepared in a structured format and in accordance with the relevant Standards and Guidance documents produced by the Chartered Institute for Archaeologists (Ci*f*A).

4.2.3 Analysis and Publication

Depending on the nature and / or significance of any discoveries made, findings may be considered to warrant reporting in the form of articles, published in a range of journals and publications. In the event that publication is considered suitable, reporting will be conducted in accordance with recommendations made in post-excavation assessment, analysis and reporting. All publication matters will be discussed and agreed in advance with Moray East, MS-LOT and HES.

4.2.4 Archiving

All reports generated through the project will form part of the project archive. The archive will consist of both documentary and digital records, as appropriate, alongside any archaeological material recovered during the project and reported through the MARP. Project archives will be kept together whenever possible, along with a summary of the contents of the archive.

4.3 Archaeological Samples and Artefacts

There are no planned archaeological investigations associated with the proposed project and as such, the need to handle samples and / or artefacts is not currently anticipated. However, should unexpected discoveries of archaeological materials occur, the project will adhere to the methodologies set out in the model clauses. The model clauses includes agreed methodologies for the following:

- Environmental Sampling Strategies;
- Environmental Samples: Handling, Labelling, Packaging and Storage
- Artefacts: Handling, Labelling, Packaging and Storage;
- Ordnance;
- Human Remains;
- Aircraft,
- Wreck; and
- Materials Conservation and Storage.

Further information regarding samples and finds can be found as part of the 'Guidelines for Identifying Finds of Archaeological Interest and Handling Artefacts', Appendix II of ORPAD.

4.4 Avoiding Archaeological Impacts

AEZs will be the principle means used to preserve *in situ* any features or deposits of potential or known archaeological interest. The implementation, monitoring and modification of AEZs will take place in accordance with the measures specified in model clauses.

AEZs preclude development activities from taking place within their boundaries, thereby avoiding significant impacts to assets contained within. These AEZs will apply to construction works, vessel mooring and any other activities that may disturb the seabed during the installation, operation and maintenance and decommissioning of the wind farm and associated OfTI, thus preventing impact upon the known archaeological and cultural heritage resources arising as a result of invasive activities, such as wind turbine generator, offshore sub-station platform and inter-array / export cable installation, and anchoring or deployment of jack–up legs.

The AEZs listed in this document with respect to the Moray East site are based upon recommendations as set out within the existing baseline studies in the Moray East ES 2012. The AEZs listed in this document with respect to the OfTI are based upon recommendations made as part of the archaeological assessment of geophysical / geotechnical survey data across the OfTI (Appendix 3 below) which is considered to supersede those measures set out in the ES prepared for the OfTI Corridor (Moray East Modified TI ES 2014).

Moray East will ensure that the locations, extent and conditions applicable to the AEZs are made available to all relevant parties to ensure that all Project staff respect their boundaries. Moray East will retain responsibility for ensuing adherence to the AEZs throughout the project lifespan (pre-construction, construction, operation and decommissioning).

4.4.1 Location and extent of AEZs

4.4.1.1 Wind Farm

Recommendations included as part of the Moray East ES 2012 proposed the establishment of AEZs of 100 m around sites identified as being of high sensitivity (HW 1001, 1002, 1004, 157, 158 and 159) and

50 m around those of medium sensitivity (HW1014, 1015, HW 36, 44, 52, 61, 71, 72, 73, 74, 75, 76, 77, 78, 80, 100, 102, 108 and 117).These AEZs are summarised in Table 4-1.

Table 4-1: Recommended AEZs within the wind farm area

ID	Description	AEZ Extent	Position (UTM30N)	
			Easting	Northing
HW 1001	*Carisbrook* (possibly) (Recorded Wreck) and geophysical anomaly of high archaeological potential	100m	515045	6461955
HW 157			515051	6461979
HW 1002	*Llanishen* (probably) (Recorded Wreck) and geophysical anomaly of high archaeological potential	100m	514733	6458851
HW 159			514760	6458894
HW 1004	Unknown (Recorded Wreck) and geophysical anomaly of high archaeological potential	100m	516574	6453645
HW 158			516486	6453673
HW 1014	Recorded Obstruction	50m	516351	6453014
HW 1015	Recorded Obstruction	50m	524948	6453838
HW 36	Geophysical anomaly of medium archaeological potential	50m	525712	6447161
HW 44	Geophysical anomaly of medium archaeological potential	50m	521132	6446479
HW 52	Geophysical anomaly of medium archaeological potential	50m	520385	6447576
HW 61	Geophysical anomaly of medium archaeological potential	50m	523746	6454553
HW 71	Geophysical anomaly of medium archaeological potential	50m	520780	6448862
HW 72	Geophysical anomaly of medium archaeological potential	50m	516405	6447812
HW 73	Geophysical anomaly of medium archaeological potential	50m	509171	6446862
HW 74	Geophysical anomaly of medium archaeological potential	50m	508986	6447061
HW 75	Geophysical anomaly of medium archaeological potential	50m	515055	6461947
HW 76	Geophysical anomaly of medium archaeological potential	50m	515643	6462110
HW 77	Geophysical anomaly of medium archaeological potential	50m	511513	6456395
HW 78	Geophysical anomaly of medium archaeological potential	50m	513932	6454259
HW 80	Geophysical anomaly of medium archaeological potential	50m	517192	6450734
HW 100	Geophysical anomaly of medium archaeological potential	50m	513357	6458593
HW 102	Geophysical anomaly of medium archaeological potential	50m	516052	6463919
HW 108	Geophysical anomaly of medium archaeological potential	50m	517946	6450716
HW 117	Geophysical anomaly of medium archaeological potential	50m	509730	6439767
HW 163	Geophysical anomaly of medium archaeological potential	50m	513144	6456338

In addition to the above AEZs, it is recommended that the scheme design is microsited to avoid two magnetic anomalies of medium archaeological potential (HW 20 and 21) each described in the Moray East ES 2012 technical report as ‘a strong possible candidate for a wreck or other manmade object’. If avoidance of these anomalies is not possible, it is recommended that these anomalies be subject to additional archaeological assessment to ascertain their nature and archaeological potential. This will be considered on a site-by-site basis in agreement with MS-LOT and HES.

Table 4-2: Anomalies recommended for micrositing within the wind farm area

ID	Description	Position (UTM30N)	
		Easting	Northing
HW 20	Magnetic anomaly of medium archaeological potential	516683	6456760
HW 21	Magnetic anomaly of medium archaeological potential	521104	6456967

The locations of two recorded wrecks HW 1005 and HW 1006 are not currently proposed for the establishment an AEZ. Both are located outside the development area (Figure 2-1 above) although HW 1005 is located in close proximity to the point where the OfTI Corridor meets the Wind Farm site. This record, however, equates to WA 2000 which, following the assessment of marine geophysical data within the Modified TI Corridor, has been interpreted as a recorded loss location only (see 4.4.1.2 below).

The 10 A2 anomalies identified within the Moray East Site section of the 2018 OfTI archaeological study area subject to archaeological assessment (see Appendix 3) are not subject to an AEZ. Recommendations outlined in the archaeological assessment of geophysical survey data state that these sites should be avoided instead by means of micrositing the scheme design. Groundworks associated with cable and / or OSP installation during the construction phase should also avoid A2 anomalies. Additionally, at times when the installation vessel or any support vessels are required to keep their stations, anchoring should take place in areas which also avoid A2 archaeological anomalies. Any predetermined anchor spread plans should take the presence of any archaeological receptors into consideration and be devised to ensure their avoidance. Where the micrositing to avoid anomalies not subject to AEZs is not possible, it is recommended that anomalies be subject to additional archaeological assessment to ascertain their nature and archaeological potential. This will be considered on a site-by-site basis in agreement with MS-LOT and HES.

4.4.1.2 OfTI Corridor

There are currently no AEZs recommended within the OfTI Corridor. The Moray East Modified TI ES 2014 originally stated that development exclusion zones were to be placed around WA 2000-2008 pending further clarification on the presence or not of any remains through the assessment of the marine geophysical data. The subsequent assessment of marine geophysical data alongside an interrogation of original source material has indicated that WA 2000 - 2008 relate to records of loss rather than tangible remains on the seafloor. On this basis, these records are not considered as part of the known marine archaeological / cultural heritage resource and are no longer considered as candidates for AEZs.

The 96 A2 anomalies identified within the OfTI survey area subject to archaeological assessment (see Appendix 3) are not subject to an AEZ. Recommendations outlined in the archaeological assessment of geophysical survey data state that these sites should be avoided instead by means of micrositing the scheme design. During the pre-Construction phase, grapnel runs should take place so as to avoid A2 anomalies. The proposed treatment of A2 anomalies is previously discussed in Section 4.4.1.1.

4.4.1.3 Monitoring of AEZs

The AEZs outlined above must be retained throughout the project lifetime, unless modified by agreement. AEZs can be reduced, enlarged or removed in agreement with HES if further relevant information becomes available (e.g. as a result of ground-truthing exercises or following the archaeological review of updated geophysical survey data).

In the event that additional geophysical survey data is subject to archaeological assessment during the pre-construction phase (see Section 4.5 below), the AEZs as outlined above may be refined. Should additional archaeological assessment take place, consideration will be given to preparing a construction phase Method Statement which will outline any commitments with respect to AEZs, including their location and extent, following the review of additional geophysical survey data (see Sections 3.1.1 and

3.1.2). Monitoring of AEZs may also be required by the regulator and curator to ensure adherence both during construction and in the future operation of the wind farm.

4.5 Marine Geophysical and Geotechnical Investigations

Moray East are currently considering the requirement for the archaeological assessment of data acquired during additional geophysical and geotechnical surveys undertaken and / or anticipated to take place in the pre-construction phase. This decision will depend on the survey specification / location and whether or not the archaeological assessment of such data will enable the mitigation strategy of the Project to be refined in a manner that is appropriate and proportionate to the potential archaeological anomalies considered to be present. If so, geophysical and / or geotechnical data will be subject to archaeological assessment by archaeological contractors with the requisite experience and expertise to undertake the necessary works. The full complement of data will be subject to archaeological assessment in line with the methodology for 'Archaeological Interpretation of Further Geophysical Data' as set out in the model clauses (Appendix 1, Section 5.7) and / or the 'Archaeological Review of Geotechnical Logs' as set out in the model clauses (Appendix 2, Section 6.3). Assessment results will be reported on in a manner consistent with the model clauses on reporting and will include any recommendations regarding mitigation which may be required as a result of the newly acquired data. In the event of such an assessment, consideration will be given to preparing a construction phase Method Statement which will outline any commitments with respect to AEZs following on from this phase of assessment should they alter from those outlined in Section 4.4 above.

The archaeological assessment of geophysical and geotechnical data prepared for the Modified TI corridor (Appendix 3 below) identified four vibrocores of high priority status (VC-6, VC-15, VC-26A and VC-68) due to the presence of organics, and four vibrocores of medium priority status (VC-28, VC-53, VC-54 and VC-55) as they show indications of potentially being deposited in a nearshore to intertidal environment. It has been recommended that all high and medium priority vibrocores are made available for geoarchaeological recording by a suitably trained geoarchaeologist. It is recommended that the results of this assessment are to be delivered in a Stage 2 geoarchaeology report, with recommendations further Stage 3 assessmen..

Stage 2 geoarchaeology reporting comprises of physical analysis of vibro-core samples, where cores are split before cleaning and geoarchaeological data recorded. Depending on the findings of Stage 2, cores may be sub-sampled and analysed of paleoenvironmental data such as pollen, diatom and foraminifera presence and reported in a Stage 3 report. A full description of the stages of geoarchaeological assessment is provided in Table 2-5, Appendix 3.

4.6 Archaeological Investigations Using Divers and / or ROVs

Moray East are currently considering the requirement for diver / Remotely Operated Vehicle (ROV) surveys pre-construction. Should any such surveys be required for non-archaeological purposes, archaeological input should be sought at the planning stage of any such works so that any additional data can enhance upon an understanding of the marine archaeological and cultural heritage resource. Such surveys have the potential to serve as ground-truthing exercises which enable the nature and character of currently unidentified geophysical anomalies to be better understood. Enhanced knowledge can thus further aid upon an understanding of mitigation strategies, enabling assets that may warrant further investigation to be identified or to identify those sites that are no longer of archaeological interest and require no mitigation. As such, the results of such work have the potential to enlarge, reduce, move or remove AEZs.

If the opportunity to incorporate archaeological objectives as part of any diver / ROV survey arises, Moray East would adhere to standards and guidance as set out in the model clauses. The results of any investigations would be compiled as an archaeological report consistent with the model clauses on reporting.

4.7 Archaeological Watching Briefs

An archaeological watching brief is a formal programme of archaeological monitoring. Monitoring undertaken as part of the offshore elements of the project is anticipated to take place through the mechanism of the MARP (Section 5 below).

5 Marine Archaeological Reporting Protocol

The Moray East consent conditions set out a requirement for a reporting and recording protocol, including reporting of any wreck or wreck material during construction, operation and decommissioning of the project.

In accordance with this requirement, the project will adhere to the Offshore Renewables Protocol for Archaeological Discoveries (ORPAD) (The Crown Estate, 2014) (Appendix 2). ORPAD came into effect in December 2010 and applies to pre-construction, construction and installation activities in developing offshore renewable energy schemes where an archaeologist is not present on site. The aim of ORPAD is to reduce any adverse effects of the project on the historic environment by enabling people working on the development to report unexpected discoveries of archaeological material in a manner that is both convenient to their everyday work and effective with regard to the requirements of Archaeological Curators.

Activities during which previously unidentified sites or unexpected discoveries of material may be encountered include:

- Pre-construction surveys, for example;
- Seabed clearance, pre-lay grapnel runs (e.g. finds brought to the surface);
- Vessel anchoring (e.g. anchor caught on obstruction);
- Installation of the export cables (e.g. obstruction interactions with plough); and
- Installation of wind turbine foundations (e.g. obstruction interactions with jack-up legs).

ORPAD anticipates discoveries being made by Project Staff, who report to a Site Champion on their vessel or site. The Site Champion is a single person who is responsible for reporting discoveries to a Nominated Contact within the Developer's core team. The Nominated Contact is nominated by the Developer to co-ordinate the implementation of the Protocol. The Nominated Contact will in turn inform the Implementation Service by means of uploading information about discoveries onto a secure web portal. The procedure of uploading discoveries will alert the Implementation Service automatically regarding the presence of new discoveries. The Crown Estate provides for the reporting and assessment of discoveries through the ORPAD Implementation Service, currently maintained by Wessex Archaeology.

The Nominated Contact at Moray East is:

- Redacted
- Moray East Offshore Wind Farm, 4th Floor, 40 Princes Street Edinburgh EH2 2BY
- E-mail: Redacted
- Tel: +Redacted

The identity of the Site Champion will be clearly communicated to work teams, via pre-commencement briefings for example.

Moray East will be responsible for ensuring that the relevant staff on all construction vessels, operation and decommissioning vessels will be informed of the Protocol, details of the find types that may be of archaeological interest, and the potential importance of any archaeological material encountered. The ORPAD documentation, including a full description of the methodology and requirements for implementing the protocol, can be found in Appendix 2.

Training to construction staff, site crews and work teams with regard to the practical application of the protocol in their day to day work can be provided by means of a short 'Toolbox Talk'. Hard copies of the ORPAD document will be made available for use on board the construction vessels.

Provision will be made by Moray East, in accordance with the Protocol, for the prompt reporting / recording to MS-LOT and HES of archaeological remains encountered or suspected during the works. If the find is a wreck within the meaning of the Merchant Shipping Act (1996) then a report will also be made to the Receiver of Wreck. If the find is treasure it will be notified to the Treasure Trove Unit which has delegated authority from the Queen's (and Lord Treasurer's Remembrancer) in relation to such matters.

Following completion of the construction phase, a report will be prepared presenting the results of the ORPAD implementation during activities and submitted to MS-LOT. In the event that no discoveries are made, a nil discoveries report should be compiled in order to demonstrate adherence to the scheme in accordance with the consent conditions detailed in Section 1.2.1 above.

6 References

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APPENDIX 1: MODEL CLAUSES FOR ARCHAEOLOGICAL WRITTEN SCHEMES OF INVESTIGATION (OFFSHORE RENEWABLES PROJECTS)

Model Clauses for Archaeological Written Schemes of Investigation

Offshore Renewables Projects

December 2010

Wessex Archaeology

THE CROWN ESTATE

Model Clauses for Archaeological Written Schemes of Investigation

Offshore Renewables Projects

Prepared on behalf of

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Wessex Archaeology

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CONTENTS

1 INTRODUCTION

1.1 Background

The Crown Estate recognises the importance of dealing with the historic environment where it may be affected by offshore renewables and their associated infrastructure. In the course of developing applications, the archaeological heritage has to be addressed through the process of Environmental Impact Assessment (EIA), to include the identification of mitigation measures where significant effects are anticipated.

In terrestrial planning, mitigation measures have historically been secured through conditions requiring the implementation of a Written Scheme of Investigation (WSI). The use of WSIs in this way has transferred successfully to the marine sphere and, in recent years, WSIs have become a common means of securing archaeological mitigation for marine development.

The draft National Policy Statement (NPS) for Renewable Energy Infrastructure (EN-3; November 2009) applicable to England & Wales states (p. 44) that:

> *It is likely to be necessary for the [Regulator] to impose conditions requiring that … the following [is] undertaken:*
>
> *a Written Scheme of Investigation (WSI). This sets out when, how and why archaeological mitigation measures recommended in the ES are to be implemented. It should include necessary monitoring of the effects of the development during the construction, operational and decommissioning phases of the scheme.*

Whilst formal guidance equivalent to EN-3 has yet to emerge in Scotland and Northern Ireland, it is likely that conditions requiring implementation of a WSI will also apply.

In *Historic Environment Guidance for the Offshore Renewable Energy Sector* (Cowrie 2007) Cowrie set out the following guidance with respect to WSIs (para 11.2.1-2):

> *The design and implementation of mitigation measures should be informed by best archaeological practice and is likely to take the form of a Written Scheme of Investigation, which is a document that can be used to explain when, how and why mitigation measures recommended in the ES are to be implemented for any given scheme. In designing mitigation measures, reference should be made to the opinions provided by curators during scoping. It is advisable to discuss the content of a WSI with the relevant curators in the course of its preparation.*
>
> *The objectives of a WSI are to:*
> - *Set out the respective responsibilities of the Developer, main contractors, and archaeological contractors/consultants, to include contact details and formal lines of communication between the parties and with archaeological Curators;*
> - *Ensure that any further geophysical and geotechnical investigations associated with the project are subject to archaeological input, review, recording and sampling;*
> - *Provide for archaeological involvement in any diver and/or ROV obstruction surveys conducted for the scheme;*
> - *Establish the exact position and extent of archaeological exclusion zones, and methodologies for their monitoring, modification and/or removal;*
> - *Propose measures for mitigating effects upon any archaeological material encountered during the operation and decommissioning of the scheme; and*
> - *Establish the reporting, publication, conservation and archiving requirements for the archaeological works undertaken in the course of the scheme.*

WSIs provide details of the archaeological actions required by consent, avoiding the need to include such detail within the consent itself. WSIs are commonly used in land-based archaeology, invoked by conditions on planning consents, and they have found increasing use in consenting offshore renewables and other marine schemes. As they are 'living documents' that can be reviewed and revised through agreement between Developer and Regulator, they are especially suitable for adapting archaeological measures to reflect the results of new data or surveys.

Broadly, marine WSIs comprise:

a) an outline of the known and potential receptors implicated by the scheme;
b) roles and responsibilities;
c) an account of the archaeological actions that are to take place in various circumstances; and
d) detailed methodologies for these archaeological actions.

Whilst items (a) to (c) are scheme-specific and have to be prepared accordingly, archaeological methodologies, item (d), are relatively generic. The Model Clauses in this document set out agreed archaeological methodologies so that they do not have to form part of the preparation and agreement of each WSI. This is expected to save time and costs both in preparing each WSI and in obtaining agreement to them.

Insofar as the Model Clauses are agreed in advance, then the WSIs can focus on items (a) to (c) above and to be tailored to specific aspects of the respective development.

It is likely that the scheme-specific WSI will form part of, or cross refer to, the overarching Environmental Management Systems applicable to the scheme. These Model Clauses may be used in such Environmental Management Systems.

This document is intended to help meet requirements placed on Developers with respect to the historic environment. The aims of the Model Clauses are:

- to facilitate the consenting process, including zonal assessment, EIA, discussions about conditions, and determination. Common agreement of methodologies in advance provides increased certainty about the detail of mitigation actions and promotes greater confidence in determining the residual effects of impacts 'with mitigation';
- to inform the preparation of an Environmental Statement during pre-consent survey, or to be used during survey conducted at later stages (post-consent) to inform detailed project delivery;
- to be used both pre- and post-consent to ensure that Developers are fully aware of the mitigation processes required, whilst ensuring that Archaeological Contractors are clear about the standard requirements of the industry;
- to provide greater certainty for Developers so that they know what to accommodate in their post-consent plans for site investigations and construction;
- to encourage an open and level playing field for the provision of archaeological services by contractors.

Scheme-specific WSIs may refer to the Model Clauses in this document without needing to repeat them in the WSI. Where a scheme-specific WSI deviates from these Model Clauses due to the circumstances of the scheme, the rationale for such deviation must be clearly stated in the WSI, which will be subject to the approval of the Regulator and their archaeological advisors.

The Model Clauses draw upon a corpus of practical experience in developing and agreeing methodological clauses WSI-by-WSI in the course of Round 1 and Round 2 offshore windfarm development, and in the course of other forms of marine development such as ports and aggregates.

The Model Clauses have been written to apply, as relevant, to archaeological investigations on land, intertidal areas and at sea, due to the breadth of impacts from offshore developments.

It should be noted that Regulator or its advisors will want to satisfy themselves that the competence of archaeological contractors implementing WSIs has been sufficiently demonstrated. Competence is indicated by membership of the Institute for Archaeologists (IfA) at the appropriate grade, or registration with the Institute as an organisation holding itself out as capable of carrying out the work in question. In any other case individuals must be able to demonstrate competence to an equivalent standard.

1.2 Roles and Responsibilities

The following table details the roles and responsibilities of the organisations involved. The main roles and responsibilities in relation to the historic environment will be as follows:

Organisation	*Term* used in document	Responsibility
Offshore Renewable Energy Developers	*Developer*	Developers involved in Offshore Renewable Energy Schemes will be commissioning EIAs and WSIs at strategic points in the planning process
Regulatory Bodies (MIPU, MMO etc.)	*Regulator*	Overall responsibility for protection of the historic environment
National Curatorial Body (EH, HS, Cadw etc.)	*Archaeological Curators*	Provide guidance and advice to the regulator pre- and post-consent
Local Curatorial Body (Local Planning Authority)	*Archaeological Curators*	Provides local authority advice to the Regulator
The Crown Estate	*The Crown Estate*	Ownership/Management of the Seabed, Commissioning body, 'land' owner
Archaeologists	*Retained Archaeologist (RA)*	The Archaeological Contractor appointed by the Developer to act as their retained archaeologist
Archaeologists	*Archaeological Contractor*	Archaeological Contractor appointed by the Developer to carry out specific packages of archaeological work
Sub-Contractors	*Contractor*	Contractors and Sub-contractors appointed by the Developer to deliver aspects of the scheme

1.3 Scope of the Model Clauses

Seven sets of Model Clauses are included in this document for the following methodologies:

Chapter	*Title*	Contents
2	*Archaeological Recording, Reporting, Data Management and Archiving*	Clauses covering basic requirements common to all archaeological activities
3	*Archaeological Samples and Artefacts*	Generic requirements for handling, labelling, packaging and storing samples and artefacts, to include reference to legal and other requirements in respect of wreck, aircraft, human remains, ordnance
4	*Archaeological Exclusion Zones*	Standard clauses on the design and monitoring of exclusion zones, including review and modification in light of additional data
5	*Marine Geophysical Investigations*	Where geophysical surveys are to include archaeological objectives, clauses on survey planning, acquisition procedures, processing and archaeological interpretation
6	*Marine Geoarchaeological Investigations*	Covering archaeological involvement in planning geotechnical surveys such as vibrocoring and boreholes, on site recording and sampling, assessment of logs, laboratory recording and sub-sampling, sample assessment, scientific dating, analysis and reporting
7	*Archaeological Investigations using Divers and/or ROVs*	Clauses on the conduct of underwater interventions, including position-fixing
8	*Archaeological Watching Briefs*	Clauses covering circumstances where archaeologists may be required to be present during construction activities, such as pre-lay grapnel runs and intertidal cable-laying.

A list of sources of guidance and further reading can be found in Chapter 9.

2 ARCHAEOLOGICAL RECORDING, REPORTING, DATA MANAGEMENT AND ARCHIVING

2.1 Archaeological Method Statements

2.1.1 Each package of archaeological works will be subject to a Method Statement that is consistent with the scheme-specific WSI and these Model Clauses. Method Statements will be prepared for the Developer either by the Retained Archaeologist or by Archaeological Contractors monitored by the Retained Archaeologist on behalf of the Developer.

2.1.2 The Developer will submit each Method Statement (including generic and specific Method Statements, and varied and updated Method Statements) to Archaeological Curators in advance of the archaeological works, and in accordance with the time frame agreed between the Developer and Archaeological Curators in the scheme-specific WSI.

2.1.3 The Archaeological Curators will confirm that they have agreed each Method Statement in accordance with the time frame agreed between the Developer and Archaeological Curators in the scheme-specific WSI.

2.1.4 Archaeological works will not commence unless the Archaeological Curators have confirmed their agreement of the Method Statement, or if the time frame agreed in the scheme-specific WSI has elapsed.

2.1.5 Method Statements will include provision for Archaeological Curators to monitor the conduct of the archaeological work as appropriate, including site visits, interim statements and/or meetings with the Developer, the Retained Archaeologist and the Archaeological Contractor.

2.1.6 Unless otherwise agreed by the Developer and the Archaeological Curators, Method Statements will address the following matters:

- form of commission and contractual relationship with the Developer;
- relation between licence condition(s), WSI and the Method Statement;
- context in terms of relevant construction works;
- summary results of previous archaeological investigations in the vicinity;
- archaeological potential;
- specific objectives of archaeological works;
- extent of investigation;
- investigation methodology, to cover:
  - intrusive methods;
  - recording system;
  - finds, including the policy for selection, retention and disposal and provision for immediate conservation and storage;
  - environmental sampling strategy;
- anticipated post-investigation actions, including processing, assessment and analysis of finds and samples;
- reporting, including Intellectual Property Rights in the report and associated data, confidentiality and timescale for deposition of the report in a publicly accessible archive;
- timetable, to include investigation and post-investigation actions;
- monitoring arrangements, including monitoring by Archaeological Curators;
- health, safety and welfare.

2.1.7 Method Statements may refer directly to these Model Clauses as appropriate and need not repeat them.

2.2 Indexing and Recording Systems

2.2.1 All archaeological recording will be based on a series of unique site identifiers that are cross-referenced to the identifiers used in pre-consent investigations (e.g. zone assessment/EIA).

2.2.2 All archaeological finds and deposits will be recorded using a *pro forma* recording system, based on a running matrix of assigned contexts for each site. Numbers will be allocated in blocks that are unique to that site. A number log will be maintained.

2.2.3 All archaeological finds and deposits will be added, as appropriate, to a Geographic Information System (GIS) maintained by the Retained Archaeologist. Summary details and archaeological constraints (including Archaeological Exclusion Zones (AEZs)) will also be added to the scheme GIS maintained by the Developer.

2.2.4 A full photographic record will be maintained using digital, video and stills photography as appropriate. Recovered material will be subject to photographic recording by digital stills, monochrome prints and colour transparencies as appropriate. Additional illustrative photographs will be taken as appropriate and a register of the photographic record will be maintained.

2.3 Data Management

2.3.1 All data in digital formats will be considered part of the primary archive and will be prepared in accordance with the guidance in *Digital Archives from Excavation and Fieldwork: Guide to Good Practice* (AHDS, 2000).

2.3.2 All data will be stored on a suitable safe medium and protected from accidental or deliberate harm.

2.3.3 Provisions for digital data will accord with procedures recommended by The Crown Estate, Marine Environment Data and Information Network (MEDIN), Archaeology Data Service (ADS) and the relevant Archaeological Curators. Digital material will be subject to managed quality control and curation processes which will embed appropriate metadata within the material and ensure its long term accessibility.

2.3.4 Summary data will be compiled in a format suitable for submission of Monument, Event and Source records to the relevant National Monument Record and Local Historic Environment Record (HER).

2.3.5 Survey data relating to wrecks should be submitted to UKHO using form H525.

2.3.6 On completion of scheme construction (in England and Scotland), an OASIS form will be produced for the whole scheme, and copies of all archaeological reports will be attached as data files. Notification of the completion of the OASIS form will be sent to relevant local HERs, and the English Heritage Marine Planning Unit to enable compliance with any relevant consent.

2.4 Position-Fixing and Levelling

2.4.1 The spot height of all principal features and levels will be calculated in metres relative to Ordnance Datum, correct to two decimal places. Plans, sections and elevations will be annotated with spot heights as appropriate.

2.4.2 Levels of principal features and of the seabed/land surface will also be converted to metres relative to Chart Datum.

2.4.3 Position-fixing will be related to UTM WGS 84 datum in offshore use and British National Grid (BNG) in intertidal and terrestrial uses. Where positions have been acquired in another projection, details of the position in its original projection will be maintained including an audit trail for the conversion to BNG or WGS 84.

2.4.4 Position-fixing will be by GPS, either by hand-held unit (on land or intertidal areas); by reference to vessel navigation systems; or by dedicated survey equipment.

2.4.5 On land and in intertidal areas, levels will be obtained by Total Station or by RTK (Real Time Kinematic) GPS.

2.4.6 Position-fixing during diver or ROV-based investigations will be determined by acoustic tracking system linked to GPS.

2.4.7 The methods and likely accuracy of position-fixing and levelling will be stated in Archaeological Reports.

2.5 Reports

2.5.1 Each package of work outlined in the scheme-specific WSI will give rise to one or more Archaeological Reports, as set out in the Method Statement relating to the work.

2.5.2 Each Archaeological Report will satisfy the Method Statement for the investigation and will present the project information in sufficient detail to allow interpretation without recourse to the project archive.

2.5.3 Archaeological reports will be prepared in accordance with the guidance given in the relevant IfA's Standards and Guidance documents. Reports will typically include:

- a non-technical summary;
- the aims and methods of the work;
- the results of the work including finds and environmental remains;
- a statement of the potential of the results;
- proposals for further analysis and publication; and
- illustrations and appendices to support the report.

2.5.4 Illustrations will include a plan of the area subject to investigation in relation to the development scheme.

2.5.5 Each Archaeological Report will be submitted in draft to the Retained Archaeologist for submission to the Developer. If the report is prepared by the Retained Archaeologist it will be submitted directly to the Developer.

2.5.6 Arrangements and timescales for submitting draft Archaeological Reports by the Developer to Archaeological Curators will be set out in the scheme-specific WSI.

2.5.7 Where comments are received from the Archaeological Curators, Archaeological Reports will be returned by the Developer to the report originator to undertake such amendments as might be required.

2.5.8 Arrangements and timescales for submitting final Archaeological Reports by the Developer to Archaeological Curators will be set out in the scheme-specific WSI.

2.5.9 On completion of archaeological works relating to construction of the scheme and to a timetable agreed with the Developer and Archaeological Curators, an overarching report on the archaeology of the scheme will be prepared in draft and final copies in accordance with the methods set out above. The overarching report need not repeat the details contained in each preceding report, but should serve as an index to, and summary of, the archaeological investigations as a whole.

2.5.10 Draft and final Archaeological Reports may be submitted in pdf format. Final Archaeological Reports must also be submitted in hard copy: one copy for the Retained Archaeologist; two copies for the Developer; and a further three copies for forwarding to Archaeological Curators (including relevant National Monument Records and Local Historic Environment Records).

2.5.11 Full copyright of each report shall be retained by the originator under the Copyright, Designs and Patents Act 1988 with all rights reserved, excepting that:

- the Developer will be licensed to use each report in all matters directly relating to the scheme;
- the Developer will be licensed to make each report available for public dissemination as part of the dissemination measures; and
- at an appropriate time, the Developer will submit the reports to the appropriate National repositories with full usage rights to make accessioned material publicly available as part of their normal functions.

2.5.12 Except where further analysis and publication are to take place (see below), a note based on the overarching report should be published in at least one appropriate peer-reviewed local, national, thematic or period-based journal. The note will signpost the availability of further details of the investigations, including reports, records and archives.

2.6 Post-Fieldwork Assessment

2.6.1 Post-fieldwork assessment will address, where possible, the character and extent, date, integrity, state of preservation and relative quality of the archaeological features or remains of the recorded archaeology, and provide a costing for any further research, analysis, publication and archiving (including the costs of depositing the archive).

2.6.2 Decisions regarding the scope of post-fieldwork assessment will be made by agreement between the Developer and Archaeological Curators following submission of investigation reports, based on the possible importance of the results in terms of their contribution to archaeological knowledge, understanding or methodological development.

2.6.3 As a minimum, a single post-fieldwork assessment may be carried out in respect of the investigations associated with the scheme as a whole. Such an assessment may be carried out by expanding the overarching archaeological report to include proposals in respect of analysis, publication and archiving.

2.6.4 An assessment of the potential of the archive for further analysis will be undertaken. The assessment phase may include (but is not limited to) the following elements:

- the conservation of appropriate materials, including the X-raying of metalwork;
- the spot-dating of all pottery from any investigation. This will be corroborated by the scanning of other categories of material;
- the preparation of Site matrices with supporting lists of contexts by type, by spot-dated phase and by structural grouping supported by appropriate scaled plans;
- an assessment statement will be prepared for each category of material, including reference to quantity, provenance, range and variety, condition and existence of other primary sources;
- a statement of potential for each material category and for the data set as a whole will be prepared, including specific questions that can be answered and the potential value of the data to local, regional and national investigation priorities.

2.6.5 Where warranted by – for example – the investigation of an important site, a discrete post-fieldwork assessment may be undertaken of the specific sites or investigations in advance of assessment of the investigations associated with the scheme as a whole.

2.6.6 Post-fieldwork assessment reports will be prepared in a manner consistent with the Model Clauses on reporting above.

2.7 Analysis and Publication

2.7.1 On the basis of post-fieldwork assessment, and as agreed by the relevant local or national Archaeological Curators, mitigation requirements will be satisfied by

carrying out analysis of the post-fieldwork assessment to include publication of important results in a recognised peer-reviewed journal or as a monograph.

2.7.2 Other forms of publication (e.g. 'popular publication', internet publishing, and publication of photographs, videos etc. on digital media or online) may be employed where appropriate. The scope of any such publication will be informed by the post-fieldwork assessment and subject to agreement between the Developer and the relevant Archaeological Curators.

2.8 Archiving

2.8.1 It is accepted practice to keep project archives, including written, drawn, photographic and artefactual elements (together with a summary of the contents of the archive) together wherever possible and to deposit them in appropriate receiving institutions once their contents are in the public domain.

2.8.2 Best practice should be adhered to in line with Archaeology Archives Forum, *Archaeological Archives: A guide to best practice in creation, compilation, transfer and curation* (2007) and IfA, *Standard and Guidance for the creation, compilation, transfer and deposition of archaeological archives* (2009).

2.8.3 Where appropriate, reference should also be made to: Museums and Galleries Commission*, Standards in the Museum Care of Archaeological Collections* (1992); Society of Museum Archaeologists, *Retention and Dispersal of Archaeological Collections; Guidelines for use in England, Wales and Northern Ireland* (1993); Institute for Conservation (ICON)*, Conservation Guidelines No. 3: environmental standards for the permanent storage of excavated material from archaeological sites* (1993) and; Walker, K.*, Guidelines for the preparation of excavation archives for long-term storage* (1990).

2.8.4 The relevant receiving institution will be notified of any archaeological investigation in advance of fieldwork. Any specific requirements relating to the preparation and deposition of project archives raised by archaeological contractors will be accommodated as appropriate. The Archaeological Contractor, through the Developer, will inform the Archaeological Curators of arrangements for archiving.

2.8.5 In the course of developing Method Statements for archaeological investigations that are likely to result in artefacts etc. being added to the project archive, the Archaeological Contractor will contact an appropriate receiving institution to discuss the intended fieldwork and seek their agreement to accept the project archive for long-term storage and curation. An Accession Number will be sought for the project archive.

2.8.6 The relevant Archaeological Curators and the Archaeological Contractor will agree with the receiving institution a policy for the selection, retention and disposal of excavated material, and confirm requirements in respect of the format, presentation and packaging of archive records and materials, and will notify the receiving institution in advance of any fieldwork.

2.8.7 Written archives will be on clean, stable materials, and will be suitable for photocopying. The materials used will be of the standard recommended in *Guidelines for the Preparation of Excavation Archives for Long-term Storage* (Walker, 1990).

2.8.8 The timetable for depositing archives with the receiving institution after completion of the post-fieldwork programme will be agreed based on a Method Statement prepared for the Developer by the Archaeological Contractor following fieldwork.

2.8.9 If records are to be copied to microfilm for the purposes of archive storage, then the guidelines set out in IfA Paper No. 2 *Microfilming archaeological sites* (1999) will be applied. The Archaeological Contractor should contact the relevant national receiving institution to check their requirements. The microfilm and one diazo duplicate will be submitted to the local receiving institution and one diazo duplicate submitted to the National receiving institution.

2.8.10 In England, The National Monuments Record (NMR) is the repository for fieldwork records. The NMR operates a policy for the selection of records relating to sites of national importance.

2.8.11 For Scotland, the National Monuments Record of Scotland at the Royal Commission on the Ancient and Historic Monuments is the elected repository for all fieldwork records generated during archaeological fieldwork.

2.8.12 For Wales, the Royal Commission on the Ancient and Historic Monuments of Wales acts as the repository for the deposition of all archaeological fieldwork records and archives.

2.8.13 For Northern Ireland the Built Heritage Division, Department of the Environment in Northern Ireland acts as the repository for the deposition of all fieldwork records.

3 ARCHAEOLOGICAL SAMPLES AND ARTEFACTS

3.1 Environmental Sampling Strategies

3.1.1 Deposits (i.e. sediments) of archaeological/ historical/cultural interest that do not comprise artefactual remains will not be considered to be 'finds' but may be subject to sampling. Any artefactual material subsequently discovered in the course of processing such samples would be treated as finds thereafter.

3.1.2 For each programme of archaeological work, environmental sampling strategies and methods – including methods for processing, assessing and/or analysing samples – will be set out in the Method Statement for the archaeological work.

3.1.3 Approaches and methods will be consistent with *Environmental Archaeology: a guide to the theory and practice of methods, from sampling and recovery to post-excavation* (Centre for Archaeology Guidelines, English Heritage 2002) and *Geoarchaeology: using earth sciences to understand the archaeological record* (English Heritage 2007). It should be noted that a second edition of *Environmental Archaeology* is forthcoming from English Heritage.

3.2 Environmental Samples: Handling, Labelling, Packaging and Storage

3.2.1 All environmental samples will be satisfactorily and legibly labelled, and recorded on a register of samples. Sample record sheets will provide information on type, reason for sampling, size, context and sample numbers, spatial location, date taken, and a brief description/interpretation.

3.2.2 All environmental samples will be stored in appropriate conditions by the Archaeological Contractor pending any assessment and analysis.

3.2.3 Geotechnical and geoarchaeological samples should also be handled, labelled, packaged and stored in accordance with guidelines set out in the above document.

3.2.4 For geotechnical and geoarchaeological samples derived from developer-led sampling programmes, the Developer will ensure that samples are made available for geoarchaeological recording and sub-sampling, in accordance with the archaeological Method Statement, prior to any processes that may render the sample ineffective, such as strength testing.

3.3 Artefacts: Handling, Labelling, Packaging and Storage

3.3.1 All retained finds will be processed in accordance with the IfA's *Standard and guidance for the collection, documentation, conservation and research of archaeological material* (IfA, 2005 revised October 2008). All finds will be recorded and labelled appropriately.

3.3.2 All finds and other items of archaeological interest have an owner, but the law regarding ownership varies according to the character of the material, the environment in which it was found, and national legislation. From the point of discovery, all finds will be held by the Archaeological Contractor in appropriate conditions pending further recording, investigation, study or conservation. Ownership will be transferred to the institution receiving the archive unless other arrangements are agreed with the Archaeological Curators.

3.3.3 Artefacts that are exposed in the course of scheme works will be recovered by the Archaeological Contractor or, where recovery is impracticable, recorded. All finds will be recorded by context and in the case of significant objects ('special finds'), in three dimensions using a unique sequence of reference numbers.

3.3.4 Recovered objects will be selected, retained or disposed of in accordance with the policy agreed with the institution receiving the archive, and in consultation with the Archaeological Curators.

3.3.5 Subject to the agreement reached with the receiving institution regarding selection, retention and disposal of material, the Archaeological Contractor will retain all recovered objects unless they are undoubtedly of modern or recent origin. The presence of discarded objects will, however, be noted on context records. In these circumstances sufficient material will be retained

to characterise the date and function of the deposit from which it was recovered.

3.3.6 In the event of the discovery of unexpected, unusual or extremely fragile and delicate objects and deposits, the Retained Archaeologist, the Developer and the Archaeological Curators will be notified immediately. Additional work required to recover, record, analyse, conserve and archive such objects and deposits will be agreed in consultation with the Archaeological Curators.

3.3.7 In the event of the discovery of items that may be eligible for legal protection, the Archaeological Contractor will immediately notify the Retained Archaeologist, who will notify the relevant legal authority as soon as possible. The Developer and the Archaeological Curators will be notified as soon as possible.

3.3.8 The Retained Archaeologist will prepare and implement a finds monitoring and maintenance programme, which will cross-refer to finds management/monitoring systems maintained by the Archaeological Contractor(s)/Developer.

3.3.9 Contingency will be made for specialist advice and conservation needs on-site should unexpected, unusual or extremely fragile and delicate objects be recovered, and the advice and input from an appropriate Conservation Service will be sought through the Archaeological Contractor's Finds Manager. A range of internal and external specialists will be consulted as appropriate.

3.4 Ordnance

3.4.1 In the event that any item(s) of ordnance is discovered it should be treated with extreme care as it may not be inert. Industry guidelines provided by the Developer must be followed prior to any recording of items for archaeological purposes.

3.4.2 Depending on the items' age, ordnance may be of archaeological interest, especially when discovered with other related material from a wreck, either shipwreck or aircraft, and should be recorded if it is safe to do so.

3.4.3 Any firearms and ammunition (e.g. from a crashed military aircraft) are likely to be subject to the Firearms Acts (various dates). Ammunition should be regarded as ordnance, irrespective of its size.

3.5 Human Remains

3.5.1 All archaeological work in respect of human remains will be in accordance with the standards set out in the IfA *Technical Paper No 7 Guidelines to the Standards for Recording Human Remains* (IfA 2004).

3.5.2 In the case of the discovery of human remains, at all times they should be treated with due decency and respect. For each situation, the following actions are to be undertaken, and in any event, the Retained Archaeologist will inform the Developer and Archaeological Curators:

- for human remains on land and in intertidal areas, application should be made to the Ministry of Justice for an exhumation licence under the Burial Act 1857;
- for human remains within territorial waters where the remains have been intentionally buried, application should be made to the Ministry of Justice for an exhumation licence;
- in all other cases, the Retained Archaeologist will immediately inform the Coroner and the Police. If neither the Coroner nor the Police propose to investigate the remains, they may be dealt with as set out in the following paragraph.

3.5.3 Where practical the human remains will be left *in situ,* covered and protected. Where it has been established that the Coroner or Police have no interest in the remains, or their disturbance or removal is not subject to an exhumation licence under the Burial Act 1857 but development will unavoidably disturb them, then all excavation and post-excavation processes will be in accordance with the standards set out in IfA *Technical Paper No 7 Guidelines to the Standards for Recording Human Remains* (IfA 2004). In those instances where a licence for their excavation is issued by the Ministry of Justice, the requirements of that licence will also be followed.

3.5.4 Where human remains have been found and development will unavoidably disturb them, the remains will be fully recorded, excavated and removed from the site.

3.5.5 The final placing of human remains following analysis will be subject to the requirements of the Ministry of Justice Licence.

3.6 Aircraft

3.6.1 The majority of aircraft wrecks are military and so fall under the legal protection of the Protection of Military Remains Act 1986. Archaeological Contractors should refer to guidance outlined in *COWRIE Historic Environment Guidance* (Wessex Archaeology, 2007) and *Draft Interim Guidance on the use of the Protocol for Reporting Finds of Archaeological Interest in relation to Aircraft Crash Sites at Sea* (Wessex Archaeology, 2008).

3.6.2 Any finds that are suspected of being military aircraft will be reported immediately to the Retained Archaeologist (where appointed). The Developer will be informed as well as the Service Personnel and Veterans Agency (SPVA: Joint Casualty and Compassionate Centre – SO3 Historic Casualty Casework). Any subsequent actions will be guided by *Crashed Military Aircraft of Historical Interest: Licensing of Excavations in the UK – Guidance Notes for Recovery Groups* (MOD/SPVA, April 2007) and by advice received from SPVA. In the case of a military aircraft being investigated under licence, any human remains will be reported immediately in accordance with paragraph 14 of *Guidance Notes for Recovery Groups*.

3.6.3 In England, reference should also be made to guidance produced by English Heritage on aircraft crash sites: *Military Aircraft Crash Sites: Archaeological guidance on their significance and future management* (English Heritage, 2002). In Wales, reference should also be made to guidance produced by Cadw in *Caring for Military Sites of the Twentieth Century*.

3.7 Wreck

3.7.1 Archaeological artefacts that have come from a ship are 'wreck' for the purposes of the Merchant Shipping Act 1995. Developers, via their Archaeological Contractors, should ensure that the Receiver of Wreck is notified, either on behalf of or directly by the Developer, for all items of wreck that have been recovered. The Developer may prefer to retain control of the reporting process due to legal responsibilities under the Merchant Shipping Act 1995.

3.8 Materials Conservation and Storage

3.8.1 All recovered materials, on land and underwater, will be subject to a Conservation Assessment to gauge whether special measures are required while the material is being held. In the case of material recovered from underwater or inter-tidal areas, the conservation assessment will take place no more than four weeks after recovery. If warranted, all or part of the Conservation Assessment will be carried out at an earlier stage (for example, in advance of recovery, or onboard immediately following recovery).

3.8.2 This Conservation Assessment will be carried out by the Retained Archaeologist or an Archaeological Contractor with an appropriate level of expertise, with advice from appropriate specialists and following recommendations in the *Guidance for Archaeological Conservation Practice* (ICON, 1990).

3.8.3 The Retained Archaeologist (where appointed) or an Archaeological Contractor with appropriate expertise will implement recommendations arising from the Conservation Assessment.

3.8.4 Objects that require immediate conservation treatment to prevent deterioration will be treated according to guidelines laid down in *First Aid for Finds* (Leigh, Watkinson and Neal (eds.) 1998) and/or *First Aid for Underwater Finds* (Robinson 1998). A full record of any treatment given will be made by the person applying the treatment and these records will form part of the archive.

3.8.5 Specialist conservation work approved by the Developer and the Archaeological Curators on metalwork, bone (including worked bone), human remains and other organic remains, industrial waste, ceramic material, glass and lithic material will be carried out by appropriately qualified Archaeological Contractors, monitored by the Retained Archaeologist.

3.8.6 Where no special measures are recommended, finds will be conserved, bagged and boxed in accordance with guidelines set out in the Archaeology Section of the ICONs *Conservation Guidelines No 2: packaging and storage of freshly excavated artefacts from archaeological sites* (1993).

3.8.7 Plans for the permanent storage of the finds and samples should be determined in line with the *Conservation Guidelines No. 3: environmental standards for the permanent storage of excavated material from archaeological sites* (ICON 1993).

3.8.8 Materials conservation and storage will accord with the IfA *Standard and Guidance for the collection, documentation, conservation and research of archaeological materials* (2008).

4 ARCHAEOLOGICAL EXCLUSION ZONES

4.1 Introduction

4.1.1 Archaeological Exclusion Zones (AEZs) agreed between the Developer and Archaeological Curators will be the principal means used to preserve *in situ* any features or deposits of known or potential archaeological interest.

4.1.2 The Offshore Renewables Protocol for Archaeological Discoveries (The Crown Estate 2010) provides for Temporary Exclusion Zones (TEZs) to be introduced when discoveries are made. The TEZ may be lifted following advice, or may form the basis of an AEZ in the event that further disturbance should be avoided.

4.1.3 The Developer will require its contractors to conduct all construction activity in such a way as to prevent any impacts by construction or related works within any AEZs, including impacts from plant and equipment that is not directly engaged in construction.

4.1.4 Although AEZs are fixed, provision is made below for their alteration, following appropriate archaeological investigation and consultation, should this become necessary before or during construction.

4.1.5 The design, alteration and removal of AEZs will be subject to agreement with Archaeological Curators.

4.1.6 The Developer will notify its contractors of AEZs and of any alteration or removal of AEZs.

4.2 Location and Extent of Archaeological Exclusion Zones

4.2.1 Provision will be made for AEZs around confirmed sites, anomalies and palaeo-geographic features that can be safeguarded *in situ*.

4.2.2 AEZs are formed by establishing a buffer around the known extents of sites, or around geophysical anomalies for which the available evidence suggests that there could be archaeological material present on the seabed. For sites and anomalies for which there is insufficient detailed information available to ascertain the site's archaeological importance, the AEZ will be implemented based on the potential apparent to the Retained Archaeologist.

4.2.3 Details of individual AEZs will normally be appended to the WSI. The baseline data used to establish the AEZ will be incorporated within the details of the AEZ. This baseline data will form the basis for subsequent monitoring of the AEZ, supplemented by such other data that becomes available.

4.3 Establishing New Archaeological Exclusion Zones

4.3.1 If new finds of archaeological importance come to light during the course of construction, they may also be subject to the implementation of additional AEZs. This includes conversion of a TEZ to an AEZ as a result of ground truthing or new information.

4.3.2 The need for and the design (position, extent) and implementation of any new AEZs will be subject to the agreement of Archaeological Curators.

4.4 Altering Archaeological Exclusion Zones

4.4.1 AEZs may be altered (enlarged, reduced, moved or removed) as a result of further data assessment or archaeological field evaluation of data covering those areas that are subject to AEZs. Further data assessment could include a formal archaeological analysis of new geophysical data, and archaeological field evaluation could include suitable high-resolution geophysical survey and/or field survey.

4.4.2 The alteration of AEZs will only be undertaken with the agreement of Archaeological Curators. Following alteration, a new plan giving details of the AEZs will be drawn up and issued to each relevant party.

4.5 Monitoring of Archaeological Exclusion Zones

4.5.1 Provision for monitoring AEZs will be set out in a method statement agreed between the Developer and the Archaeological Curators with reference to any

relevant regulatory consent. Monitoring will take place relative to the baseline data used to establish the AEZ and continue for the duration set out in the scheme-specific WSI.

4.5.2 Development-related activities will not be undertaken within an AEZ. If it becomes apparent that activities have taken place within any AEZ, the party responsible will obtain advice from the Retained Archaeologist in accordance with their obligations with respect to AEZs and the detail of the scheme-specific WSI as relevant to any identified AEZs.

4.5.3 Periodic Archaeological Reports will be prepared to review whether there have been any incursions into each AEZ and whether there are still archaeological grounds for maintaining each AEZ. Archaeological Reports on AEZs will include recommendations regarding amendment of the extent, removal and/or creation of new AEZs.

4.5.4 Following completion of construction, a report will be complied on the effectiveness of the AEZs during construction, any alterations to them, and the results of the monitoring.

4.5.5 Post-construction monitoring will be carried out in accordance with the methods and timescales set out in the scheme-specific WSI with a view to identifying any impacts on AEZs attributable to indirect effects of construction. The duration of monitoring should be consistent with the time frame for monitoring processes (e.g. sediment transport) that have been identified as having possible indirect archaeological effects.

5 MARINE GEOPHYSICAL INVESTIGATIONS

5.1 Planning Further Geophysical Surveys

5.1.1 The specification of any proposed marine geophysical surveys whose primary aim is non-archaeological will be subject to advice from the Retained Archaeologist to ensure that archaeological input is provided at the planning stage and to enable archaeological considerations to be taken into account without compromising the primary objective of the survey.

5.1.2 The archaeological input will take the form of advice from a marine archaeologist with an appropriate level of expertise, coupled with relevant professional accreditation, on the following points:

- available details of sites and/or anomalies identified in previous studies;
- archaeological potential of areas where no existing sites and/or anomalies are yet known;
- geophysical sources/equipment;
- methodologies, including spacing and orientation of lines and cross lines;
- source/equipment settings;
- requirements for post-processing, interpreting and archiving resulting data.

5.1.3 Where a survey is carried out primarily to meet archaeological objectives, the specification shall be prepared by the Retained Archaeologist and carried out by a survey company with appropriate archaeological expertise.

5.2 Undertaking Further Geophysical Surveys

5.2.1 Where a survey is carried out primarily to meet archaeological objectives, the survey will be carried out by a survey company with appropriate archaeological expertise and including geophysicists with appropriate archaeological expertise onboard.

5.2.2 Where archaeological objectives have been added to a survey whose primary objectives are non-archaeological (e.g. engineering or environmental), consideration will be given to having an archaeologist or geophysicist with appropriate archaeological expertise onboard during the acquisition of data. The onboard archaeologist will advise on the suitability for archaeological purposes of the data being acquired, and be able to propose, though communication with the Retained Archaeologist, minor changes to the survey method, settings, etc. in order to optimise archaeological results, and thereby minimise the need for repeat surveys.

5.2.3 Surveys will be carried out to a single datum and co-ordinate system. All survey data – including navigation (position, heading and velocity) - will be acquired digitally in industry-standard formats. Care is to be taken to maintain the orientation and attitude of sensors on line. Track-plots are to be corrected for layback (including catenary effects) and made available in digital (GIS) form.

5.2.4 Once the surveys have been processed to meet their primary objectives, the survey data – together with factual reports – will be made available in digital formats to an archaeologist or geophysicist with appropriate expertise in archaeological processing and interpretation.

5.3 Sidescan Sonar Survey

5.3.1 Sidescan sonar survey will be carried out at frequency, range and gain settings capable of resolving all objects that are 0.5m and above throughout the survey.

5.3.2 Where a survey is carried out primarily for archaeological purposes, line spacing will be equal to or less than the effective range, and no more than 1.75x the effective range, to ensure that the seabed is ensonified at least twice (from different directions), enhancing object recognition and ensuring coverage directly beneath survey lines. Known sites and anomalies of apparent archaeological potential will be 'boxed' by at least two and preferably four lines along and across the principal axis of the anomaly. These lines will be offset so that the anomaly does not lie immediately beneath the fish, and run at optimal frequency and range settings for imaging the anomaly.

5.3.3 Towfish height and speed will be carefully monitored during the survey to maintain optimum data quality and resolution.

5.3.4 Sidescan sonar data will be made available in the form of raw, un-mosaiced files in a suitable proprietary format.

5.4 Magnetometer Survey

5.4.1 Magnetometer survey will be carried out using a caesium gas or equivalent system capable of resolving anomalies of 5 nano Teslas (nT) and above.

5.4.2 The magnetometer towfish should be towed as close to the seafloor as possible and operated with a sample rate of at least 4Hz.

5.4.3 Lines can be run in conjunction with other sensors (i.e. on the same line spacing and orientation) but provision should be made to run additional lines and cross-lines across known sites and anomalies of apparent archaeological potential as indicated by desk-based information or any of the other sensors.

5.4.4 Magnetometer data will be made available as cleaned, de-spiked text (x,y,z) files for each line, including layback.

5.5 Sub-bottom Survey

5.5.1 Sub-bottom survey will be carried out using a source capable of resolving internal structures to the full depth of anticipated scheme impacts within Quaternary deposits.

5.5.2 The system should be able to penetrate up to 40m sub-seabed with a vertical resolution of 0.3m or better at the seabed with no ringing.

5.5.3 Where a survey is carried out primarily for archaeological purposes, line and cross-line spacing and orientation will be sufficient to resolve the extents and characteristics of the principal Quaternary deposits.

5.5.4 A pulse test of the seismic source will be undertaken prior to survey.

5.5.5 A single beam echosounder will be run in conjunction with the sub-bottom survey; the first reflector (seabed) should be levelled with reference to a tide gauge.

5.5.6 Sub-bottom data will be made available in a suitable proprietary format.

5.6 Multibeam Survey

5.6.1 Where a multi-beam survey is to be carried out mainly for archaeological purposes a beam-forming system capable of achieving an effective cell/bin size better than 1m is preferred.

5.6.2 Where an anomaly of apparent archaeological potential is identified, a single slow pass will be carried out at the highest possible ping rate.

5.6.3 Single beam and multi-beam data will be made available as de-spiked and tidally-corrected text (x, y and z) files for each line, in addition to any gridded/rendered surfaces. In relation to multibeam data, backscatter data should be included (if collected) along with the associated survey log.

5.7 Archaeological Interpretation of Further Geophysical Data

5.7.1 New geophysical survey data will be interpreted by an archaeologist with an appropriate level of expertise.

5.7.2 Raw survey data, together with factual reports and trackplots, will be made available in digital formats to the Archaeological Contractor.

5.7.3 Archaeological interpretation will include:

- examination of sidescan, magnetometer, sub-bottom and multibeam data for the area and surroundings of known wreck sites and previously identified geophysical anomalies;
- examination of sidescan, magnetometer, sub-bottom and multibeam data within areas that will be subject to scheme impacts in order to identify as yet unknown wreck remains;
- assessment of sub-bottom data in order to plot the general trend of the sub-surface sediments with archaeological potential;
- following the initial assessment, further detailed interpretation of sub-bottom data within those areas that will be subject to scheme impacts.

5.7.4 Sidescan and sub-bottom data will be interpreted initially on the basis of line-by-line review in an un-mosaiced format. The interpretation of point data (multibeam, single beam and magnetometer) will include reference to original point-cloud data and not be limited only to post-processed surfaces.

5.7.5 The results of further geophysical interpretation will be compiled as an Archaeological Report consistent with the Model Clauses on reporting that will identify new features or deposits (if any) that warrant additional mitigation measures or further investigation. Archaeological Reports on geophysical surveys will set out the methods used in processing and interpreting the geophysical data.

5.7.6 The requirements under this section should be implemented with regard to any policies for mitigating disturbance to European marine species.

6 MARINE GEOARCHAEOLOGICAL INVESTIGATIONS

6.1 Planning Geoarchaeological involvement in Geotechnical Surveys

6.1.1 The specification of any proposed geotechnical surveys will be subject to advice from the Retained Archaeologist to ensure that archaeological input is provided at the planning stage and to enable archaeological considerations to be taken into account. The geotechnical specification will also be informed by any previous stages of work, for example archaeological interpretation of geophysical data (see 5.7.1).

6.1.2 The archaeological input will take the form of advice from an archaeologist with appropriate expertise, on the following points:

- available details of deposits and surfaces of archaeological interest identified in previous studies, including the results of geophysical work and deposit modelling;
- archaeological potential of areas from which there is no previous evidence;
- the suitability for archaeological purposes of the proposed geotechnical methods and equipment;
- methodologies, including positioning and spacing of trial pits/cores/boreholes and transects;
- requirements for the archaeological description and sub-sampling of geotechnical exposures, cores and samples to yield the necessary information, to include the presence of archaeologists with appropriate expertise during trial-pitting, coring and/or extrusion;
- requirements for processing, interpreting and archiving resulting data.

6.1.3 Archaeological Curators will be consulted regarding the proposed locations of geotechnical work and will be provided with the results of each stage of investigation (see below).

6.1.4 It is recommended that a timetable and policy for the storage, retention and disposal of samples is agreed and set out in a Method Statement, at the outset of the project, between the Developer, Curator and any receiving institutions.

6.1.5 The advice set out in the forthcoming COWRIE guidance on optimising geotechnical survey material for historic environment analysis (in press) will be taken into account.

6.2 Geoarchaeological Investigations

6.2.1 A structured approach will be taken to any necessary archaeological analysis of the material obtained as appropriate to satisfy the requirements of the Archaeological Curators for delivery of the required mitigation measures.

6.2.2 The objectives, approaches and methods to be applied in each geoarchaeological investigation will be set out in a Method Statement which will be subject to agreement with Archaeological Curators.

6.2.3 Consultation will be held between the Archaeological Contractor (and Retained Archaeologist, where appointed) and the contractor undertaking geotechnical investigations in order to enable the relevant samples to be retained for geoarchaeological analysis.

6.2.4 Geotechnical cores, or a representative sample of cores agreed with the Archaeological Contractor, will be retained undisturbed until a selection of cores for archaeological recording has been made. If the cores cannot be retained then further steps should be taken, such as having an archaeologist present during sampling operations.

6.2.5 The Developer should ensure that the core logs are available for review. The geotechnical contractor should assist with flexibility of sub-sampling prior to discard/destruction of samples.

6.3 Archaeological Review of Geotechnical Logs

6.3.1 A competent Archaeological Contractor will review borehole/vibrocore/CPT logs on completion of the geotechnical investigations carried out by the geotechnical contractor.

6.3.2. This review will provide an overview of the sedimentary sequence within the area, including whether there is any organic material present and whether there are homogenous sedimentary layers across the area.

6.3.3 Based on this review, recommendations will be made regarding the need for further examination of selected core samples. The scope of any further work will be agreed by the Developer and Archaeological Curators. If no further work is recommended a final report will be produced by the Archaeological Contractor. Guidence given in COWRIE (in press) *Offshore Geotechnical Investigations and Historic Environment Analysis: guidance for the renewable energy sector* will be adhered to.

6.4 Splitting and Recording Geotechnical Cores

6.4.1 If the review of logs identifies sedimentary horizons with archaeological potential, a selection of core samples will be split and recorded archaeologically for a range of palaeo-environmental indicators and dating material.

6.4.2 One undisturbed half of each selected core sample is required for archaeological recording. The recording programme will comprise:

- the longitudinal splitting of each core sample and the cleaning of half of each sample; and
- the detailed archaeological recording of each sample, noting sediment colour, type and inclusions.

6.4.3 The results of archaeological recording should be presented as a report, to be agreed with the relevant local or national Archaeological Curators. The report will include recommendations indicating whether sampling and laboratory assessment of core samples is warranted to produce an appropriate representation of the area subject to development. The Archaeological Curators will advise the Developer on the necessary work to complete the necessary analysis and interpretation. If no further work is recommended by the Archaeological Curators a final report will be produced by the Archaeological Contractor.

6.5 Sub-sampling

6.5.1 If archaeological recording identifies sedimentary horizons with the potential for the preservation of palaeo-environmental evidence, sections of core containing such evidence should be sub-sampled for environmental indicators such as plant macros, pollen, diatoms, ostracods and foraminifera, and for scientific dating.

6.5.2 Sub-sampling will comprise collection of small (circa 1 cm^3) samples from selected points within the sedimentary sequence in the selected core(s).

6.5.3 Sub-sampling may occur in the course of archaeological recording of cores (above), especially if the cores are available for a limited time. Sub-sampling may, however, be deferred to form part of the assessment stage, below, to benefit from lengthier consideration in conjunction with other sources if there is scope to re-open the cores once decisions about assessment have been made.

6.6 Laboratory Assessment of Sub-samples

6.6.1 If warranted by the results of archaeological recording (above), sub-samples will be subject to lab-based assessment of the value of the palaeo-environmental material (pollen, diatoms, ostracods and foraminifera) surviving within the cores.

6.6.2 The assessment programme will also comprise scientific (e.g. radiocarbon) dating.

6.6.3 If no further work is recommended, and in agreement with the Archaeological Curators, the Archaeological Contractor will produce a final report (see 6.8.1).

6.7 Laboratory Analysis of Samples

6.7.1 If the assessment identifies significant palaeo-environmental evidence full analysis will be undertaken, involving the complete counts, identification and interpretation of the pollen, diatom, ostracod and foraminifera samples. If scientific dating has not occurred previously, then such dating will accompany this analysis.

6.7.2 Laboratory analysis will result in an account of the successive environments within the coring area, a model of environmental change over time, and an outline of the archaeological implications of the analysis. It will include the incorporation of the results into a model of the seabed sediments and palaeo-topography based on analysis of geophysical (sub-bottom) data.

6.8 Geoarchaeological Report

6.8.1 The Archaeological Contractor will produce a final report at the end of the last stage to which geoarchaeological investigation proceeds. To the extent available, the final report will integrate the results of review, recording, assessment, analysis and dating. The report will address the palaeo-topography and prehistory of the area affected by the development, including relevant data generated by desk-based assessment and other field investigations, including geophysical surveys.

6.8.2 The geoarchaeological report will be prepared in a manner consistent with the Model Clauses on reporting (above) and agreed with the Archaeological Curators prior to finalisation and deposit.

7 ARCHAEOLOGICAL INVESTIGATIONS USING DIVERS AND/OR ROVS

7.1 Non-Archaeological Diver/ROV-Surveys

7.1.1 In order to maximise the potential benefits of any proposed diver/Remote Operated Vehicle (ROV) surveys undertaken primarily for engineering, ecological or other non-archaeological purposes, the Developer will seek archaeological input at the planning stage of any such works. Any such survey specification will be informed by previous stages of the project, including any documentary studies, as well as geophysical and geotechnical analysis, so that archaeological considerations can be taken into account.

7.1.2 Archaeological input will take the form of advice from the Retained Archaeologist on measures to optimise archaeological results from the planned survey. Advice will include:

- the available details of sites and/or anomalies identified in the desk-based assessment;
- the archaeological potential of areas where no existing sites and/or anomalies are yet known;
- the type and level of diver/ROV positioning, voice recording and video/still recording to be utilised; and
- the provision of clear guidance on the types of sites and finds that are to be reported and recorded.

7.1.3 Where the primary objectives of dive survey are non-archaeological, consideration will be given to having an Archaeological Contractor present during any diver or ROV surveys, either as observer(s) or participating diver(s) to optimise archaeological results and thereby reduce the need for repeat survey.

7.2 Review of data collected by Non-Archaeological Diver/ROV surveys

7.2.1 Following the completion of a non-archaeological diver/ROV survey, all data, including video footage, will be reviewed by an Archaeological Contractor with appropriate expertise.

7.2.2 This review will identify any sites that are potentially of archaeological interest – typically this will involve the identification of vessel remains, rather than just stray artefacts. The report will identify those sites and/or geophysical anomalies that may warrant further investigation. It will also identify those sites that are no longer of archaeological interest, and hence may be removed – for example – from the list of Archaeological Exclusion or Temporary Exclusion Zones (AEZs or TEZs).

7.2.3 If the review of data collected by diver/ROV survey identifies sites of archaeological interest that will be subject to impact during construction then the Developer will discuss with Archaeological Curators whether an Archaeological diver/ROV-based assessment is required.

7.3 Archaeological diver/ROV-based site assessment

7.3.1 Archaeological diver or ROV-based investigations will take place where the primary objectives are archaeological and the diving is led by archaeologists.

7.3.2 Archaeological diver and/or ROV surveys can be employed in order to gather archaeological data concerning wreck sites and geophysical anomalies to safeguard the archaeological record or to alter (enlarge, reduce, move or remove) existing AEZs or TEZs. Specifically, an archaeological diver or ROV-based assessment may be required where it is not possible to protect an archaeological site through the implementation of an AEZ or where visual clarification is sought in order to confirm or amend an AEZ or TEZ.

7.3.3 Diver/ROV assessment primarily for archaeological purposes will be undertaken by an Archaeological Contractor with a marine archaeological team with the appropriate expertise and experience of the environment/conditions likely to be encountered.

7.3.4 Every dive will be recorded using a digital video system with helmet-mounted camera or the ROV's onboard instrumentation.

7.3.5 The position of the diver/ROV will be determined using an acoustic navigation system. The position will be

integrated into a diver tracking and recording system where the position of the objects on the seabed can be compared to the geophysical data, and the extent and character of the features recorded.

7.3.6 Recording will be conducted to a level whereby a statement can be made as to the date, character, extent and archaeological importance of the site. Significant diagnostic features will be recorded by photography backed up with written records and measurements. Limited documentary research may also be required to support the assessment of importance.

7.3.7 Details of levels for wreck recording are outlined in Appendix I.

7.4 Reporting

7.4.1 The archaeological results of any diver/ROV survey will be compiled in a report by the Archaeological Contractor. The report will include a statement of the likely requirements (if any) for further archaeological work.

7.4.2 The report will be prepared in a manner consistent with the Model Clauses on reporting and agreed with the Archaeological Curators prior to finalisation and deposit.

8 ARCHAEOLOGICAL WATCHING BRIEFS

8.1 General

8.1.1 A watching brief is a formal programme of archaeological monitoring and will involve attendance by an Archaeological Contractor during groundworks in the terrestrial or inter-tidal zone, during offshore obstruction clearance and other activities associated with the scheme.

8.1.2 Attendance will be by an archaeologist or geoarchaeologist (as appropriate) with an appropriate level of expertise during intrusive groundworks or other site activity/investigation associated with the development.

8.1.3 All watching brief activities will be conducted in accordance with the standards outlined in the IfA's *Standard and Guidance for an archaeological watching brief* (IfA 1994 revised 2008), as well as Chapters 2 and 3 of this document and the scheme-specific WSI and accompanying Method Statements.

8.1.4 An archaeologist will attend development activities that are operating in areas considered to be of medium or high archaeological potential as defined by the relevant Curator. The watching brief will allow for either constant or intermittent monitoring as appropriate, based on the requirements of scheme-specific WSI and method statements. In areas of low potential (where monitoring does not take place) a Protocol for Archaeological Discoveries (PAD) will be in operation.

8.1.5 The Archaeological Contractor will seek to minimise any impact on the Developer's programme caused by the archaeological investigation.

8.2 Actions in the Course of Development Activities

8.2.1 Excavated surfaces and up-cast material will be inspected by the Archaeological Contractor. Any finds will be collected and allocated a record number and their position will be logged. A suitable metal detector may be used to enhance artefact recovery.

8.2.2 Archaeological features or structures will be examined and/or excavated. A sufficient sample of each layer/feature type will be investigated in order to elucidate the date, character, relationships and function of the feature/structure.

8.2.3 Any standing section of trench edge will be inspected by the Archaeological Contractor, where safe to do so.

8.2.4 Development activities will include provision for sampling of features and deposits in order to recover artefacts, ecofacts and dating evidence, and in order to determine stratigraphic relationships. Recording will include written, drawn, and photographic elements as conditions allow.

8.2.5 Where appropriate, sieving of bulk environmental samples will be undertaken to enhance levels of artefact recovery. Bulk soil samples may be taken specifically for artefact recovery.

8.2.6 Where construction equipment is not capable of being observed (e.g. towed grapnels), the equipment should be periodically recovered to the surface and inspected for artefacts or other material of archaeological interest. All such material should be photographed, recorded and stored.

8.2.7 If significant archaeological or palaeo-environmental deposits are encountered then the Developer, in consultation with the relevant Curator, will make provision for the Archaeological Contractor to undertake a programme of investigation commensurate with the evidence discovered.

8.3 Recording and Reporting

8.3.1 A site plan at an appropriate scale will be annotated with the position of areas observed in relation to the construction footprint. The plan will show the location of features observed and recorded in the course of the investigations. The site plan should include a note of the position-fixing method and the accuracy achieved.

8.3.2 The basic record of each feature/structure identified during the watching brief should include:

- a full photographic record;
- drawn record (plans and sections);
- position in three dimensions; and
- a written description including initial interpretation and contextual relationships.

8.3.3 Positions will be related to National Grid and Ordnance Datum (above the MLWM) or WGS84 and LAT (below the MLWM).

8.3.4 Finds will be allocated a record number (from a continuous unique numbering system) and their position, along with any features and/or layers of archaeological interest, will be logged in an appropriate manner.

8.3.5 The archaeological results will be compiled in a report by the Archaeological Contractor, in accordance with the requirements outlined in *Standard and Guidance for archaeological watching briefs* (IfA 1994 revised 2008).

9 SOURCES OF GUIDANCE AND FURTHER READING BY TOPIC/CHAPTER

9.1 General Guidance

Cadw, *Caring for Coastal Heritage* (1999)
Cadw, *Caring for Military Sites of the Twentieth Century* (2009)
DECC, *Draft National Policy Statement for Renewable Energy Infrastructure (EN-3)* (2009)
DEFRA, *Our Seas – A shared resource: High level marine objectives* (2009)
English Heritage, *England's coastal heritage: A statement on the management of coastal archaeology* (1996)
English Heritage, *Military Aircraft Crash Sites – Archaeological guidance on their significance and future management* (2002)
English Heritage, *Wind Energy and the Historic Environment* (2005)
English Heritage, *Management of Research Projects in the Historic Environment – MoRPHE* (2006)
English Heritage, *Conservation Principles: policies and guidance* (2008)
Historic Scotland, *Conserving the Underwater Heritage, Historic Scotland* (1999)
Historic Scotland, *Scottish Historic Environment Policy* (2009)
Institute for Archaeologists, *Standard and Guidance for the stewardship of the historic environment* (2007)
Joint Nautical Archaeology Policy Committee, *Code of Practice for Seabed Development* (2006)
Wessex Archaeology, COWRIE *Historic Environment Guidance for the Offshore Renewable Energy Sector, Published Guidance Note* (2007)
Wessex Archaeology, *Draft Interim Guidance on the use of the Protocol for Reporting Finds of Archaeological Interest in relation to Aircraft Crash Sites at Sea* (2008)

9.2 Archaeological Recording, Reporting, Data Management and Archiving

AHDS, *Digital Archives from Excavation and Fieldwork: Guide to Good Practice* (2000)
Archaeology Archives Forum, *Archaeological Archives: A guide to best practice in creation, compilation, transfer and curation* (2007)
Institute for Archaeologists, *Standard and Guidance for Archaeological Desk Based Assessment* (1994, revised 2008).
Institute for Archaeologists, *Standard and Guidance for archaeological field evaluation* (1994, revised 2008).
Institute for Archaeologists, *Standard and Guidance for archaeological watching briefs* (1994, revised 2008).
Institute for Archaeologists, *Standard and Guidance for archaeological excavation* (1995, revised 2008)
Institute for Archaeologists, *Standard and Guidance for archaeological investigation and recording of standing buildings or structures* (1996, revised 2008)
Institute for Archaeologists, *IfA Technical Paper No. 2: Microfilming archaeological sites* (1999)
Institute for Archaeologists, *Standard and Guidance for the collection, documentation, conservation and research of archaeological materials* (2008)
Institute for Archaeologists, *Standard and Guidance for the creation, compilation, transfer and deposition of archaeological archives* (2009)
Society of Museum Archaeologists, *Retention and dispersal of Archaeological Collections; Guidelines for use in England, Wales and Northern Ireland* (1993)
Walker, K., *Guidelines for the preparation of excavation archives for long-term storage* (ICON, 1990)

9.3 Archaeological Samples and Artefacts

English Heritage, *Environmental Archaeology: a guide to the theory and practice of methods, from sampling and recovery to post-excavation* (2002)
English Heritage, *Geoarchaeology: using earth sciences to understand the archaeological record* (2007)
Institute for Archaeologists, *Standard and Guidance for the Collection, Documentation, Conservation and Research of Archaeological Materials* (2008)
Institute for Archaeologists, *Technical Paper No 7: Guidelines to the Standards for Recording Human Remains* (2004)
Institute for Conservation (ICON), *Conservation Guidelines No. 2: Packaging and Storage of Freshly-Excavated Artefacts from Archaeological Sites* (1993)

Institute for Conservation (ICON), *Conservation Guidelines No. 3: environmental standards for the permanent storage of excavated material from archaeological sites* (1994)
Institute for Conservation (ICON), *Guidance for Archaeological Conservation Practice* (1990)
Leigh, D., Watkinson, D. and Neal V. (eds.) *First Aid for Finds* (1998)
Museums and Galleries Commission, *Standards in the Museum Care of Archaeological Collections* (1992)
Robinson, W., *First Aid for Underwater Finds* (1998)

9.4 Archaeological Exclusion Zones

Wessex Archaeology, COWRIE *Historic Environment Guidance for the Offshore Renewable Energy Sector, Published Guidance Note* (2007)

9.5 Marine Geophysical Investigations

English Heritage, *MoRPHE Project Planning Note 1: Marine Archaeological Geophysical Surve*y (2006)
Ruth Plets, Justin Dix and Richard Bates, *Marine Geophysics Data Acquisition, Processing and Interpretation Guidance Notes* (Forthcoming)
Wessex Archaeology, COWRIE *Historic Environment Guidance for the Offshore Renewable Energy Sector, Published Guidance Note* (2007)

9.6 Marine Geoarchaeological Investigations

COWRIE, *Offshore Geotechnical Investigations and Historic Environment Analysis: Guidance for the Renewable Energy Sector* (Forthcoming)
Society of Underwater Technology: Offshore Site Investigation Group, *Guidance Notes On Site Investigations For Offshore Renewable Energy Projects* (Forthcoming)
Wessex Archaeology, COWRIE *Historic Environment Guidance for the Offshore Renewable Energy Sector, Published Guidance Note* (2007)

9.7 Archaeological Investigations using Divers and/or ROVs

Wessex Archaeology, COWRIE *Historic Environment Guidance for the Offshore Renewable Energy Sector, Published Guidance Note* (2007)

9.8 Archaeological Watching Briefs

Institute for Archaeologists, *Standard and Guidance for Archaeological Watching Briefs* (1994, revised 2008).

10 APPENDIX I: ARCHAEOLOGICAL WRECK RECORDING LEVELS

Level	Type	Objective	Sub-level	Character	Scope	Description
1	**Assessment**	A record sufficient to establish the presence, position and type of site	**1a**	Indirect (desk-based)	A basic record based on documentary, cartographic or graphic sources, including photographic (incl. AP), geotechnical and geophysical surveys commissioned for purposes other than archaeology	Documentary assessment / inventory of a site, compiled at the start of work on a site, and updated as work progresses
			1b	Direct (field)	A basic record based on field observation, walkover survey, diving inspection etc., including surveys commissioned specifically for archaeological purposes	Typically a 1–2 dive visit to the site (to assess a geophysical anomaly, etc.)
2	**Evaluation**	A record that provides sufficient data to establish the extent, character, date and importance of the site.	**2a**	Non-intrusive	A limited record based on investigations that might include light cleaning, probing and spot sampling, but without bulk removal of plant growth, soil, debris etc.	Typically a 2-4 dive visit to assess the site's archaeological potential, backed up by a sketch plan of the site with some key measurements included.
			2b	Intrusive	A limited record based on investigations including vigorous cleaning, test pits and/or trenches. May also include recovery (following recording) of elements at immediate risk, or disturbed by investigation	Either an assessment of the buried remains present on a site; the recovery of surface artefacts; or cleaning to inform, for example, a 2a investigation
3	***In situ***	A record that enables an archaeologist who has not seen the site to comprehend its components, layout and sequences.	**3a**	Diagnostic	A detailed record of selected elements of the site	The first stage of a full record of the site. This would include a full measured sketch of the site and a database (or equivalent) entry for all surface artefacts
			3b	Unexcavated	A detailed record of all elements of the site visible without excavation	Full site plan (i.e. planning frame or equivalent accuracy) with individual object drawings, and full photo record (possibly including a mosaic)
			3c	Excavated	A detailed record of all elements of the site exposed by open excavation of part or whole of the site	This may take the form of full or partial excavation of a site
4	**Removal**	A record sufficient to enable analytical reconstruction and/or reinterpretation of the site, its components and its matrix			A complete record of all elements of the site in the course of dismantling and/or excavation	
5	**Intra-site**	A record that places the site in the context of its landscape and other comparable sites.			A complete record of all elements of the site, combined with selective recording of comparable sites and investigation of the surrounding area	

11 APPENDIX III: GLOSSARY OF ACRONYMS

ADS	Archaeological Data Service
AEZ	Archaeological Exclusion Zone
AHDS	Arts and Humanities Data Service
PAD	Protocol for Archaeological Discoveries
DCMS	Department of Culture, Media and Sport
DECC	Department of Energy and Climate Change
DEFRA	Department for Environment, Food and Rural Affairs
EH	English Heritage
EIA	Environmental Impact Assessment
HER	Historic Environment Record
HS	Historic Scotland
ICON	Institute for Conservation
IfA	Institute for Archaeologists
IPC	Infrastructure Planning Commission
MEDIN	Marine Envinonment Data and Information Network
MHWM	Mean High Water Mark
MIPU	Major Infrastructure Planning Unit
MLWM	Mean Low Water Mark
MOD	Ministry of Defence
MoJ	Ministry of Justice
NMR	National Monuments Record
OWF	Offshore Wind Farm
ORs	Offshore Renewables
PAS	Portable Antiquity Scheme
RA	Retained Archaeologist
ROV	Remote Operated Vehicle
SPVA	Service Personnel and Veterans Agency
TEZ	Temporary Exclusion Zone
UKHO	United Kingdom Hydrographic Office

12 APPENDIX IV: LIST OF CONSULTEES

List of Consultees for The Crown Estate, Offshore Renewable Energy and the Historic Environment Consultation

Advisory Committee for Historic Wreck Sites
Association of Local Government Archaeological Officers: Maritime Committee
Association of Local Government Archaeological Officers: Planning & Legislation Committee
Cadw
Centrica
Council for British Archaeology
Department for Culture, Media and Sport
Department for Environment, Food and Rural Affairs
Department of Energy and Climate Change
Department of Enterprise Trade and Investment
Department of the Environment, Northern Ireland
DONG Wind (UK) Ltd
East Anglia Offshore Wind (SP Renewables)
English Heritage: Marine Team
E.ON
Fluor
Forewind
Historic Scotland
Infrastructure Planning Commission
Institute for Archaeologists
Joint Nautical Archaeology Policy Committee
Manx National Heritage
Marine Management Organisation
Marine Scotland
Ministry of Defence
Ministry of Justice
Nautical Archaeology Society
Northern Ireland Environment Agency
Portable Antiquities Scheme
Receiver of Wreck (MCA)
Renewable UK
RES
Royal Commission on the Ancient and Historical Monuments of Scotland
Royal Commission on the Ancient and Historical Monuments of Wales
Scottish Government
Sea Energy Renewables
The Crown Estate
UHI Millenium Institute
Welsh Assembly Government: Energy Team
Welsh Assembly Government: Marine Policy Team

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REGISTERED ORGANISATION IfA

APPENDIX 2: PROTOCOL FOR ARCHAEOLOGICAL DISCOVERIES (OFFSHORE RENEWABLES PROJECTS)

THE CROWN ESTATE

Protocol for Archaeological Discoveries: Offshore Renewables Projects

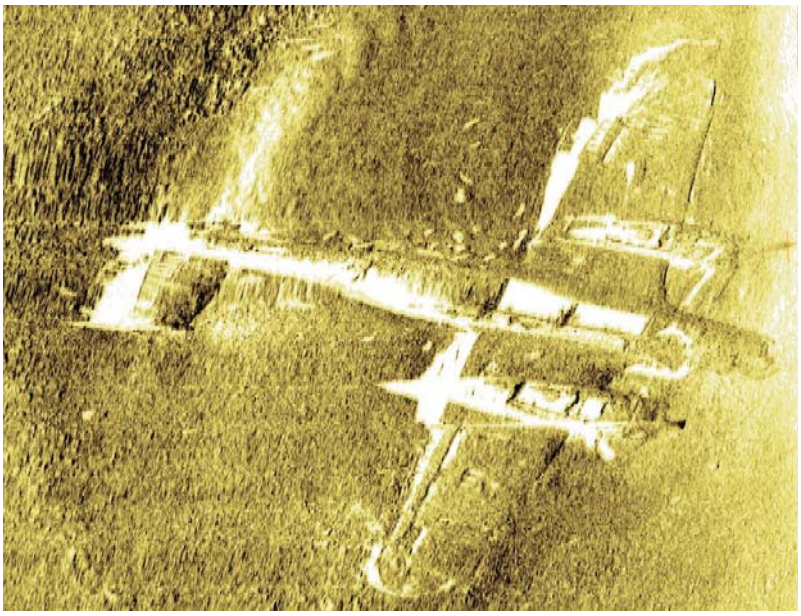
Prepared by
wessex archaeology

Front cover photographs

Alpha Vantus, courtesy of Areva.

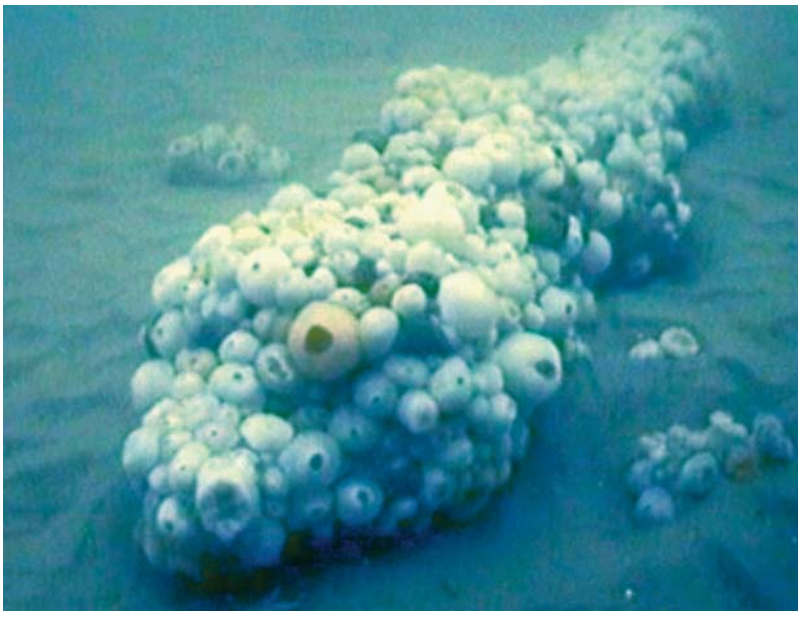
Diver at the Drumbeg historic wreck site
courtesy of Wessex Archaeology.

1944 British naval telescope found in the sea
courtesy of Wessex Archaeology.



A sidescan sonar image of a rare German bomber, the Dornier Do 17, which was found on the Goodwin Sands. Shot down on 26th August 1940, the Dornier's historical importance is considerable as it is the world's only surviving example of this type of German aircraft.

Detail of a fragment of Roman samian ware which was made in Gaul (modern day France) some 1700 years ago. It was found in the North Sea and retains its makers mark.



An historic cannon found during site investigation for wind farm construction. It was left *in situ* and is one of many archaeological finds successfully reported through the Protocol.

1st issue December 2010.
2nd issue July 2014 (revised)

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Photograph credits
Cannon photograph on page 1 is courtesy of the reporting Developer. Photograph on page 10 copyright The Crown Estate. Photograph of Golliath & Flintstone Walney on page 12 is courtesy of the DEME Group. Photographs on page 18 are courtesy of the reporting Developer. The sidescan sonar image & samian ware photograph on page 1, photographs on page 16 and photograph on page 20 are courtesy of Wessex Archaeology.

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Contents

1 Introduction

1.1 Background

1.1.1 This document is a Protocol that will satisfy anticipated conditions relating to the reporting of archaeological discoveries across the offshore renewable energy industry, if followed correctly.

1.1.2 Protocols for Archaeological Discoveries (PADs) are systems of monitoring for unexpected or incidental finds relating to the historic environment, and have come into use predominantly in the marine sphere where construction tends to be a 24 hour operation, involving multiple vessels, where conventional watching briefs (routinely used in the terrestrial sector) are not cost effective. They are recommended in 'Historic Environment Guidance for the Offshore Renewable Energy Sector' (COWRIE 2007, 11.3, 45–6).

1.1.3 The character of the marine environment and lower baseline of archaeological knowledge at sea means that the level of unspecified risk of archaeological discoveries is generally higher at sea than on land, whilst the construction team's flexibility in the event that a significant site is discovered is generally less. Protocols may also prove useful on land to provide a safety-net when construction activities are diffuse or in areas of apparently low potential, especially given the legal requirements applicable to some archaeological discoveries. It is anticipated that the PAD will apply to all activities in the marine and inter-tidal zone and on land, if part of the offshore scheme.

1.1.4 This PAD is specific to archaeology, and it should be used at all stages of the development process where archaeological information may be obtained, including all pre-development surveys such as benthic sampling, obstruction surveys and other such operations.

1.1.5 The Crown Estate actively supports this Protocol and encourages Developers to utilise it to its full extent. Doing so may help meet the Developers' conditions of consent, will assist in protecting the historic environment, may help meet targets on sustainable development and will demonstrate the Developers' commitment to corporate social responsibility.

1.1.6 It should be noted that this PAD is a 'safety-net' only. Anticipated scheme impacts on the historic environment will have been taken into account prior to consent and wherever possible dealt with either in advance or by conditions requiring the implementation of an archaeological Written Scheme of Investigation (WSI). This Protocol in no way detracts from the basic tenet; that impacts on the historic environment should be considered and addressed in the earliest stages of the development process.

1.1.7 PADs have been used very effectively in other industries – most notably Marine Aggregate Industry (MAI) Protocol used in the aggregate dredging sector. To date over 970 individual finds have been investigated as a result of over 370 reports, such as the important lithic tool assemblages found in Area 240. These discoveries are helping to directly inform the advice given to industry, by the Archaeological Curators. A number of previously unknown archaeological sites have been recognised due to assemblages and artefacts reported through the MAI Protocol. Details of the MAI Protocol and the important discoveries that have been made can be found at http://www.wessexarch.co.uk/projects/marine/bmapa/index.html.

1.1.8 The MAI Protocol has proved to be a cost effective mitigation measure with huge benefits for industry and the protection of our heritage. It has also contributed to continuing good relationships between archaeologists and those working offshore. A programme of awareness-raising visits, newsletters and online resources have helped those working in the aggregate dredging industry to learn how reporting finds contributes to identifying potentially significant archaeological sites and, where appropriate, protecting them for future generations.

1.1.9 This Protocol is intended to satisfy any conditions that relate to reporting protocols included on consents administered by marine licensing authorities, including the Major Applications and Plans Directorate of the Planning Inspectorate, the Marine Management Organisation (or equivalent planning authority), Marine Scotland, Natural Resources Wales Marine Licensing Team or the Department of the Environment (Northern Ireland). Where implementation of this Protocol is a condition of consent, failure to follow the Protocol may give rise to a breach of condition.

1.1.10 'Our Seas – a Shared Resource', which documents the UK's High Level Marine Objectives, envisages that: "The use of the marine environment is spatially planned where appropriate and based on

an ecosystems approach which takes account of climate change and recognises the protection and management needs of marine cultural heritage according to its significance" (DEFRA, 2009).

1.1.11 This theme is echoed and expanded in the UK-wide Marine Policy Statement (MPS) (2011). It intended to provide the high level policy context within which Marine Plans will be developed, and set the direction for marine licensing and other relevant authorisation systems. The MPS states:

> *The view shared by the UK Administrations is that heritage assets should be enjoyed for the quality of life they bring to this and future generations, and that they should be conserved through marine planning in a manner appropriate and proportionate to their significance. Opportunities should be taken to contribute to our knowledge and understanding of our past by capturing evidence from the historic environment and making this publicly available particularly if a heritage asset is to be lost.*

1.1.12 Section 5.8 of the Overarching National Policy Statement for Energy (EN-1) (DECC 2011) sets out conditions and recommendations that are pertinent to the historic environment and in particular:

> *Where the IPC [Infrastructure Planning Commission] considers there to be a high probability that a development site may include as yet undiscovered heritage assets with archaeological interest, the IPC should consider requirements to ensure that appropriate procedures are in place for the identification and treatment of such assets discovered during construction.*

This Protocol will help to satisfy that requirement when followed correctly.

1.1.13 COWRIE's *Historic Environment Guidance for the Offshore Renewable Energy Sector* (2007) document states:

> *The aim of protocols for unexpected discoveries is to reduce any adverse effects of the development upon the marine historic environment by enabling people working on the project to report their discoveries or recovered material rapidly in a manner that is convenient and effective. The protocol will set out the respective responsibilities of the developer, main contractors, and archaeological contractors/consultants. The protocol therefore provides a mechanism to aid compliance with the Merchant Shipping Act 1995 in respect to recovery of 'wreck', as defined by the Act and reporting of military vessel and aircraft wrecks to the Ministry of Defence.*

1.1.14 This Protocol applies to things that are or may have been made, used or affected by people. This will include, for example, fossilised remains from periods of human inhabitation, but not fossils that are exclusively pre-human in origin. It will not include finds of geological, ecological, or other non-archaeological origin, unless a link to human activity can be assumed.

1.1.15 This Protocol takes into account, and is consistent with, existing statutory and non-statutory regimes for reporting discoveries, ownership of finds and other legal regimes in each of the home countries (England; Scotland; Wales; Northern Ireland), on land, within territorial waters and outside territorial waters.

1.1.16 For some classes of find there are specific legal requirements (e.g. treasure, wreck, human remains). These legal requirements will be met by following this Protocol. In such instances, failure to follow the Protocol may also give rise to a criminal offence.

1.1.17 Where **ordnance** is concerned, specific rules are likely to have been put in place by the Developer or their contractors. These rules are required for the safe conduct of construction and installation operations, and must take precedence over this Protocol. Historic ordnance may, however, also be of archaeological interest and can be reported under this Protocol once local rules for ordnance have been satisfied.

1.1.18 This Protocol is supported by an **Implementation Service** (IS) funded by The Crown Estate which will cover the administration of the reporting of discoveries and provide advice about immediate actions (including recording, handling and storage, and introduction of measures to prevent or reduce damage if the presence of a significant archaeological site is suspected).

1.1.19 The IS can help the Developer with any subsequent actions required, but such actions are expected to be the direct responsibility of the Developer, to be agreed case-by-case with the Regulator and their archaeological advisors (curators) with the assistance of the Developer's own Retained Archaeologist, where appointed.

1.1.20 The Protocol is accompanied by an **Awareness Programme** to provide awareness-raising in the workplace, taking into account differing workplace circumstances.

1.1.21 In order for historic environment finds' protocols to be operationally effective, there must be three elements which need to be fully resourced and functioning. These are:

- The Implementation Service (IS)
- The Developer's internal reporting chain
- Awareness training to the right personnel

If just one of these elements is not in place, resourced or functioning correctly, then the Protocol will not operate and will be ineffectual for that development.

1.2 Outline

1.2.1 Archaeological finds made in the course of construction and installation activities are important because they can shed light on past human use of the landscape, sea and seabed. The information that such discoveries bring to light can help archaeologists better understand society and human endeavour in the past, and better protect significant aspects of our history on behalf of future generations.

Important: This Protocol is a supplement (rather than an alternative) to the conventional regulatory mechanisms employed in the earlier stages of the development process to consider and address impacts upon the historic environment. As a 'safety-net', the use of the Protocol should in no way be seen as a devolution of normal responsibilities toward the historic environment with respect to the planning process and the Environmental Impact Assessment (EIA) directive. It is essential that the Offshore Renewables Protocol for Archaeological Discoveries (ORPAD) is not assumed to provide a catch-all approach to dealing with marine archaeology, such that proper investigation is curtailed.

1.2.2 The Protocol is intended to apply to development, construction and installation activities where an archaeologist is not present on site and therefore not immediately available, i.e. in those instances where a traditional archaeological scheme of works is not in place (such as a watching brief, evaluation, etc.). In cases where the Developer has made provision for an archaeologist to be on site, as part of a site investigation, watching brief or specific archaeological works, then the archaeological method statement relating to this provision will take precedence. Where no specific archaeological provision has been made, then this Protocol will apply.

1.2.3 This Protocol addresses finds of archaeological interest made on the seabed, onboard vessels, in the inter-tidal zone or on land. They may be identified as a result of geophysical survey, remote operated vehicle or diver visual identification or through coming into contact with anchors, grapnels, jack-up legs or other seabed equipment. Alternatively they may be uncovered during groundworks on land or in the inter-tidal zone. These finds or anomalies may indicate that an object or structure of archaeological interest has been encountered on the seabed, the inter-tidal zone or on land.

1.2.4 The definition of an archaeological "find" in this context is of an object or site with archaeological potential or significance. It does not refer just to items brought to the surface. An archaeological "site" is a group of features or objects that make up a relatively discrete collection of associated archaeological objects. This could be a shipwreck, structure, or other archaeological assemblage.

1.2.5 An "anomaly" is distinct from a find or site, and is a signature that could be visual or digital (e.g. geophysical) that indicates a possible find or site. Further investigation may reveal that it is not of human origin, or is too modern to be of archaeological interest – but until this takes place it must be considered as a source of **possible** archaeological interest.

1.2.6 The Protocol anticipates discoveries being made by Project Staff, who report to a Site Champion on their vessel or site (usually the senior person on site), who then reports to a person (the Nominated Contact) who has been nominated by the Developer to co-ordinate implementation of the Protocol. The Nominated Contact will in turn inform the IS and the Developer's Project Manager(s). The IS will in turn liaise with the Nominated Contact, Archaeological Curators and the Developer's Project Manager(s) as necessary.

1.2.7 It is recognised that, for the Protocol to be effective, participants (such as Site Champions or Project Staff) should receive appropriate training. This will take place through the Awareness Programme referred to above.

1.2.8 The response to reported finds will be implemented through the measures set out in the Protocol, such as further survey or the establishment of Temporary Exclusion Zones (TEZs), which may be converted into new Archaeological Exclusion Zones (AEZs), if warranted. Any action to implement new, or to amend agreed AEZs or TEZs will only be done in agreement with the appropriate national Archaeological Curators and the Regulator responsible for consenting the development.

1.2.9 It is recognised that this Protocol refers primarily to offshore schemes of development. However, with offshore renewable schemes it is usual to have associated infrastructure (such as export cables) that impact not only the offshore historic environment, but also inshore, inter-tidal, and in fully terrestrial localities. Therefore this Protocol has been designed to operate in all of these environments, where an archaeologist is not present.

1.3 Roles and Responsibilities

1.3.1 The Site Champion is the person formally appointed by the Developer to be directly

responsible for reports arising from a particular activity location. The Site Champion could be a Vessel Master, a Construction Foreman or any other person in a position to control the immediate works.

1.3.2 The Developer's Nominated Contact is the formal point of contact for all matters relating to the PAD between the Developer, its subcontractors, the Site Champions, the IS, the Retained Archaeologist (where appointed), the Archaeological Curators and ultimately the Regulator. The Nominated Contact could be the scheme's Environmental Manager, Project Manager or any other co-ordinator that the Developer feels is appropriate and effective in acting in this role. It is critical that all parties hold the Nominated Contact's full contact details and that any changes to the Nominated Contact's details are circulated as soon as possible.

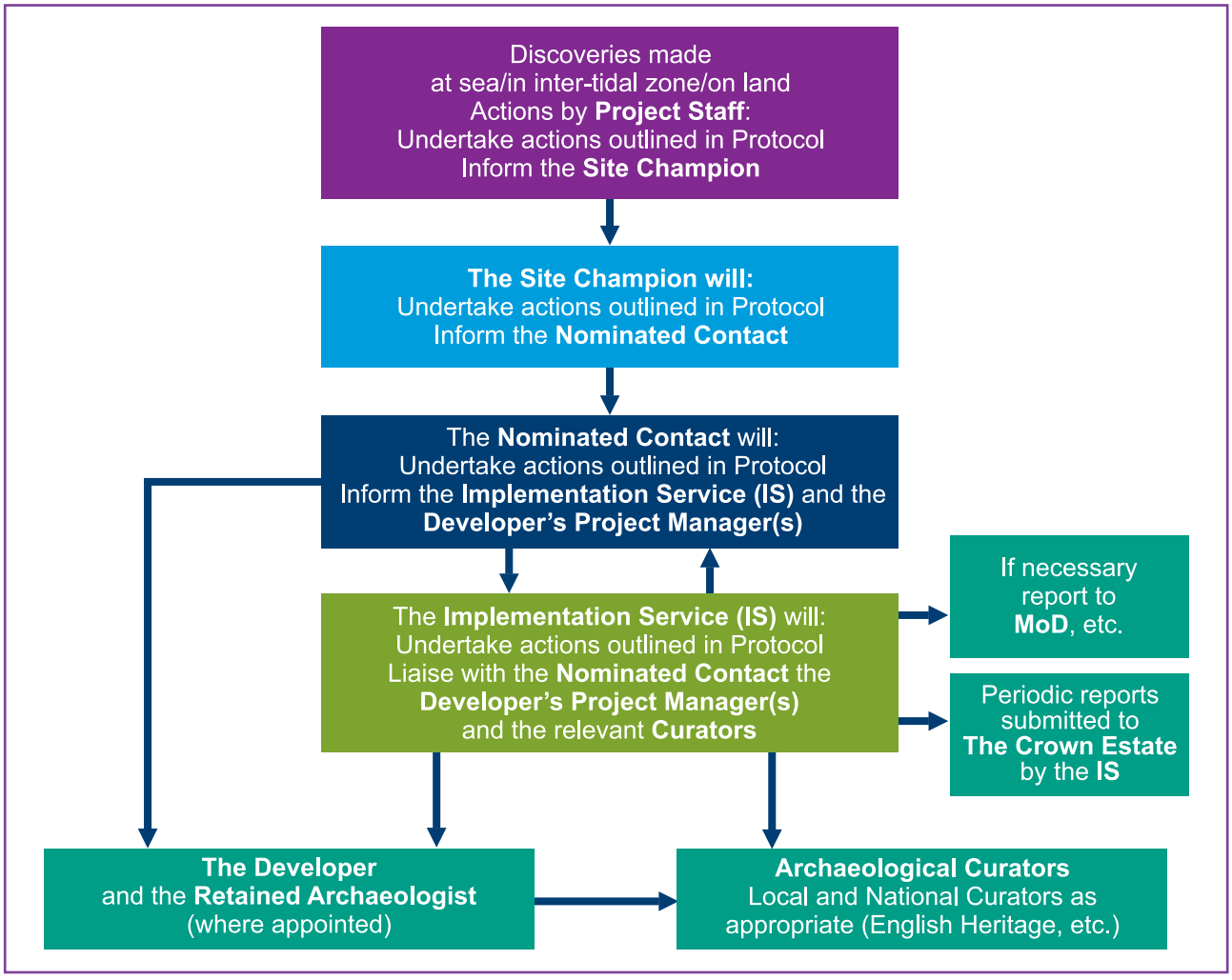
1.3.3 The IS is a service provided by an archaeological contractor appointed by The Crown Estate to manage the day to day responses to reports through the PAD. The performance of the IS will be reviewed by The Crown Estate, and the annual report of the IS will be submitted to Regulators, Archaeological Curators and Developers.

1.3.4 The Developer may have appointed a Retained Archaeologist to provide archaeological advice and/or services to the development. In this case the IS will undertake its duties in liaison with the Retained Archaeologist, as well as the Nominated Contact for the Developer. The actions of the IS will not take precedence over the Developer's Retained Archaeologist, but timely information should be provided to the IS that allows the ORPAD database to be sufficiently updated.

1.3.5 It should be noted that a detailed assessment of the potential of any discoveries may be dependent on the advice of, and information from, a range of external specialists, repositories and organisations. Therefore the IS can only provide a full response as that information becomes available.

1.3.6 Response times for Initial Responses will vary but the system is designed for information to be submitted to the IS website and a rapid response made within office hours. Alternative communication may take the form of email correspondence and/or telephone conversations (where internet access is restricted).

Basic Sequence of Reporting (when an archaeologist is not present)



2 Actions by Project Staff

2.1 In All Cases

2.1.1 If a find of archaeological interest is made, Project Staff will immediately inform the Site Champion (via their supervisor if appropriate).

2.1.2 If the discovery is ordnance, then Project Staff will abide by their operational procedures which are to take precedence; and then report via the Protocol once safe to do so.

2.1.3 Where items of archaeological interest are recovered, Project Staff (under direction of the Site Champion) will:

- Handle all material with care.
- Any rust, sediment, concretion or marine growth should not be removed and 'groups' of items or sediments should not be separated.
- If possible photograph the item in the condition in which it was recovered.
- Record the position at which the artefact/sediments were recovered.
- Label artefact appropriately and add the unique ID when provided by the Implementation Service.

If the find is from a waterlogged or underwater environment, then Project Staff (under direction of the Site Champion) will arrange for the find to be immersed in seawater in a suitable clean container, which should be covered.

2.2 Discoveries On Board

2.2.1 If a find of archaeological interest is made on board a construction vessel (for instance, caught in a grapnel/anchor or trapped in a plough), Project Staff will immediately inform the Officer on Watch. The Officer on Watch will inform the Site Champion.

2.2.2 Where it is possible to identify the seabed position from which the find originated, the Officer on Watch will temporarily cease construction activities in the vicinity of the seabed location, or move to an alternate location, until the advice of the IS has been obtained. The advice of the IS will be provided within the timescales previously advised (1.3.6).

2.3 Anomalies on the Seabed

2.3.1 Finds or sites of archaeological potential may be encountered via a number of methods including; geophysical survey, diver magnetometer, obstacle avoidance sonar, visual survey by remote operated vehicles or divers, and interaction with ploughs, anchors, jack-up legs or seabed grapnels. Staff should be constantly aware of the possibility of archaeological discoveries.

2.3.2 If an anomaly is identified in advance of impact, such as on the forward-looking sonar of a cable plough, the route should – where possible – be deviated around the obstruction, in line with normal ploughing practice. The position of the anomaly will be reported to the Officer on Watch and thence to the Site Champion.

2.3.3 If an anomaly is identified after an impact has occurred, for example, as indicated by a change in the towing cable tensiometer, avoidance by deviation will be precluded. However, the change in tension should be immediately brought to the attention of the Officer on Watch and the Site Champion so that the anomaly can be reported, advice can be sought and any requirements for further investigation determined.

2.3.4 The Officer on Watch will arrange for the grapnel or plough to be recovered to the surface and examined as soon as possible, once recovered to surface, to see if any archaeological material is trapped within it, and will inform the Site Champion accordingly.

2.3.5 If an anomaly comes to light in the course of geophysical survey or drop-down video survey the Officer on Watch will ensure that the position of the anomaly is noted on navigational software and that the Site Champion is informed.

2.4 Discoveries on Land or in Inter-tidal Areas

2.4.1 Discoveries may be made in the course of groundworks, trenching or site investigations. They should be reported to the Site Champion and the finds handled in accordance with the general guidance above.Where archaeological investigations are already taking place, as part of a watching brief, evaluation trenching, strip map and sample or open area investigation, then the method statement for those investigations will take precedence and discoveries need not be reported under this Protocol.

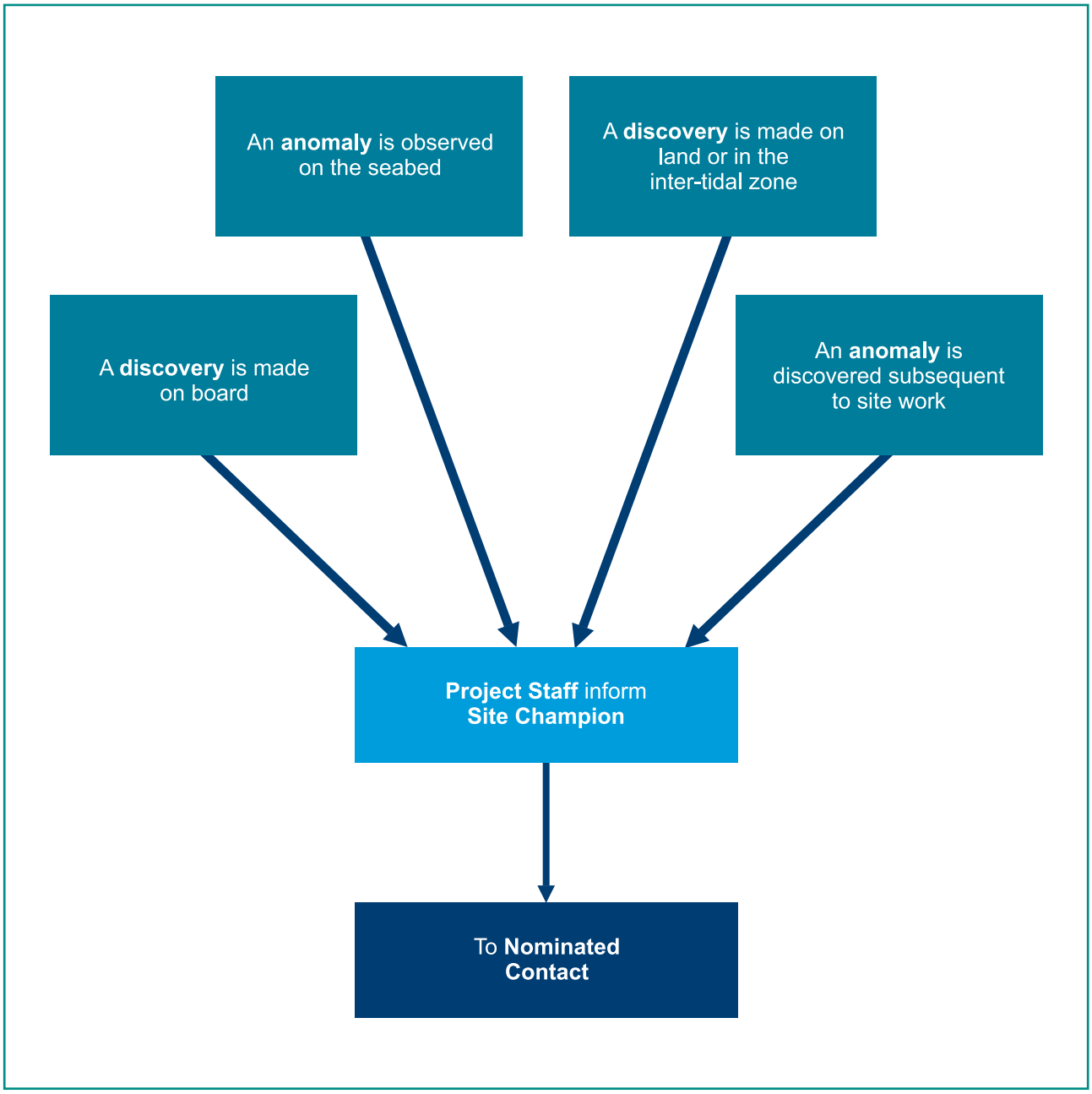
2.5 Discoveries Subsequent to Work on Site

2.5.1 There are a number of circumstances in which the presence of material of archaeological interest may be identified after work on site has occurred. For example, Project Staff reviewing geophysical data or video might observe an anomaly. Similarly, Project Staff involved in processing samples in the laboratory may make archaeological discoveries in their samples.

2.5.2 Staff examining sample material (e.g. core material; benthic samples) should consider the potential for archaeological and/or palaeoenvironmental material being recovered within their samples. Where such discoveries are made Project Staff should inform the Site Champion and pass on details of the sample number and its position.

2.5.3 If an anomaly comes to light in the course of processing or interpreting geophysical survey data, video or other photographic data, Project Staff should inform the Site Champion and pass on details of the data files and navigational information relating to the positions where the data were obtained.

Actions by Project Staff (when an archaeologist is not present)



3 Actions by Site Champion

3.1.1 Where it is possible to identify the position from which the discovery originated, the Site Champion will arrange for a TEZ in which construction activities will cease temporarily (in the vicinity of the location), or move to an alternate location, until the advice of the IS has been obtained. The advice of the IS will be provided within the timescales previously advised (1.3.6).

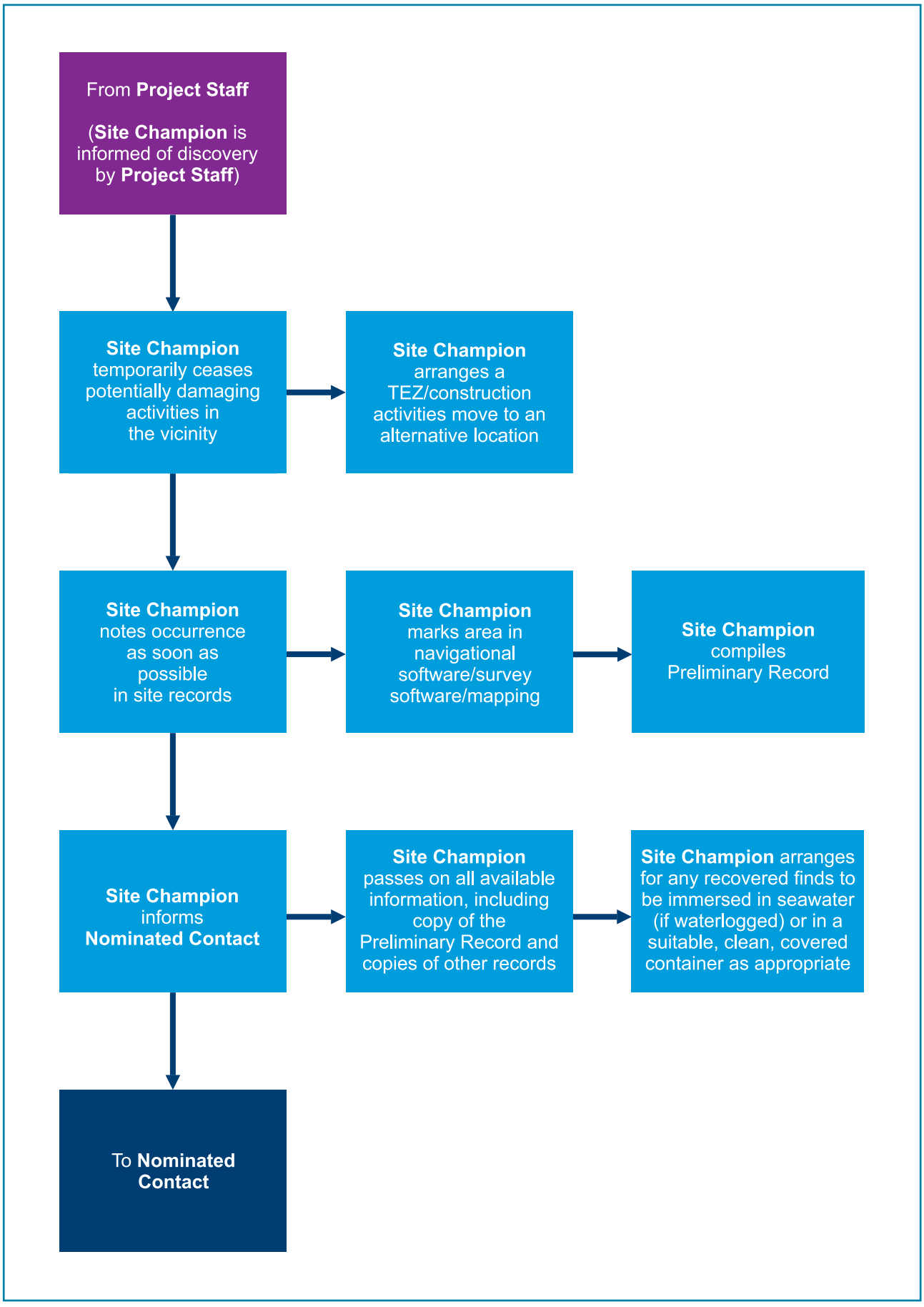
3.1.2 The Site Champion will note the occurrence as soon as possible in the site daybook or vessel log together with the time and exact position. The entry should include a close approximation of the original position of the find/anomaly. Additionally, the area should be marked on site drawings or surveys.

3.1.3 The Site Champion will compile a Preliminary Record (see Appendix II) of the occurrence. The Site Champion will inform the Developer's Nominated Contact of the occurrence as soon as possible and pass on all available information, including a copy of the Preliminary Record and copies of any photographs, drawings or other records that have been made.

3.1.4 The Site Champion will arrange for any finds (of archaeological material) to be carefully contained and protected;

- if waterlogged: immersed, bagged and placed in a protective container, or placed in seawater in a suitable clean container, which should be covered and stored in a cool, dark place;
- if dry: placed in a suitable container and stored in a cool, dark place;
- any dirt, rust, concretion or marine growth should not be removed.

Actions by Site Champion



4 Actions by the Nominated Contact

4.1.1 The Nominated Contact will confirm with the Site Champion that all the details set out in the Preliminary Record are comprehensive and correct.

4.1.2 Contact will be made with the Implementation Service (IS) at the earliest opportunity, preferably using the IS web service. The IS will provide advice on the appropriate immediate actions in addition to the recording, handling and storage of any items recovered. The advice of the IS will be provided within the timescales previously advised (1.3.6).

4.1.3 The Nominated Contact shall pass on to the IS all available information relating to the circumstances of the occurrence, including a copy of the Preliminary Record and copies of any other records that have been made.

4.1.4 In addition any finds should be made available to the IS if required.

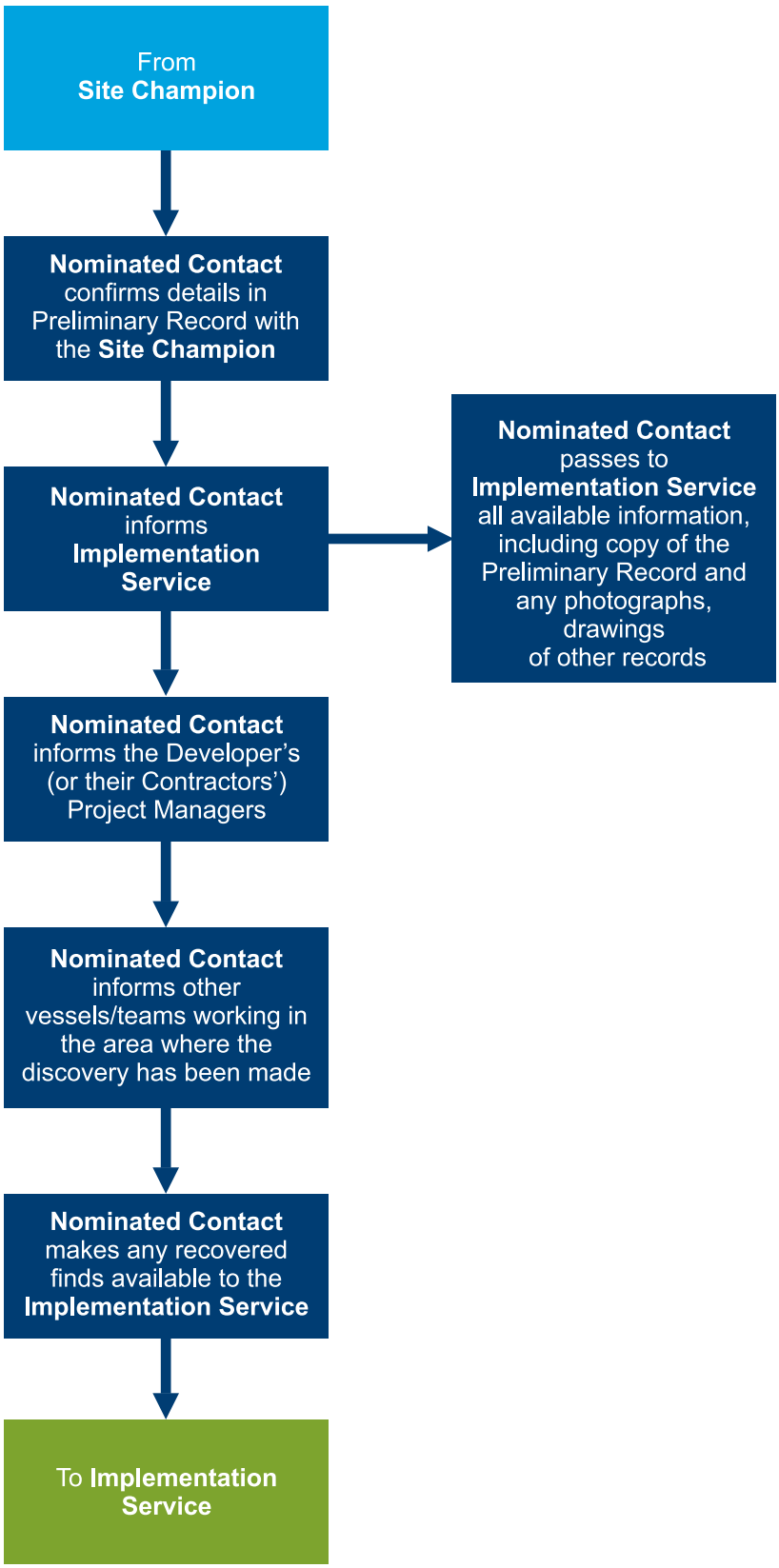
4.1.5 Once informed of a find by a Site Champion, the Nominated Contact will inform the Developer's (or their Contractors') Project Managers (as appropriate), in addition to the IS.

4.1.6 The Nominated Contact should inform other teams engaged in potentially damaging activities in the same area, to ensure that they are aware of the position of the discovery so that further possible damage to the historic environment can be avoided.

4.1.7 Should it be required by The Crown Estate or the Developer, IS archaeologists will travel to the site to inspect any finds or data made available.


COURTESY OF DEME GROUP

Actions by Nominated Contact



5 Actions by the Implementation Service

5.1 Initial Response

5.1.1 The Implementation Service (IS) will review the information about the discovery in conjunction with geophysical and/or desk-based information, where available. This review will normally be based on information uploaded to the IS website. Additional communication may take the form of email correspondence and/or telephone conversations (where internet access is restricted).

5.1.2 The IS will send an Initial Response to the Nominated Contact to acknowledge the report.

5.2 Urgent Reports

5.2.1 Where the report is urgent, the Initial Response will include an assessment of archaeological potential and a decision on the continuation or removal of the TEZ.

5.3 Assessment of Archaeological Potential

5.3.1 The assessment of archaeological potential will be based on the following guidance:

5.3.2 The following types of discovery are likely to be of **low** potential:

- reports of single, apparently isolated, finds that are not datable or are of modern (post-1800) or later date;
- peat deposits.

5.3.3 The following types of discovery are likely to be of **high** potential:

- reports of single finds that are of post-medieval or earlier date;
- reports of single finds that relate to military aircraft;
- reports of multiple finds from the same area;
- reports indicating the presence of a wreck or other structural remains;
- reports of peat or other fine-grained sediments that contain worked flint, charcoal or bone.

5.3.4 In the case of a discovery of **high** potential, construction will not recommence in the TEZ without the approval of the Archaeological Curators. The IS will confirm the extent of the area of the TEZ. The IS will notify the Archaeological Curators that a discovery of high potential has been reported, and will provide details of the further actions (see below) that have been advised.

5.3.5 In the case of discoveries of **low** potential, the IS will advise the Nominated Contact that the TEZ may be lifted and that construction activities in the vicinity of the discovery may recommence.

5.4 Summary Record

5.4.1 The IS will send a Summary Record of the report to the Nominated Contact and to other relevant parties. The Summary Record will include:

- advice on the identification of finds and the character of their seabed locations;
- an assessment of the archaeological potential of the report, including the rationale for the conclusion reached;
- advice on actions to be taken in respect of the discovery, including any recovered finds.

5.5 Subsequent Actions

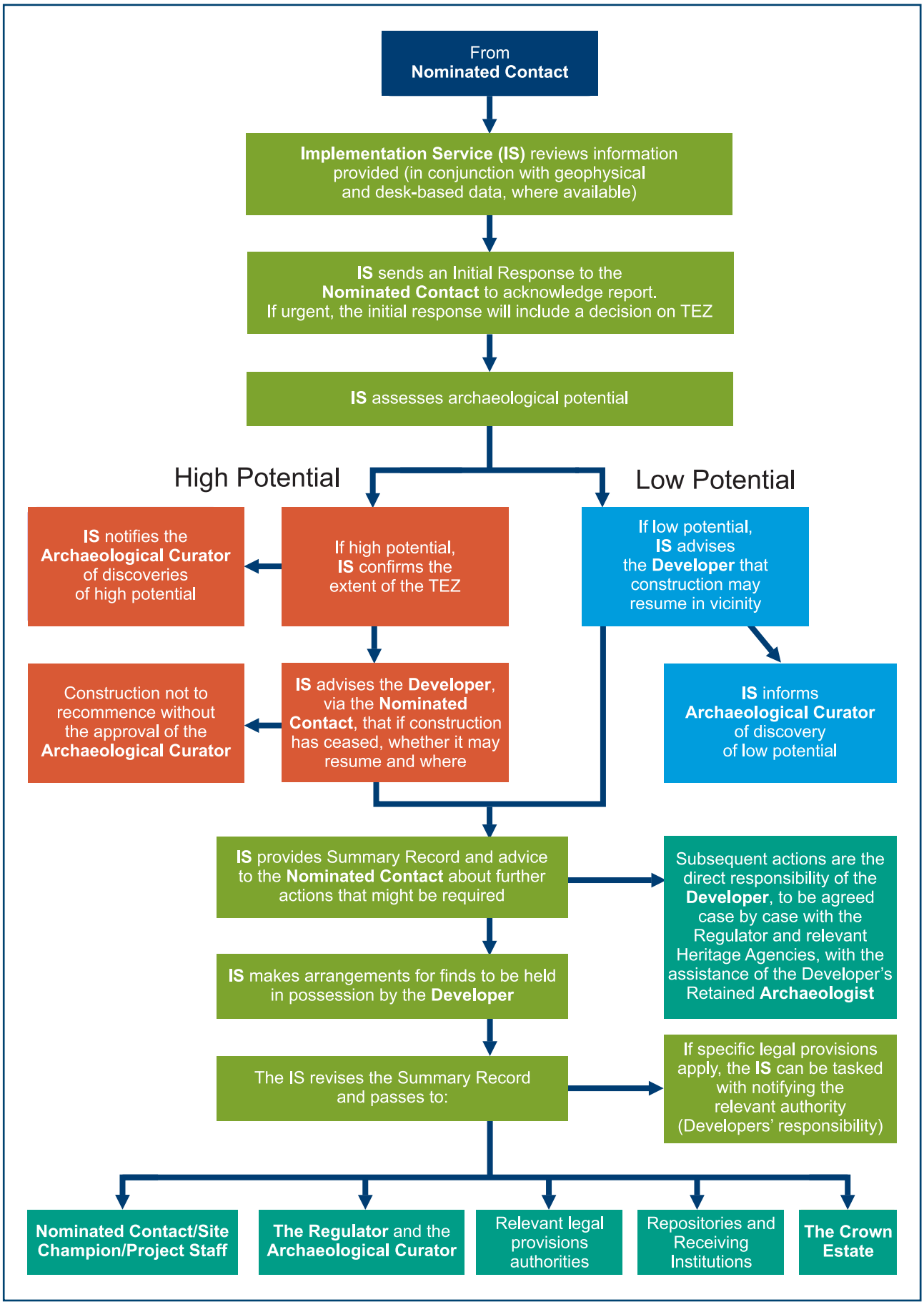
5.5.1 The IS will advise the Nominated Contact of the implications of the discovery and of further actions that might be required. Further actions may include call-out investigations, the conversion of a TEZ to an AEZ, and/or the institution of a watching brief. The rationale for conclusions reached will be provided to the Nominated Contact.

5.5.2 Any subsequent actions are expected to be the direct responsibility of the Developer, to be agreed case-by-case with the Regulator and relevant Heritage Agencies with the assistance of the Developer's own Retained Archaeologist, where appointed.

5.6 Further Requirements

5.6.1 If the discovery is something to which specific legal provisions apply (treasure, human remains, wreck etc.), it will remain the responsibility of the Developer to undertake such statutory reporting as is required. The Developer may, however, task the Implementation Service with making statutory reports alongside reporting under this Protocol if they so wish.

Actions by Implementation Service flow chart



5.7 Finds

5.7.1 The IS will make arrangements for the Developer to hold in possession any recovered finds, subject – in the case of wreck – to agreement with the Receiver of Wreck. The subsequent handling, retention or disposal of finds will be subject to applicable law and to arrangements between the Developer and the institution receiving the archaeological archive arising from the scheme.

5.8 Revised Summary Record

5.8.1 The Summary Record will be revised to take account of further information or actions that have taken place or are planned. The IS will pass on a copy of the revised Summary Record to the Nominated Contact for circulation to the Site Champion and relevant Project Staff.

5.9 MIDAS Report

5.9.1 A report conforming to MIDAS Heritage (the UK's historic environment data standard) will be prepared and submitted to:

- The relevant Regulator and Archaeological Curator(s).
  - In England this is English Heritage and the Local Government Archaeological Curator. The Implementation Service will send a copy of the MIDAS Report to the National Record of the Historic Environment (NRHE) for incorporation into their records.
  - In the Scottish Offshore Region this is Historic Scotland and the Local Government Archaeological Curator. The Implementation Service will send a copy of the MIDAS Report to the Royal Commission on the Ancient and Historical Monuments of Scotland (RCAHMS) for incorporation into their records.
  - In the Welsh Offshore Region this is Cadw and the Local Government Archaeological Curator. The Implementation Service will send a copy of the MIDAS Report to the Royal Commission on the Ancient and Historical Monuments of Wales (RCAHMW) for incorporation into their records.
  - In Northern Ireland this is the Northern Ireland Environment Agency (Built Heritage) and the Local Government Archaeological Curator. The Implementation Service will send a copy of the MIDAS Report to the Northern Ireland Sites and Monuments Record (NISMR).
- The relevant authority, where specific legal provisions apply (e.g. Ministry of Justice, Ministry of Defence etc.).
- The relevant archaeological records repository, including the relevant NRHE, Historic Environment Record, Portable Antiquities Scheme Officer etc.
- The Crown Estate.
- The Receiver of Wreck has a standard reporting form for all items deemed to be wreck and where applicable material will be reported to them using this form.

Activities such as pre-lay grapnel runs have a high chance of encountering archaeological materials.

Worked flint, such as this example, attests to the use of the seabed environment by humans prior to its submergence.

Archaeologists examine evidence for past environments by looking at organic materials found during wind farm construction activities.

6 Appendix I: Legal Terms and Responsibilities

6.1 Legal Terms & Responsibilities*

6.1.1 Protection of Wrecks Act 1973. Under the 1973 Act, shipwrecks and wreckage of historical, archaeological or artistic importance within UK territorial waters can be protected by way of designation. Once a wreck has been designated it is an offence to carry out certain activities on or around the site without a licence.

6.1.2 Administration of the Act and associated licences is the responsibility of English Heritage in England, Historic Scotland in Scotland, Cadw in Wales and the Northern Ireland Environment Agency (Built Heritage) in Northern Ireland.

6.1.3 Currently, designated wrecks in UK waters range in date from the middle Bronze Age to the 20th century. Where a wreck is located that it is considered warrants designation, the relevant Secretary of State is required to consult appropriate advisors prior to designation. However, Developers should be aware that it is also possible for a wreck or wreck material to be designated in an emergency.

6.1.4 Merchant Shipping Act 1995. This Act is not a form of designation, but will affect offshore renewable energy schemes if, in the course of site investigations or construction, any material is recovered which falls within the definition of 'wreck'. All wreck has an owner, and the Merchant Shipping Act sets out the procedure for returning recovered wreck to the owner or their successor. The Receiver of Wreck has to be notified of all recovered wreck landed in the UK, and will seek to identify the original owner so that it can be claimed. Ownership of unclaimed wreck from within territorial waters vests in the Crown or in a person to whom rights of wreck have been granted. Unclaimed wreck from beyond territorial waters is returned to the finder.

6.1.5 The Receiver of Wreck has a duty to ensure that finders who report wreck receive an appropriate salvage payment. In the case of material considered to be of historic or archaeological importance, a suitable museum will be asked to purchase the material at the current market valuation. The finder will receive the net proceeds of the sale as a salvage payment. If the right to, or the amount of, salvage cannot be agreed, either between the owner and finder or between competing salvors, the Receiver of Wreck will hold the wreck until the matter is settled, either through amicable agreement or by court judgement.

6.1.6 Protection of Military Remains Act 1986. The primary purpose of The Protection of Military Remains Act is to protect the resting places of military personnel from unauthorised disturbance. It allows the Ministry of Defence (MoD) to protect vessels and aircraft that were in military service when they were lost or wrecked. The MoD can designate any such named vessel lost after 4 August 1914 as a 'protected place' even if the position of the wreck is not known. In addition the MoD can designate a 'controlled site' as any such wreck whose position is known.

6.1.7 Access is not prohibited at a 'protected place', but it is an offence to tamper with, damage, move or remove items from such a wreck without a licence. However, access, salvage and excavation are all prohibited on 'controlled sites', except where a licence for restricted activities has been obtained from the MoD.

6.1.8 The remains of all aircraft that have been lost in military service are automatically classified as 'protected places' by the Act.

6.1.9 Marine (Scotland) Act 2010. This Act enables Scottish Ministers to designate Historic Marine Protected Areas (MPAs). This is restricted to Scottish Territorial Waters.

6.1.10 Human Remains. Human remains in archaeology may be considered in relation to the Burial Act 1857, where they are not interred on sites for which specific burial ground legislation applies. The Act requires a licence to be granted prior to the removal of human remains from deliberately deposited contexts, on land and up to the 12 nautical mile limit of territorial waters. Remains encountered offshore however may not be deliberately deposited (i.e. buried) and licences cannot be granted retrospectively. It will be rare for the Burial Act 1857, or other burial legislation, to apply to human remains found in the marine

* Adapted from 'Historic Environment Guidance for the Offshore Renewable Energy Sector', COWRIE, 2007

environment. Where human remains are associated with vessels and aircraft that were in military service when they were lost or wrecked, the provisions of the Protection of Military Remains Act 1986 would apply.

6.1.11 For sites in Scotland, the guidance offered in 'Historic Scotland Operational Policy Paper 5: The Treatment of Human Remains in Archaeology' should be adhered to.

6.1.12 **Treasure: The Treasure Act 1996**. The Act has effect in England, Wales and Northern Ireland and is supplemented by the Treasure (Designation) Order 2002. Finders of gold and silver objects (over 300 years old) and some base metal assemblages (prehistoric) as defined in the Act are required to report such finds by contacting the Coroner and delivering the items for hand over as per the Coroners' instructions.

6.1.13 The Act and the Order apply to objects found anywhere in England, Wales and Northern Ireland, including in or on land, in buildings (whether currently occupied or ruined), in rivers and lakes and on the foreshore (that is the area between mean high water and mean low water on beaches and tidal river banks), provided that the object does not come from a wreck.

6.1.14 In Scotland, the Scots common law right relating to found archaeological and historic items in Scotland (and dealt with through the system of Treasure Trove) does not extend to the marine environment except to the foreshore.

6.1.15 ***Bona Vacantia*** **(Scotland)**. The term *bona vacantia* means "ownerless goods". In Scotland, *bona vacantia* refers only to the assets of dissolved companies and lost property, which is administered under the Civic Government (Scotland) Act 1982. In Scottish law, ownerless goods fall to the Crown and the realised value of such assets are paid into the Scottish Consolidated Fund for use of the Scottish Government on behalf of the people of Scotland.

6.1.16 **Ancient Monuments and Archaeological Areas Act 1979**. Monuments that are of national importance within UK territorial waters can be protected by being added to the schedule of monuments protected under this Act. It is an offence to damage, or carry out a range of specified activities on such a 'scheduled monument', unless a licence for these activities has been obtained from the relevant authority, in the form of 'scheduled monument consent'.

6.1.17 Monument can mean, among other things, the site of any vehicle, vessel, aircraft or other structure. It also refers to many types of archaeological site in the traditional sense.

6.1.18 In Scotland, the Act is devolved to Scottish Ministers and the Historic Environment (Amendment) (Scotland) Bill was introduced to the Scottish Parliament in 2010.

6.1.19 **The Historic Monuments and Archaeological Objects (Northern Ireland) Order 1995**. The Ancient Monuments Act 1979 does not apply in Northern Ireland. The relevant legislation is the Historic Monuments and Archaeological Objects (Northern Ireland) Order 1995. It provides for the designation of scheduled monuments and the statutory reporting of archaeological objects found.

This anchor was recovered during cable installation for a wind farm. It is probably a Rodgers' Small-palm anchor, named after Lieutenant (later Commander) Rodgers and was patented in 1832. The anchor was carefully recovered to the vessel, recorded and reported, and returned to the seabed away from development impacts.

7 Appendix II: Guidelines for Identifying Finds of Archaeologcial Interest and Handling Artefacts

7.1 Materials Guidelines

7.1.1 Rubber, Plastic etc. In most cases, rubber, plastic, bakelite and similar modern materials are not of archaeological interest and can be disregarded. One exception is where such materials are found in the same area as aluminium objects and structures, which may indicate aircraft wreckage from World War Two. Such material should be reported.

7.1.2 Iron and Steel. The potential range and date of iron and steel objects is so wide that it is difficult to provide general guidance. In broad terms, iron and steel objects which are covered by a thick amorphous concrete-like coating ('concretion') are likely to be of archaeological interest and should be reported. Pieces of metal sheet and structure may indicate a wreck and should be reported. Specific operational measures are likely to apply in respect of ordnance (cannonballs, bullets, shells) which should take precedence over archaeological requirements. However, discoveries of ordnance may be of archaeological interest, and they should be reported.

7.1.3 Other Metals. Items made of thin, tinned or painted metal sheet are unlikely to be of archaeological interest. Aluminium objects may indicate aircraft wreckage from World War Two, especially if two or more pieces of aluminium are fixed together by rivets. All occurrences should be reported. Copper and copper alloy (bronze, brass) objects might indicate a wreck, or they may be very old. All occurrences should be reported. Precious metal objects and coins are definitely of archaeological interest because they are relatively easy to date. All occurrences should be reported.

7.1.4 Bone. Discoveries of animal bone, teeth and tusks are of archaeological interest because they may date to periods when the seabed formed dry land, and should be reported. Such bones, teeth, tusks etc. may have signs of damage, breaking or cutting that can be directly attributed to human activity. Large quantities of animal bone may indicate a wreck (the remains of cargo or provisions) and should be reported. Human bone is definitely of archaeological interest, and may, if buried and found within territorial waters, be subject to the provisions of the Burial Act 1857. Alternatively, it may be subject to the Protection of Military Remains Act 1986. Any suspected human bone should be reported, and treated with discretion and respect. Objects made out of bone – such as combs, harpoon points or decorative items – can be very old and are definitely of archaeological interest. All occurrences should be reported.

7.1.5 Wood. Light coloured wood, or wood that floats easily, is probably modern and is unlikely to be of archaeological interest. 'Roundwood' with bark – such as branches – is unlikely to be of archaeological interest, although it may provide paleo-environmental evidence. However, roundwood that has clearly been shaped or made into a point should be reported. Pieces of wood that have been shaped or jointed may be of archaeological interest, especially if fixed with wooden pegs, bolts or nails – all occurrences should be reported. Objects made out of dark, waterlogged wood – such as bowls, handles, shafts and so on – can be very old and are definitely of archaeological interest. All occurrences should be reported.

7.1.6 Stone. Small to medium size stones that are shaped, polished and/or pierced may be prehistoric axes. All occurrences should be reported. Objects such as axe heads or knife blades made from flint are likely to be of prehistoric date and should be reported. Large blocks of stone that have been pierced or shaped may have been used as anchors or weights for fishing nets. All occurrences should be reported. The recovery of numerous stones may indicate the ballast mound of a wreck, or a navigational cairn. All occurrences should be reported.

7.1.7 Pottery. Any fragment of pottery is potentially of interest, especially if it is a large fragment. Items which look like modern crockery can be discarded, but if the item has an unusual shape, glaze or fabric it should be reported.

7.1.8 Brick. Bricks with modern proportions and v-shaped hollows ('frogs') are of no archaeological interest. Unfrogged, 'small', 'thin' or otherwise unusual bricks may date back to Medieval or even Roman times and should be reported.

7.1.9 Peat and Clay. Peat is black or brown fibrous soil that formed when sea level was so low that the seabed formed marshy land, for example on the banks of a river or estuary. Peat is made up of plant remains, and also contains microscopic remains that can provide information about the environment at the time it was formed. This information helps us to understand the kind of landscape that our predecessors inhabited, and about how their landscape changed. It can also provide information about rising sea-level and coastline change, which are important to understanding processes that are affecting us today. Prehistoric structures (such as wooden trackways) and artefacts are often found within or near peat, because our predecessors used the many resources that these marshy areas contained. As these areas were waterlogged, and have continued to be waterlogged because the sea has risen, 'organic' artefacts made of wood, leather, textile and so on often survive together with the stone and pottery which are found on 'dry' sites.

7.1.10 Fine-grained sediments such as silts and clays are often found at the same places as peat. These fine-grained sediments also contain the microscopic remains that can provide information about past environments and sea level change. Any discoveries of such material would be of archaeological interest, and their occurrence should be reported.

7.2 Artefact Storage Advice

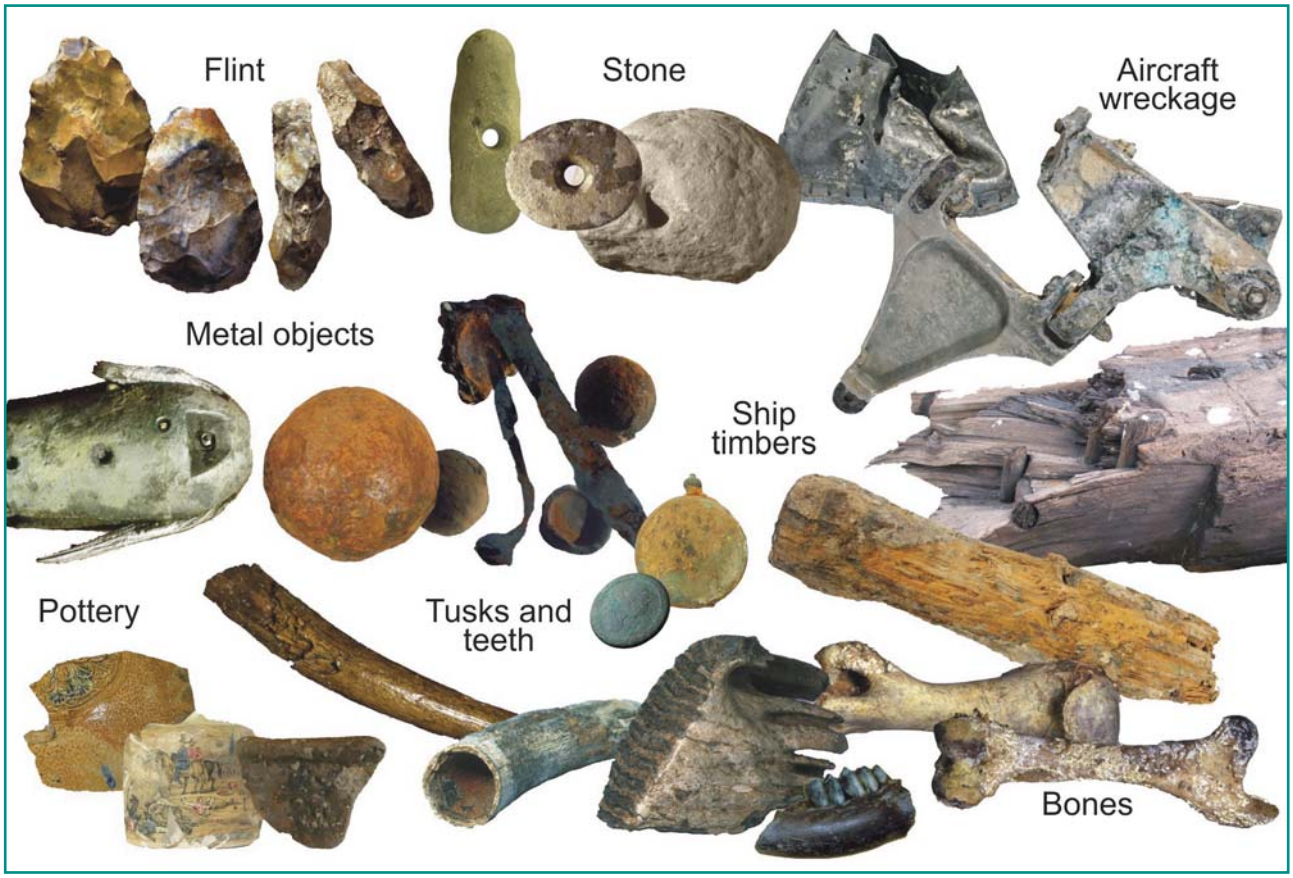
7.2.1 It should be noted that 'time is of the essence' in terms of the recovery of waterlogged archaeological material. If waterlogged organic items are allowed to dry out this can cause irreparable damage. Care in handling items is paramount.

7.2.2 In the event of artefact recovery, the finds should be stored in the following manner:

- If dry, finds should be placed in sealable bags and/or stored in a suitable protective container in a cool, dark area if possible.
- If waterlogged, any artefacts should be kept damp, or preferably totally submerged (in sea water), in sealable bags which are then stored in rigid plastic boxes to prevent damage. Items should be kept wet, covered, and stored in a cool, dark area if possible.
- Any sediments of interest will be collected and double bagged in sealable bags.

7.2.3 If particularly delicate or significant items are recovered the Implementation Service should be contacted for further advice.

7.2.4 The Developer will supply suitable storage materials to its construction operations. The IS can advise on suitable materials for this purpose.



Protocol for Archaeological Discoveries: Offshore Renewables Projects

Preliminary Record Form: Discoveries on the Seabed/ on board / in the inter-tidal zone / on land

Company Name:
Vessel/Team Name:
Site/sea area Name:
Date:
Time of compiling information:
Name of compiler (Site Champion):
Name of finder (if different to above):

Time at which discovery was encountered:
Vessel position at time when anomaly was encountered:
a) Latitude
b) Longitude
c) Datum (if different from WGS84)
Original position of the anomaly on the seabed, if known:
Notes on likely accuracy of original position stated above:
a) How accurate is the position?
b) Is the position the original position or has the material been moved by operations?
c) Details of circumstances and activity that lead to the discovery

THE CROWN ESTATE

Protocol for Archaeological Discoveries: Offshore Renewables Projects

Preliminary Record Form: Discoveries on the Seabed/ on board / in the inter-tidal zone / on land

Description of the find/anomaly:
Apparent size/extent of the anomaly:
Details of any find(s) recovered:
Details of photographs, drawings or other records made of the find(s) (e.g. location figure):
Details of treatment or storage of find(s):
Date and time Nominated Contact informed:
General notes:
If discovered on the seabed:
a) Derived from: e.g. Obstacle Avoidance Sonar, Cable Tensiometer?
b) Apparent size/extent of anomaly (length, width, height above seabed)
c) Extent of deviation/route development
Signed: Date: THE CROWN ESTATE

8 Appendix III: Glossary

AEZ
Archaeological Exclusion Zone

COWRIE
Collaborative Offshore Wind Research into the Environment

DECC
Department of Energy and Climate Change

DEFRA
Department for Environment, Food and Rural Affairs

EH
English Heritage

EIA
Environmental Impact Assessment

HER
Historic Environment Record

HS
Historic Scotland

IPC
Infrastructure Planning Commission

IS
Implementation Service

MAI
Marine Aggregates Industry

MoD
Ministry of Defence

MoJ
Ministry of Justice

MPA
Marine Protected Areas

MPS
Marine Policy Statement

NISMR
Northern Ireland Sites and Monuments Record

NRHE
National Record of the Historic Environment

ORPAD
Offshore Renewables Protocol for Archaeological Discoveries

PAD
Protocol for Archaeological Discoveries

PAS
Portable Antiquities Scheme

RoW
Receiver of Wreck

TEZ
Temporary Exclusion Zone

WSI
Written Scheme of Investigation

9 Appendix IV: List of Consultees

List of Consultees for The Crown Estate, Offshore Renewable Energy and the Historic Environment Consultation

Advisory Committee for Historic Wreck Sites

Association of Local Government Archaeological Officers: Maritime Committee

Association of Local Government Archaeological Officers: Planning & Legislation Committee

Cadw

Centrica

Council for British Archaeology

Department for Culture, Media and Sport

Department for Environment, Food and Rural Affairs

Department of Energy and Climate Change

Department of Enterprise Trade and Investment

Department of the Environment, Northern Ireland

DONG Wind (UK) Ltd

East Anglia Offshore Wind (SP Renewables)

English Heritage: Marine Team

E.ON

Fluor

Forewind

Historic Scotland

Infrastructure Planning Commission

Institute for Archaeologists

Joint Nautical Archaeology Policy Committee

Manx National Heritage

Marine Management Organisation

Marine Scotland

Ministry of Defence

Ministry of Justice

Nautical Archaeology Society

Northern Ireland Environment Agency

Portable Antiquities Scheme

Receiver of Wreck (MCA)

Renewable UK

RES

Royal Commission on the Ancient and Historical Monuments of Scotland

Royal Commission on the Ancient and Historical Monuments of Wales

Scottish Government

Sea Energy Renewables

UHI Millenium Institute

Welsh Assembly Government: Energy Team

Welsh Assembly Government: Marine Policy Team

10 Appendix V: References

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APPENDIX 3: ARCHAEOLOGICAL ASSESSMENT OF GEOPHYSICAL SURVEY DATA: MOD OFTI

MORAY EAST
OFFSHORE WINDFARM

Archaeological Assessment of Geophysical and Geotechnical Data - Technical Report

Telford, Stevenson and MacColl Offshore Wind Farms and Associated Offshore Transmission Infrastructure

March 2018

Moray Offshore Windfarm (East) Limited

Produced by Wessex Archaeology on behalf of Moray Offshore Windfarm (East) Limited	
Produced by	Redacted
Reviewed by	
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Review / Approval

Moray East Ecological Clerk of Works	**Moray East**

Redacted

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List of Abbreviations

OfTI	Offshore Transmission Infrastructure
SSS	Sidescan sonar
MBES	Multibeam Bathymetry
SBP	Sub-bottom profiler

Executive Summary

Wessex Archaeology has been commissioned by Moray Offshore Windfarm (East) Limited (Moray East) to carry out an archaeological assessment of geophysical survey and geotechnical data acquired from the Moray East Offshore Transmission Infrastructure (OfTI 2018 Archaeology Study Area). The Moray East Offshore Wind Farm is located on the Smith Bank in the outer Moray Firth, approximately 41 km from the Aberdeenshire coastline. The OfTI extends south from the proposed development area, running approximately 50 km to a landfall at Inverboyndie Bay. The geophysical assessment has identified 106 seabed features of archaeological potential within the OfTI 2018 Archaeology Study Area. As all of these features have been assigned an A2 archaeological rating (uncertain origin of possible archaeological interest), no Archaeological Exclusion Zones are recommended at this time. However, avoidance of these features by micro-siting is recommended if the Development (wind farm and OfTI) directly impacts them in the future. A further 21 palaeolandscape features have been designated with a P2 archaeological rating (feature of possible archaeological interest).

A geoarchaeological assessment of 91 geotechnical vibrocore logs was undertaken with the aim of assessing if they contained deposits of low, medium or high geoarchaeological potential, and to ground-truth the geophysical interpretation. The vibrocores contained a sequence of Pleistocene to Holocene deposits overlain by seabed sediments. Four vibrocores (VC-6, VC-15, VC-26A and VC-68) were assigned high priority status due to the potential presence of organic material. Four vibrocores (VC-26, VC-53, VC-54 and VC-55) were assigned medium priority status as they comprise silt and sand sediments not previously recorded in the area. These have the potential to have been deposited in a shallow water intertidal to coastal setting. The remaining 83 vibrocores have low geoarchaeological potential. It is recommended both high and medium priority vibrocores are made available for Stage 2 geoarchaeological recording.

It is recommended that, if any objects of possible archaeological interest are recovered during any groundwork operations, they should be reported using the established Protocol for Archaeological Discoveries: Offshore Renewables Projects (The Crown Estate 2014). This will establish whether the recovered objects are of archaeological interest and recommend appropriate mitigation measures.

Acknowledgments

Wessex Archaeology would like to thank Redacted of Royal HaskoningDHV with respect to this report.

1 Introduction

1.1 Project background

Wessex Archaeology has been commissioned by Moray Offshore Windfarm (East) Limited (Moray East) to carry out an archaeological assessment of geophysical survey and geotechnical data acquired from the Telford, Stevenson and MacColl Offshore Wind Farm (Moray East Offshore Wind Farm Offshore Transmission Infrastructure (OfTI). The Development is located on the Smith Bank in the outer Moray Firth, approximately 41 km from the Aberdeenshire coastline. The OfTI will connect the offshore wind farm to the National Grid near New Deer in Aberdeenshire, via a landfall near Inverboyndie Bay.

The geophysical survey data assessed for this report comprises 2014 data collected across the OfTI and part of the Moray East Offshore Wind Farm, and 2017 geophysical data collected over a small inshore area of the OfTI at Inverboyndie Bay (**Figure 1**). The geophysical data comprised sub-bottom profiler (SBP), sidescan sonar (SSS), magnetometer and multibeam echosounder (MBES) datasets. This report presents the results of the 2014 and 2017 geophysical survey results along with any historical data.

The 2014 data were acquired by Gardline Geosurvey Limited (Gardline) during May and June 2014. The 2017 geophysical survey data were acquired by Bibby HydroMap between 17 and 26 August 2017.

The geotechnical data comprises 91 geotechnical vibrocore logs from 68 locations.

1.2 Aims and objectives

The aim of this report was to undertake an archaeological assessment of geophysical survey and geotechnical data acquired within the OfTI 2018 Archaeology Study Area. The objectives were as follows:

- To assess the geophysical survey data acquired by Gardline in 2014 and Bibby HydroMap in 2017 in order to identify any material of archaeological and cultural heritage significance present within the OfTI 2018 Archaeology Study Area;
- to identify any evidence for palaeolandscapes present within the OfTI 2018 Archaeology Study Area;
- geoarchaeologically review geotechnical vibrocore logs;
- identify sediments of potential archaeological and geoarchaeological interest, assigning either a low, medium of high priority status;
- make recommendations for any further geoarchaeological recording;
- to compare the geophysical and geoarchaeological interpretations with any desk based assessments, historical data, and known archaeological sites in the vicinity of the OfTI 2018 Archaeology Study Area;
- to recommend mitigation measures for any archaeological or cultural heritage assets identified within the OfTI 2018 Archaeology Study Area.

2 Methodology

2.1 Data sources

- Geophysical survey datasets (SBP, SSS, magnetometer and MBES) acquired by Gardline in 2014 and Bibby Hydromap in 2017;
- geotechnical (vibrocore) logs acquired by Gardline in 2014 and assessed by Wessex Archaeology as part of a geotechnical assessment associated with the OfTI 2018 Archaeology Study Area;
- known wreck and obstruction locations within the OfTI 2018 Archaeology Study Area, acquired from the United Kingdom Hydrographic Office (UKHO) and the National Monuments Record Scotland (NMRS);
- past reports and assessments undertaken by Wessex Archaeology from the Moray East Offshore Wind Farm development.

2.2 Geophysical data – technical specifications

The geophysical data were acquired by Gardline in 2014 and Bibby HydroMap in 2017. The 2014 dataset were acquired by Gardline during May and June 2014 onboard the MV *Vigilante* and the MV *Titan Explorer* for the inshore areas. The data collected consisted of SBP (pinger and boomer), SSS, magnetometer and MBES datasets (Gardline 2014a).

The OfTI 2018 Archaeology Study Area survey comprised 748 line km of geophysical data acquired on board the MV *Vigilante*, and the inshore OfTI survey covered 124 line km acquired on board the MV *Titan Explorer*. The survey line spacing was 100 m for the main lines, and 1000 m for the cross lines.

The 2017 data was acquired by Bibby HydroMap between 17 and 26 August 2017 onboard survey vessel MV *Lia*. The datasets comprised SBP (boomer and parametric sonar), SSS, magnetometer and MBES (Bibby 2017).

The 2017 geophysical survey area covered an area approximately 1 km by 430 m wide. The survey lines were run in a northeast to southwest orientation at 20 m line spacing with crosslines run at 100 m line spacing.

During all surveys, positions were recorded and expressed as WGS84 UTM Zone 30N projected coordinates.

A full summary of the survey equipment used is provided in Table 2-1:

Table 2-1: Summary of survey equipment

Survey Company	Survey Vessel	Data Type	Equipment	Data Format
Gardline	MV *Vigilante*	SBP	9 element Hull-mounted Pinger; Applied Acoustics surface tow boomer; Geomarine Geo-Source Sparker	*.seg*
		MBES	Kongsberg Simrad EM2040D	*.xyz*
		SSS	Edgetech 4200 FS 120/410 kHz	*.xtf*
		Magnetometer	Geometrics G-882 caesium vapour magnetometer (x 2)	*.csv*
		Positioning	Voyager5 integrated navigation system	N/A
	MV *Titan Explorer*	SBP	Applied Acoustics surface tow boomer	*.seg*
		MBES	Geoacoustics Geoswathe Plus swathe system	*.xyz*

Survey Company	Survey Vessel	Data Type	Equipment	Data Format
		SSS	Edgetech 4200-FS	*.xtf*
		Magnetometer	Geometrics G-882 caesium vapour magnetometer	*.csv*
		Positioning	Trimble SPS751 Duel Frequency GPS System	N/A
Bibby HydroMap	MV *Lia*	SBP	Applied Acoustics AA200 Boomer; Innomar SES2000 sub-bottom profiler system	*.seg*
		MBES	RESON SeaBat 7125 system	*.pts*
		SSS	Edgetech 4200-MP	*.cod*
		Magnetometer	Geometrics G-882 caesium vapour magnetometer	*.txt*
		Positioning	C-Nav 3050 GNSS system	N/A

2.3 Geophysical data – processing

A number of datasets were assessed over the OfTI 2018 Archaeology Study Area; each dataset was processed separately using the following software (**Table 2-2)**.

Table 2-2: Software used for geophysical assessment

Dataset	Processing Software	Interpretation and Rationalisation
SBP	CodaOctopus Survey Engine v5.5 (Seismic+)	ArcMap v10.5
MBES	QPS Fledermaus v7.7.5	
SSS	CodaOctopus Survey Engine v5.5 (Sidescan+)	
Mag.	Geometrics MagPick v3.25	

The SBP and MBES data were used as the primary datasets for the palaeographic assessment and all datasets were used for the seabed features assessment.

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

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

Any small reflectors which appear to be buried material such as a wreck site covered by sediment were also recorded, the position and dimensions of any such objects noted in a gazetteer, and an image of each anomaly acquired. It should be noted that anomalies of this type are rare, as the sensors must pass directly over such an object in order to produce an anomaly.

The MBES data were analysed to identify any unusual seabed structures that could be shipwrecks or other anthropogenic debris. The 2014 data were gridded at 1 m and the 2017 data were gridded at 0.25 m. These were analysed using QPS Fledermaus software, which enables a 3-D visualisation of the acquired data and geo-picking of seabed anomalies.

The high frequency *.xtf* SSS data files were processed using CodaOctopus Survey Engine Sidescan+ software. This allowed the data to be replayed with various gain settings in order to optimise the quality of the images. The data were interpreted for any objects of possible anthropogenic origin. This involves creating a database of anomalies within Coda by tagging individual features of possible archaeological potential, recording their positions and dimensions, and acquiring an image of each anomaly for future reference.

A mosaic of the SSS is produced during this process to assess the quality of the sonar towfish positioning. This process allows the position of anomalies to be checked between different survey lines and for the positioning to be further refined if necessary.

The form, size and/or extent of an anomaly is a guide to its potential to be an anthropogenic feature and therefore of archaeological interest. A single small but prominent anomaly may be part of a much more extensive feature that is largely buried. Similarly, a scatter of minor anomalies may define the edges of a buried but intact feature, or it may be all that remains as a result of past impacts from, for example, dredging or fishing.

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

The software enables both the visualisation of individual lines of data and gridding of data to produce a magnetic anomaly map. The data were first smoothed to try and eliminate any spiking. A trend was then fitted to the resulting data, and the trend values subtracted from the smoothed values. This was carried out in an attempt to remove natural variations in the data (such as diurnal variation in magnetic field strength and changes in geology). The processed data were then gridded to produce a map of magnetic anomalies, and individual anomalies tagged based on the grid and individual profile lines. Images are taken in a similar process to that of the SSS data.

2.4 Geophysical data – data quality

Once processed, the geophysical data sets were individually assessed for quality and their suitability for archaeological purposes, and rated using the following criteria (**Table 2-3**).

Table 2-3: Criteria for assigning data quality rating

Data Quality	Description
Good	Data which are clear and unaffected or only slightly affected by weather conditions, sea state, background noise or data artefacts. Seabed datasets are suitable for the interpretation of upstanding and partially buried wrecks, debris fields, and small individual anomalies. The structure of wrecks is clear, allowing assessments on wreck condition to be made. Subtle reflectors are clear within SBP data. These data provide the highest probability that anomalies of archaeological potential will be identified.
Average	Data which are moderately affected by weather conditions, sea state and noise. Seabed datasets are suitable for the identification of upstanding and partially buried wrecks, the larger elements of debris fields and dispersed sites, and larger individual anomalies. Dispersed and/or partially buried wrecks may be difficult to identify. Interpretation of continuous reflectors in SBP data is problematic. These data are not considered to be detrimentally affected to a significant degree.
Below Average	Data which are affected by weather conditions, sea state and noise to a significant degree. Seabed datasets are suitable for the identification of relatively intact, upstanding wrecks and large individual anomalies. Dispersed and/or partially buried wrecks, or small isolated anomalies may not be clearly resolved. Small palaeogeographic features, or internal structure may not be resolved in SBP data.

Data Quality	Description
Variable	This category contains datasets where the individual lines range in quality. Confidence of interpretation is subsequently likely to vary within the study area.

2.4.1 Gardline 2014 data

The 2014 SSS data were rated as 'Good', the data quality and positioning was found to be of a generally high standard with some lines showing signs of weather noise but on the whole suitable for archaeological assessment.

The magnetometer data were rated as 'Average' quality, no obvious spikes were visible in the initial assessment; however a large number of lines contained moderate amounts of noise from either weather effects or the background geology of the site. This noise has the potential to hide and mask smaller potential archaeological anomalies and makes identification more difficult. The files were smoothed and sections deleted as appropriate to aid in interpretation.

The MBES data were rated as 'Good' using the above criteria. The data quality and resolution of 1 m was found to be of a good standard and suitable for archaeological assessment of objects and debris remains over 1 m in size.

The SBP data quality were rated as 'Average' for both the OfTI 2018 Archaeology Study Area and OfTI inshore areas, some weather noise is evident in the data files. The Boomer system data files were used for the archaeological assessment.

2.4.2 Bibby HydroMap 2017 data

The SSS data were rated as 'Average' using the above criteria table, a large number of lines displayed signs of poor weather conditions, however the range and coverage of the area was suitable for archaeological assessment.

The magnetometer data were rated as 'Good'. There was no spiking within the dataset, however some background variation was evident throughout the files from the underlying geology.

The MBES data were rated as 'Good' using the above criteria. The data quality and resolution of 0.25 m was found to be of a good standard and suitable for archaeological assessment of objects and debris remains over 0.25 m in size.

The SBP data quality were rated as 'Average' with weather noise evident throughout the data files. The Boomer system data files were used for the archaeological assessment.

All SSS, magnetometer and MBES data has been interpreted within the OfTI 2018 Archaeology Study Area. For the SBP 20% of the data was initially interpreted, with additional infill lines assessed where necessary.

2.5 Geophysical data – anomaly grouping and discrimination

The previous section describes the initial interpretation of all available geophysical datasets which were conducted independently of one another. This inevitably leads to the possibility of any one object being the cause of numerous anomalies in different datasets and apparently overstating the number of archaeological features in the study area.

To address this fact the anomalies were grouped together; allowing one ID number to be assigned to a single object for which there may be, for example, a UKHO record and multiple SSS anomalies.

Once all the geophysical anomalies and desk-based information have been grouped, a discrimination flag is added to the record in order to discriminate against those which are not thought to be of an archaeological concern. These flags are ascribed as follows (**Table 2-4**).

Table 2-4: Criteria discriminating relevance of identified features

Overview Classification	Discrimination	Criteria	Data Type
Archaeological	P1	Feature of probable archaeological interest, either because of its palaeogeography or likelihood for producing palaeoenvironmental material	SBP, MBES
Archaeological	P2	Feature of possible archaeological interest	SBP, MBES
Archaeological	A1	Anthropogenic origin of archaeological interest	MBES, SSS, Mag.
Archaeological	A2	Uncertain origin of possible archaeological interest	MBES, SSS, Mag.
Archaeological	A3	Historic record of possible archaeological interest	MBES, SSS, Mag.
Non-archaeological	U1	Not of anthropogenic origin	MBES, SSS, Mag.
Non-archaeological	U2	Known non-archaeological feature / Feature of non-archaeological interest	MBES, SSS, Mag., SBP
Non-archaeological	U3	Recorded loss	MBES, SSS, Mag.
Non-impact	O1	Outside horizontal footprint of study area	MBES, SSS, Mag., SBP

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

2.6 Geotechnical data - methodology

To help frame geoarchaeological investigations, Wessex Archaeology has developed a five-stage approach, encompassing different levels of investigation appropriate to the results obtained, accompanied by formal reporting of the results at the level achieved. The stages are summarised below (**Table 2-5**).

Table 2-5: Stages of geoarchaeological assessment and recording

Stage	Method	Description
1*	**Review**	**A desk-based archaeological review of the borehole, vibrocore and CPT logs generated by geotechnical contractors. Aims to establish the likely presence of horizons of archaeological interest and broadly characterise them, as a basis for deciding whether and what Stage 2 archaeological recording is required. The Stage 1 report will state the scale of Stage 2 work proposed.**
2	Geoarchaeological Recording and deposit modelling	Archaeological recording of selected retained or new core samples will be undertaken. This will entail the splitting of the cores, with each core being cleaned and recorded. The Stage 2 report will state the results of the archaeological recording and will indicate whether any Stage 3 work is warranted.
3	Sampling and Assessment	Dependent upon the results of Stage 2, sub-sampling and palaeoenvironmental assessment (pollen, diatoms and foraminifera) may be required. Subsamples will be taken if required. Assessment will comprise laboratory analysis of the samples to a level sufficient to enable the value of the palaeoenvironmental material surviving within the cores to be identified. Subsamples will also be taken and/or retained at this stage in case scientific dating is required during Stage 4. Some scientific dating (e.g. radiocarbon or Optically Stimulated Luminescence (OSL)) may be undertaken at this stage to provide chronological context. The Stage 3 report will set out the results of each laboratory assessment together with an outline of the archaeological implications of the combined results, and will indicate whether any Stage 4 work is warranted.
4	Analysis and Dating	Full analysis of pollen, diatoms and/or foraminifera assessed during Stage 3 will be undertaken. Typically, Stage 4 will be supported by scientific dating (e.g. radiocarbon or OSL) of suitable subsamples. Stage 4 will result in an account of the successive environments within the coring area, a model of environmental change over time, and an outline of the archaeological implications of the analysis.
5	Final Report	If required Stage 5 will comprise the production of a final report of the results of the previous phases of work for publication in an appropriate journal. This report will be compiled after the final phase of archaeological work, whichever phase that is.

* This represents the current stage of assessment.

A total of 91 vibrocores logs were reviewed in order to determine their potential for further geoarchaeological works. Vibrocores were assigned either a low, medium or high priority based on their perceived geoarchaeological significance (itemised in **Annex 1**).

This report outlines the results of a Stage 1 assessment, as detailed in **Table 2-5**.

3 Palaeogeography

3.1 Geological and geoarchaeological background

Quaternary sediments in the Inner Moray Firth underlying the OfTI 2018 Archaeology Study Area have been mapped by the British Geological Survey (BGS) (Andrews *et al.,* 1990; BGS, 1984) as "Quaternary undifferentiated" which indicates the stratigraphy and lithology are not fully understood, at least at a regional scale that would be mappable. To the east of the site in the Outer Moray Firth, the stratigraphy is better understood and the area comprises sediments belonging to the Forth Formation (late Devensian) and Coal Pit Formation (Saalian to late Devensian) (**Table 3-1**).

While sediments of the Inner Moray Firth underlying the site have not been mapped in detail by BGS, they have been subdivided based on lithology into seven units as defined in **Table 3-1**. However, we do not know the distribution of these units, nor have they previously been correlated to the deposits mapped in the Outer Moray Firth.

Table 3-1: Stratigraphy of Inner and Outer Moray Firth taken from Andrews *et al.,* (1990)

	Outer Moray Firth		Inner Moray Firth	
Age	**Formation**	**Description**	**Unit**	**Description**
Late Devensian to early Holocene	Forth Formation	Sediments are glacigenic muds and occasional muddy sand and pebbly muddy sand (flow tills). Isolated zones have been exposed to desiccation producing over-consolidation. Sediment infilling channels is late glacial to early Holocene in age.	7	Comprises pale olive grey to olive green calcareous mud with few scattered pebbles.
Late Devensian			6	Red, pinkish/brownish muds of Unit 6 which outcrop extensively across the Moray Firth area.
			5	Tills described as brown to grey brown muddy sands and sandy clays with varying proportions of sand and gravels.
			3 and 4	Laminated sediment comprising grey laminated clay with occasional clasts
Mid Devensian	-	-	1 and 2	The basal deposit (Unit 1) consists of grey pebbly till, from compact pebbly sandy clays to muddy sands. Within this unit local developments of olive grey sands (Unit 2) are found.
Saalian to early Devensian	Coal Pit Formation	Fill of pre-existing channels, most likely glacial tunnel valleys, but also occurs as a blanket deposit up to 40 m thick.	-	-

Here, we adopt the stratigraphy defined for the Inner Moray Firth but recognize there are likely overlaps with the Outer Moray Firth stratigraphy which will be discussed where relevant.

The most abundant deposit across the Moray Firth area is Unit 7. Unit 7 is the youngest in the sequence and has previously been assigned as late Devensian to Holocene in age (Chester and Lawson, 1983). However, part of the sequence was subsequently recorded as Coal Pit Formation which is present in the Outer Moray Firth and is much older (Late Saalian to early Devensian). This makes it difficult to confidently assign an age to Unit 7, but there is potential it is of Holocene age. This would make it of geoarchaeological

interest as it relates to a time period when the area was potentially exposed after ice sheets retreated, and before sea levels flooded the area.

Lithological descriptions define Unit 7 as a soft olive green to olive grey calcareous mud which often fills hollows/depressions observed in geophysical data (Andrews *et al.*, 1990). In the absence of any additional palaeoenvironmental information, these descriptions will be used to correlate the OfTI 2018 Archaeology Study Area geophysical and geotechnical data to BGS stratigraphy.

Across the site nearshore seabed sediments are characterized by sandy late Holocene marine sediments (MAREMAP, online resource) which have low geoarchaeological potential but may afford protection to archaeological material and palaeogeographical features.

3.2 Geophysical assessment

The seismic data interpretation essentially underlines the BGS chart data for the Moray Firth area, two layers were tentatively observed in the boomer data.

The lower seismic layer can be interpreted as Unit 6, Unit 5, Unit 2 or Unit 1, which all comprise tills deposited under glacial conditions which would have remodelled the landscape. However, it was not possible to interpret which of the units has been identified using geophysics alone. The tills would have been deposited during glaciation and are of limited archaeological interest.

However, the uppermost seismic layer has been interpreted to correlate to Unit 7 (**Table 3-1**) as it occupies shallow depressions/channels/hollows. This unit has the potential to contain material of archaeological significance as it marks the period between the decaying ice sheets and full marine conditions. Unit 7 has been tentatively identified across the OfTI 2018 Archaeology Study Area (**Figure 1)**. It is present in very large expanses, particularly in the offshore area, and more compact/site specific extents in the nearshore area of the cable route. The base of the unit is typically observed cutting into possible glacial channel till, possibly relating to BGS Units 6, 5, 2 or 1.

Twenty-one palaeogeographic features have been identified across the OfTI 2018 Archaeology Study Area (**Annex 2**). All of these have been classified as P2 (Feature of possible archaeological interest). In a number of these features more than one phase of cut and fill can be seen (**Figure 2**), showing a complex and well-preserved deposition sequence. Typically, these stratigraphic relationships are defined by well stratified layers with some additional infills that appear seismically chaotic.

In one area of the OfTI 2018 Archaeology Study Area, acoustic blanking has been identified (**Figure 3**), typically an indicator of shallow gas and probably caused by the microbial breakdown of organic matter. This anomaly indicates that this fill has the potential to contain preserved palaeoenvironmental material. This unit, where present, may contain palaeoenvironmental material that can help to understand the environment, and depending on the age and depositional setting, may contain artefactual material. This is addressed in Section 3.3.

3.3 Geoarchaeological assessment

The results of the Stage 1 geoarchaeological review involved an examination of 91 vibrocore logs from 68 locations acquired by Gardline in 2014 (Gardline 2014b) along the OfTI 2018 Archaeology Study Area, with the aim of identifying sediments of potential geoarchaeological significance.

Target vibrocore penetration was 3.0 m and maximum recovery was 2.97 m at VC-21. No sediment was recovered at stations VC-10A, VC-12A, VC-32 and 36. The stratigraphy is described in detail below and presented in **Table 3-2**, from oldest to youngest.

Table 3-2: Deposits identified from geotechnical vibrocore logs showing their relationship to BGS stratigraphy and archaeological potential

BGS Unit	New unit	Lithology	Depositional Environment	Archaeological Potential
-	Seabed sediments	Silty shelly sand which is occasionally gravelly	Marine	Low
-	Subunit 7C	Sand	Unknown, potentially marine or intertidal/channel fill	Medium, potentially Holocene in age, requires further assessment
-	Subunit 7B	Silt	Unknown, potentially intertidal	
-	Subunit 7A	Clayey silty sand with organics	Unknown, potentially intertidal to coastal	
7	-	Soft slightly sandy silty clay	Glacimarine to marine	Low
6, 5, 2 and 1	-	Firm to stiff, silty sandy clay	Glacial	Low

3.3.1 Firm to stiff clays

The lowermost sediment recovered in VC-11, VC-14, VC-28 and VC-60 is described as a firm to very stiff, dark grey to black, silty sandy clay. It varies in thickness from 0.05 m (VC-14) to 0.73 m (VC-11).

The overconsolidated nature of these deposits suggests they may be glacial diamicts (tills), potentially correlating to Units 6, Unit 5, Unit 2 or Unit 1, deposited during previous glacial periods which would be of low geoarchaeological significance.

3.3.2 Unit 7

The most abundant deposit recovered in vibrocores is a soft to very soft, olive greyish brownish slightly sandy silty clay that often comprises rare shell fragments or a minor gravel component. These deposits are present in 46 of the 91 boreholes with a maximum thickness of 2.74 m in VC-21. They comprise closely spaced laminations of fine sand in VC-11 and thin beds of gravelly sand in VC-40.

The lithology of these sediments show characteristics of Unit 7 as described by BGS (**Table 3-1**) although there are also strong similarities with the Forth Formation. Both Unit 7 and Forth Formation are expected to be of late Devensian to early Holocene age.

The fine-grained nature of the soft, sandy, silty clays implies they were deposited in a quiet water setting. There is evidence of fine sand laminations and a minor gravel component suggesting changes in sediment flux possibly through iceberg carving in close proximity to an ice margin. The sediments are tentatively interpreted as being deposited in a glacimarine to marine environment at the end of the last glacial period. Sea-level transgression into the Moray Firth is expected to have been rapid after ice sheet retreated and there is evidence across the region that ice sheets terminated in a marine setting (Sejrup *et al.*, 1994; Graham *et al.*, 2007) which supports our interpretation.

While Unit 7 has been recognized as having archaeological potential based on an estimated Holocene age, the soft muds recorded across the OfTI 2018 Archaeology Study Area are expected to have low potential based on their interpreted depositional environment in close proximity to an ice margin that terminated in a marine setting. Cores comprising Unit 7 have therefore been assigned low priority status and no further geoarchaeological recording is required.

3.3.3 Organic sediment

Pockets of black organic material within an olive brownish grey clayey silty sand have been recorded in VC-6 and VC-26A. This potentially organic sandy unit is 0.79 m and 0.90 m thick respectively, and is buried by overlying marine shelly sand. In VC-6, the organic sand overlies sediment interpreted to be Unit 7. These sediments are potentially of Holocene age and may preserve palaeoenvironmental information. Therefore, they have been assigned high priority status.

The presence of organic material has also been recorded in VC-15 and VC-68. VC-15 records black organic material within shelly sand in the uppermost 0.21 m of the core. It is unclear from descriptions whether this sand is marine in origin comprising potentially reworked organic matter, or if it is similar to the organic sands recorded in VC-6 and VC-26A. This requires further assessment to determine the potential for preservation of in-situ palaeoenvironmental information. Therefore, VC-15 is assigned high priority status. VC-68 describes the presence of organic silty clay between 0.32 m and 0.43 m and is assigned high priority status to determine the source of organics within the clay as it hold potential to preserve palaeoenvironmental information.

These organic sediments have not previously been described in the area and are therefore not captured by the outline stratigraphy in **Table 3-1**. We do not have sufficient information from the review of geotechnical logs to redefine the stratigraphy. We are therefore considering these organic rich sediments to be a subunit of Unit 7 and will refer to them as subunit 7A from hereunder (**Table 3-2**).

3.3.4 Silt

In VC-53, VC-54 and VC-55, an olive, sandy clayey silt, with rare shell fragments has been recovered overlying Unit 7. The deposit is thickest in VC-53 where it forms the uppermost 1.80 m. In VC-54 it is 0.20 m thick and in VC-55, 0.51 m thick. At these two locations the deposit underlies a fine sand interpreted as marine.

In the outer Moray Firth, the Glenn member of the Witch Ground Formation is described as a well sorted silt that has been attributed to reworking by gas escape features (pockmarks). However, the silt recovered in these vibrocores is likely poorly sorted as it is described as clayey and sandy. Therefore, the origin of this silt is unknown and as it overlies Unit 7, it is expected to be Holocene in age. There is potential for this silt to have been deposited in a shallow water/intertidal environment and it requires further geoarchaeological assessment to test this. Therefore, it has been assigned medium priority status.

As is the case with the organic sediment described in Section 3.3.3, we do not have a previous record of this unit, we will therefore refer to it as subunit 7B for the remainder of this assessment **(Table 3-2)**. Note, we do not know its age relationship with subunit 7A.

3.3.5 Sand

In VC-25, underlying a shelly sand, a grey sand has been recovered. The description does not provide much insight into the origin of this sand but it is the only deposit of this type described across the site. The vibrocore is assigned medium priority for further assessment. We refer to this deposit as subunit 7C as again it was not previously reported in the area (**Table 3-2**).

3.3.6 Marine seabed sediments

Sand comprising abundant broken shell is present in 79 of the 91 vibrocores. This shelly sand is occasionally gravelly (VC-29A, VC-31 and VC-31A) and varies in thickness from 0.06 m (VC-24) to 2.50 m (VC-41) although its maximum thickness is unknown as 35 of the vibrocores terminate within this unit.

In VC-54, VC-55, VC-56, VC57, VC58, VC65, VC66, VC67 and VC-68 the shelly sand is absent and the uppermost deposit is instead characterised by olive brown to olive grey, clayey silty fine sand with rare to occasional shell fragments. The thickness of the unit varies from 0.09 m (VC-65) to 1.36 m (VC-54).

These sediments are interpreted as marine and represent present-day seabed sediments. They are therefore of low geoarchaeological significance, although their thickness is important when considering preservation of palaeolandscape and other archaeological features.

3.3.7 Geoarchaeological summary and priority status

Ninety-one vibrocore logs from sixty-eight locations were reviewed. The deposits comprise up to 2.50 m of Holocene post-transgression marine deposits, underlain by Holocene-Pleistocene age deposits attributed to Unit 7 of BGS Inner Moray Firth stratigraphy, newly identified subunits (7A, 7B and 7C) of Unit 7, and occasional till deposits (Units 6, 5, 2 and 1) (**Table 3-2**).

Unit 7 is the predominant deposit underlying Holocene marine sands and typically comprises soft to very soft, olive greyish brownish slightly sandy silty clay that often comprises rare shell fragments or a minor gravel component. In isolated locations, deposits comprising organic material, or a clayey sandy silt and fine sand have been recorded overlying Unit 7 (subunits 7A, 7B and 7C). These deposits have not previously been described in the Inner Moray Firth. The lowermost deposit recovered at the site was an overconsolidated clay interpreted as a till, potentially correlating to BGS Unit 6, Unit 5, Unit 2 or Unit 1.

High priority status has been assigned to four vibrocores (VC-6, VC-15, VC-26A and VC-68) as they have recovered organic material that has potential to preserve palaeoenvironmental information.

Medium priority status has been assigned to four vibrocores (VC-28, VC-53, VC-54 and VC-55). Of these vibrocores, three comprise a silt deposit of potential Holocene age that may have been deposited in a shallow water/intertidal environment (VC-53, VC-54 and VC-55) and one vibrocore (VC-26) comprises a grey sand of unknown depositional environment.

The remaining 83 vibrocores have been assigned low priority status as they comprise marine sands of Holocene age or soft clays (Unit 7) deposited in a glacimarine to fully environment at the end of the last glacial period, both of which have low geoarchaeological potential.

3.4 Palaeogeographic assessment

Assessment of geophysical data identified widespread deposition of sediments interpreted to be Unit 7, which had the potential to record evidence of past land surfaces or preserve palaeoenvironmental information as it was considered to be of late Devensian to Holocene age. Upon review of geotechnical logs, olive greyish brownish soft clays showing characteristics of BGS Unit 7 were recorded. However, these clays are interpreted to be of late Devensian age corresponding to a time period when ice sheets occupied the area, terminating in a marine environment. Therefore, the majority of deposits associated with Unit 7 are considered to have low geoarchaeological potential.

A number of deposits previously not mapped in the area were identified from the geotechnical logs. These included an organic sand (subunit 7A), a silt (subunit 7B) and a fine sand (subunit 7C). Their depositional environment is unknown, but, as they are younger than Unit 7 which is considered to be late Devensian age, there is potential these sediments were deposited in the Holocene, in coastal or intertidal environments prior to sea-level rise. These subunits require further geoarchaeological assessment.

Of the vibrocores assessed, 44 out of the 68 locations intercept the mapped extent of Unit 7 from the geophysics (**Figure 1**). Of these 44 vibrocores, 23 recovered Unit 7 and the remainder terminated at shallow depth within the marine sands.

Two of the high priority vibrocores (VC-6 and VC-26A) intercept Unit 7 as mapped by geophysics, while two (VC-15 and VC-68) lie outside of this area. Despite this, these vibrocores remain high priority due to the presence of organic material. We note here that the thickness of the deposits assigned high priority status is <1 m which is below the resolution of seismic data used in this assessment. Therefore, we would not expect to be able pick out this subunit on geophysical data.

Of the medium priority vibrocores, VC-26, VC-53, VC-54 and VC-55 are located in areas mapped as Unit 7 according to geophysics indicating geophysical data and geotechnical data support one another.

The vibrocores assessed here did not fully penetrate the features mapped from geophysical data. In addition, the deposits identified as having high and medium geoarchaeological potential were not thick enough to be identified on geophysical data. With this in mind, we have designated the palaeolandscape features identified in geophysical data as P2 receptors as they are of possible archaeological interest but we do not have sufficient information at this stage to fully reject their potential.

4 Seabed Features Assessment

4.1 Seabed features assessment results

A full assessment of 2014 and 2017 geophysical survey data was undertaken by Wessex Archaeology (**Figure 4**), are listed in **Annex 3**, and the results described below.

In total 106 anomalies were identified as being of potential archaeological interest and have been assigned an A2 archaeological potential rating.

Nine of these geophysical anomalies (7000-7009) were located outside of the OfTI 2018 Archaeology Study Area but within the geophysical survey area and the wind farm footprint. As such they have been assigned Wessex Archaeology numbering and included in this report.

Three UKHO and NMRS records fall within the OfTI 2018 Archaeology Study Area, however these represent records of loss and no evidence of geophysical anomalies have been identified and recorded in the UKHO and NMRS data. No corresponding geophysical anomalies were identified during the assessment of 2014 and 2017 survey data at these locations. These records have all been classified as U3 and are summarised in the table below (**Table 4-1**) but not included in the archaeological gazetteer.

Table 4-1: UKHO and NMRS records within the OfTI 2018 Archaeology Study Area

UKHO/NMRS Number	Easting	Northing	Description
UKHO 2188; NMRS 321896	520556	6423193	Recorded as foul ground with anchors buried in the seabed.
UKHO 2199; NMRS 101810	520817	6401642	Classified as a non-dangerous wreck by the UKHO. In 1986 possible wreckage was reported by a local fishing skipper, however this was not located during a subsequent survey.
NMRS 310238	524489	6396433	An unconfirmed report of an aircraft loss off Whitehills on 14th June 1943. As this position is based on an unconfirmed report the positional data should be treated as indicative, rather than absolute.

The identified anomalies of archaeological potential within the geophysical survey area are characterised as follows (**Table 4-2**):

Table 4-2: Anomalies of archaeological potential within the OfTI 2018 Archaeology Study Area

Archaeological Discrimination	Quantity	Interpretation
A1	0	Anthropogenic origin of archaeological interest.
A2	106	Uncertain origin of possible archaeological interest.
A3	0	Historic record of possible archaeological interest with no corresponding geophysical anomaly.
Total	**106**	

Furthermore, these anomalies can be classified by probable type, which can further aid in assigning archaeological potential and importance (**Table 4-3**).

Table 4-3: Types of anomaly identified

Anomaly Classification	Definition	Number of Anomalies
Debris field	A discrete area containing numerous individual debris items that are potentially anthropogenic, and can include dispersed wreck sites for which no coherent structure remains.	4
Debris	Distinct objects on the seabed, generally exhibiting height or with evidence of structure, that are potentially anthropogenic in origin.	18
Bright reflector	Individual objects or areas of low reflectivity, characteristic of materials that absorb acoustic energy, such as waterlogged wood or synthetic materials. Precise nature is uncertain.	2
Dark reflector	Individual objects or areas of high reflectivity, displaying some anthropogenic characteristics. Precise nature is uncertain.	39
Magnetic	No associated seabed surface expression, and have the potential to represent possible buried ferrous debris or buried wreck sites.	43
Total		**106**

These anomalies are discussed below, and a full gazetteer supplied in **Annex 3**. The distribution of the anomalies is illustrated in **Figure 5**.

Eighteen debris features have been identified across the OfTI 2018 Archaeology Study Area (see **Annex 3**). Anomaly 7078 is the smallest item of debris identified within the OfTI 2018 Archaeology Study Area with dimensions of 2.2 x 0.2 m and a height of 0.1 m. This is a distinct, thin, linear anomaly that appears anthropogenic looking compared to the surrounding geology and boulders on the seabed.

The largest piece of debris identified is 7047 with dimensions of 28.6 x 7.2 m. This is a long and thin, right angled, linear anomaly which looks to be partially buried on a sandy and even area of the seabed. The debris is composed of a number of dark reflectors with no shadows, it appears highly anthropogenic and has a small magnetic anomaly measuring 8 nT associated with it, which suggests that there may be some ferrous material present.

Anomaly 7058 is the second largest piece of debris identified in the survey area. This has a small magnetic dipole associated measuring 12 nT which indicates there is ferrous material present. The debris comprises a long and thin, curvilinear dark reflector feature with thicker anomalies attached to either ends, all with shadows. There is a second indistinct dark reflector anomaly situated behind the main body. The debris has dimensions of 18.1 x 2.2 m and height of 0.5 m (**Figure 6**).

Debris 7032 is a medium sized anomaly, made up of one long and thin, curvilinear dark reflector, with a parallel, more indistinct, appearing curvilinear object directly next to this with bright shadows. The debris is isolated on a sandy and even area of the seabed with some scouring visible, orientated northeast and measuring 12 m. The debris has dimensions of 14.4 x 5.2 x 0.5 m (**Figure 6**).

Three further debris anomalies have associated magnetic anomalies ranging from 9 nT to 555 nT, which suggests that they may be ferrous debris (7003, 7012 and 7040). Debris 7012 has a large positive monopole associated measuring 555 nT which is the largest magnetic anomaly identified across the OfTI 2018 Archaeology Study Area. The debris has dimensions of 2.6 x 2.4 x 0.6 m and is visible as an indistinct, irregularly shaped dark reflector anomaly with a distinct shadow. This ferrous debris feature is situated within an area of sandwaves and its full extent may be buried (**Figure 6**).

Four debris fields have been identified in the OfTI 2018 Archaeology Study Area, none of which have associated magnetic contacts (7010, 7022, 7066 and 7090) (**Figure 7**). The smallest of these (7090) has dimensions of 15 x 3 x 0.5 m. This is made up of three aligned ‘u’ shaped dark reflectors with matching

oval shadows and a larger possibly broken up linear dark reflector. The main anomalies are surrounded by a small number of minute dark reflectors that look anomalous to the surrounding seabed. This is possibly modern debris.

Feature 7022 is a large spread of likely debris objects, the largest feature measures 8.7 x 3.2 m and the overall dimensions are 30.3 x 10.4 x 2.6 m. The debris field is made up of a distinct and possibly broken up dark reflector with a large shadow. There are a few very indistinct, smaller dark reflectors surrounding this. The debris field appears to be situated in a depression and its full extent may be covered by sands. The feature is large enough to be visible in the MBES data, where it also appears to be in a distinct depression.

Two bright reflectors have been identified in the OfTI 2018 Archaeology Study Area (7051 and 7061). The largest bright reflector is 7061 with dimensions of 9.2 x 6.7 m, this appears in the SSS data as a circular bright reflector object with a thick linear dark reflector piece projecting out of one of its sides (**Figure 5**). The second bright reflector identified is a roughly rectangular anomaly with a single, small and circular dark reflector situated on one edge (7051). This feature has dimensions of 6.3 x 3.7 m and is anomalous to the surrounding seabed.

There are 39 anomalies identified to be dark reflectors located across the OfTI 2018 Archaeology Study Area, all of which are classified as A2 archaeological potential rating (see **Annex 3**). These features range in size from 1.2 m to 8.5 m, none of these have magnetic anomalies associated though they display some anthropogenic characteristics and as such have been classified as A2 archaeological potential.

There are 43 magnetic anomalies within the OfTI 2018 Archaeology Study Area (see **Annex 3**). These anomalies did not have a corresponding SSS or MBES anomaly, and were identified in areas categorised as sand, or thin sands and gravels, which indicates that even where there is little sediment cover there is the potential for buried material to be present. A very small number of magnetic anomalies were identified on patches of till which could be resultant of geological changes and were not included in the gazetteer. However, given the nature of the geology in the area some of the anomalies identified as potential archaeological interest could prove to be natural features on further investigation.

The smallest magnetic anomalies recorded across the survey area range from 5 nT (7018 and 7031) which is the lowest magnetic anomaly value that was taken forward past assessment stage. The largest magnetic anomaly with no corresponding seabed feature was 7075 measuring 350 nT. All of these magnetic anomalies have the potential to be buried ferrous material of possible archaeological interest.

5 Conclusions and Recommendations

5.1 Palaeogeographic features

Assessment of geotechnical vibrocore logs has identified four vibrocores of high priority status due to the presence of organic material, and four vibrocores of medium priority status as they show indications of potentially being deposited in a nearshore to intertidal environment.

Of the vibrocores recommended for Stage 2 geoarchaeological recording, six intercept the palaeolandscape features identified in the geophysical data.

Based on the results of the geotechnical log review, vibrocores have been assigned a high, medium or low priority status. Recommendations for further geoarchaeological work are itemised in **Table 5-1**.

It is recommended that all high and medium priority vibrocores are made available for geoarchaeological recording by a suitably trained geoarchaeologist. The results of this assessment will be delivered in a Stage 2 geoarchaeology report, with recommendations for further Stage 3 assessment (if applicable) (see **Table 5-1**).

Table 5-1: Recommendations

Vibrocore	Priority	Recommendation	Objective
VC-6	High	Geoarchaeological recording	To assess potential for preservation of sediment comprising palaeoenvironmental information
VC-15			
VC26-A			
VC-68			
VC-53	Medium	Geoarchaeological recording	To assess formation of silt and sand (intertidal vs marine)
VC-54			
VC-55			
VC-26			

Based on the integration of geophysical and geotechnical data, 21 features of palaeogeographic interest are designated as P2 receptors as while they comprise soft muds interpreted to be glacimarine to marine in origin, they may in some cases comprise Holocene deposits at shallow depths that are not resolvable in the geophysical data. These included simple to complex cut and fill sequences.

5.2 Seabed features

The assessment of the geophysical data within the OfTI 2018 Archaeology Study Area resulted in a total of 106 anomalies identified as being of possible archaeological interest (A2 archaeological rating).

For features assigned A2 archaeological discrimination rating, no Archaeological Exclusion Zones (AEZs) are recommended at this time. However, avoidance of these features by micro-siting is recommended should the proposed scheme directly impact any of these anomalies in the future.

It is recommended that if any objects of possible archaeological interest are recovered during any groundwork operations, that they should be reported using the established *Protocol for Archaeological Discoveries: Offshore Renewables Projects* (The Crown Estate 2014). This will establish whether the recovered objects are of archaeological interest and recommend appropriate mitigation measures.

6 References

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Annex 1 Geoarchaeological Assessment Results

Vibrocore	Recovery	Description	Priority
VC_1	2.74	Shelly sand (marine) (0.61 m) overlying very soft grey becoming dark grey slightly sandy silty clay (**Unit 7**) (2.74 m).	Low
VC_2	2.65	Shelly sand (**marine**) (0.69 m) overlying very soft brownish grey slightly sandy silty clay (**Unit 7**) (2.65 m).	Low
VC_3	0.63	Shelly sand (**marine**) (0.63 m).	Low
VC_3A	2.13	Very soft dark grey slightly sandy silty clay (**Unit 7**) (2.13 m).	Low
VC_4	2.73	Shelly sand (**marine**) (1.00 m) overlying soft grey sandy clay (**Unit 7**) (2.73 m).	Low
VC_5	2.72	Shelly sand (**marine**) (0.70 m) overlying very soft brown slightly sandy silty clay with rare shell fragments (**Unit 7**) (2.72 m).	Low
VC_6	2.43	Shelly sand (**marine**) (0.09 m) overlying dark olive grey silty clayey fine sand with occasional pockets of black organic material (**subunit 7A**) (0.88 m) overlying dark olive grey silty clayey fine sand with shell fragments (**Unit 7**) (1.50 m) overlying very soft brownish grey clay (**Unit 7**) (2.43 m).	High
VC_7	2.63	Shelly sand (**marine**) (0.42 m) overlying brown slightly sandy silty clay with occasional thin beds of clayey silty fine sand (**Unit 7**) (1.50 m) overlying soft brown slightly sandy silty clay (**Unit 7**) (2.63 m).	Low
VC_8	0.3	Shelly sand (**marine**) (0.30 m).	Low
VC_8A	2.25	Shelly sand (**marine**) (0.60 m) overlying very soft dark greyish brown silty clay (**Unit 7**) (2.25 m).	Low
VC_9	1.54	Shelly sand (**marine**) (1.54 m).	Low
VC_9A	1.38	Shelly sand (**marine**) (1.38 m).	Low
VC_10	0.66	Shelly sand (**marine**) (0.66 m).	Low
VC_11	2.14	Shelly sand (**marine**) (0.30 m) overlying very soft dark grey silty sandy clay with closely spaced fine sand laminations (**Unit 7**) (0.57 m) overlying soft very dark grey sandy silty clay with rare gravel (**Unit 7**) (1.41 m) overlying firm dark grey sandy silty clay (**Unit 6, 5, 2 or 1**) (2.14 m).	Low
VC_12	0.52	Shelly sand (**marine**) (0.21 m) overlying very dark grey very sandy silty clay with pockets of silty gravelly sand (**Unit 7**) (0.52 m).	Low
VC_13	1.63	Shelly sand (**marine**) (1.38 m) overlying soft very dark grey sandy silty clay (**Unit 7**) (1.63 m).	Low
VC_13A	0.72	Shelly sand (**marine**) (0.72 m).	Low
VC_14	0.4	Shells (**marine**) (0.35 m) overlying stiff grey clay (**Unit 6, 5, 2 or 1**) (0.40 m).	Low
VC_14A	0.25	Dark grey slightly sandy gravel (**marine**) (0.25 m).	Low
VC_15	2.23	Shelly sand with black organic material (**subunit 7A**) (0.33 m) overlying very soft brown slightly sandy silty clay (**Unit 7**) (2.23 m).	High
VC_16	2.56	Shelly sand (**marine**) (0.50 m) overlying very soft brown slightly sandy silty clay with rare shell fragments (**Unit 7**) (2.56 m).	Low
VC_17	2.64	Shelly sand (**marine**) (0.50 m) overlying very soft brownish grey slightly sandy clay (**Unit 7**) (2.64 m).	Low
VC_18	2.47	Shelly sand (**marine**) (0.44 m) overlying very soft dark olive brown slightly sandy silty clay with rare shell fragments (**Unit 7**) (2.47 m).	Low
VC_19	2.15	Shelly sand (**marine**) (0.33 m) overlying very soft brown slightly sandy silty clay (**Unit 7**) (2.15 m).	Low
VC_20	2.34	Shelly sand (**marine**) (0.67 m) overlying soft brownish grey slightly sandy clay (**Unit 7**) (2.34 m).	Low
VC_21	2.97	Shells (**marine**) (0.23 m) overlying soft dark grey slightly sandy silty clay with rare shell fragments (**Unit 7**) (2.97 m).	Low
VC_22	2.48	Shelly sand (**marine**) (1.00 m) overlying dark brown silty very gravelly sand (**marine**) (1.11 m) overlying very soft dark grey slightly sandy silty clay with rare gravel (**Unit 7**) (2.48 m).	Low
VC_23	2.62	Shelly sand (**marine**) (1.30 m) overlying very soft dark grey slightly sandy silty clay with a very thin bed of gravely sand (**Unit 7**) (2.62 m).	Low
VC_24	1.58	Shelly sand (**marine**) (0.06 m) overlying soft slightly sandy silty clay with occasional gravel (**Unit 7**) (1.58 m).	Low
VC_24A	0.22	Shelly sand (**marine**) (0.22 m).	Low
VC_25	0.3	Shelly sand (**marine**) (0.30 m).	Low
VC_25A	0.2	Shelly sand (**marine**) (0.20 m).	Low

Vibrocore	Recovery	Description	Priority
VC_26	1.1	Shelly sand (**marine**) (0.53 m) overlying grey sand (**subunit 7C**) (1.10 m).	Medium
VC_26A	1.6	Shelly sand (**marine**) (0.70 m) overlying brownish grey clayey silty sand with occasional pockets of black organic matter (1.60 m) (**subunit 7A**).	High
VC_27	1.65	Shelly sand (**marine**) (1.65 m).	Low
VC_27A	1.62	Shelly sand (**marine**) (1.62 m).	Low
VC_28	0.93	Shelly sand (**marine**) (0.93 m).	Low
VC_28A	1.52	Shelly sand (**marine**) (1.42 m) overlying firm dark grey sandy silty clay (**Unit 6, 5, 2 or 1**) (1.52 m).	Low
VC_29	0.72	Shelly sand (**marine**) (0.72 m).	Low
VC_29A	1.1	Shelly gravelly sand (**marine**) (1.10 m).	Low
VC_30	0.52	Shelly sand (**marine**) (0.52 m).	Low
VC_30A	0.27	Shelly sand (**marine**) (0.27 m).	Low
VC_31	0.05	Shelly gravelly sand (**marine**) (0.05 m).	Low
VC_31A	0.34	Sandy gravel (**marine**) (0.16 m) overlying dark grey sandy clay (**Unit 7**) (0.34 m).	Low
VC_32A	0.41	Shelly sand (**marine**) (0.41 m).	Low
VC_33	0.97	Shelly sand (**marine**) (0.97 m).	Low
VC_33A	0.92	Shelly sand (**marine**) (0.92 m).	Low
VC_34	0.67	Shelly sand (**marine**) (0.67 m).	Low
VC_34A	0.65	Shelly sand (**marine**) (0.65 m).	Low
VC_35	0.63	Shelly sand (**marine**) (0.63 m).	Low
VC_35A	0.93	Shelly sand (**marine**) (0.93 m).	Low
VC_36A	0.01	Shelly sand (**marine**) (0.01 m).	Low
VC_37	2.38	Shelly sand (**marine**) (1.28 m) overlying very soft slightly sandy silty clay with shell fragments (**Unit 7**) (2.38 m).	Low
VC_38	1.13	Shelly sand (**marine**) (1.13 m).	Low
VC_38A	1.01	Shelly sand (**marine**) (1.01 m).	Low
VC_39	1.38	Shelly sand (**marine**) (1.38 m).	Low
VC_39A	1.07	Shelly sand (**marine**) (1.07 m).	Low
VC_40	2.4	Shelly sand (**marine**) (0.45 m) overlying very soft grey sandy clay with frequent shell fragments (**Unit 7**) (1.00 m) overlying very soft grey slightly sandy silty clay with closely spaced lamination of gravelly sand (1.32 m) (**Unit 7**) overlying very soft grey silty clay (**Unit 7**) (2.40 m).	Low
VC_41	1.55	Shelly sand (**marine**) (1.55 m).	Low
VC_41A	2.5	Shelly sand (**marine**) (2.50 m).	Low
VC_42	2.41	Shelly sand (**marine**) (2.41 m).	Low
VC_43	2.21	Shelly sand (**marine**) (2.21 m).	Low
VC_44	2.41	Shelly sand (**marine**) (2.00 m) overlying very soft brown sandy clay (**Unit 7**) (2.41 m).	Low
VC_45	2.1	Shelly sand (**marine**) (0.50 m) overlying very soft brown clay with rare gravel (**Unit 7**) (2.10 m).	Low
VC_46	1.97	Shelly sand (**marine**) (1.50 m) overlying very soft very sandy clay (**Unit 7**) (1.97 m).	Low
VC_46A	1.8	Shelly sand (**marine**) (1.80 m).	Low
VC_47	2.02	Shelly sand (**marine**) (1.30 m) overlying very soft very dark grey slightly sandy silty clay with occasional shell fragments (**Unit 7**) (2.02 m).	Low
VC_47A	2.16	Shelly sand (**marine**) (2.16 m).	Low
VC_48	2.42	Shelly sand (**marine**) (2.30 m) overlying very soft brown clay (**Unit 7**) (2.42 m).	Low
VC_49	2.27	Shelly sand (**marine**) (1.50 m) overlying soft brown sandy clay (**Unit 7**) (2.27 m).	Low
VC_50	1.74	Shelly sand (**marine**) (1.50 m) overlying very soft brown sandy clay (**Unit 7**) (1.74 m).	Low
VC_50A	2.06	Shelly sand (**marine**) (1.29 m) overlying very soft sandy silty clay with occasional shell fragments (2.06 m).	Low
VC_51	2.42	Very soft olive sandy silty clay with occasional shell fragments (**Unit 7**) (2.42 m).	Low
VC_52	2.27	Shelly sand (**marine**) (2.27 m).	Low
VC_53	2.65	Olive grey sandy clayey silt with occasional shell fragments (1.80 m) (**subunit 7B**) overlying very soft grey slightly sandy silty clay (**Unit 7**) (2.65 m).	Medium
VC_54	2.5	Olive clayey fine sand with rare shell fragments (**marine**) (1.36 m) overlying olive sandy clayey silt with rare shell fragments (**subunit 7B**) (1.56 m) overlying very soft olive sandy silty clay with rare shell fragments (**Unit 7**) (2.0 m) overlying very soft grey clay (**Unit 7**) (2.50 m).	Medium

Vibrocore	Recovery	Description	Priority
VC_55	2.57	Olive clayey fine sand with rare shell fragments (**marine**) (0.09 m) overlying olive sandy clayey silt with rare shell fragments (**subunit 7B**) (0.50 m) overlying very soft olive to brown sandy silty clay with rare shell fragments (**Unit 7**) (2.57 m).	Medium
VC_56	2.6	Olive to dark olive grey silty fine to medium sand with rare shell fragments (**marine**) (0.60 m) overlying very soft brown slightly sandy silty clay (**Unit 7)** (2.60 m).	Low
VC_57	2.36	Olive silty fine to medium sand with occasional shell fragments (**marine**) (1.16 m) overlying soft grey sandy silty clay with rare shell fragments (**Unit 7**) (2.36 m).	Low
VC_58	2.37	Olive silty fine to medium sand with frequent shell fragments (**marine**) (0.58 m) overlying very soft dark grey sandy silty clay (**Unit 7**) (1.10 m) overlying soft grey sandy clay with occasional fine to medium gravel (**Unit 7**) (2.37 m).	Low
VC_59	0.47	Shelly sand (**marine**) (0.47 m).	Low
VC_59A	0.95	Shelly sand (**marine**) (0.55 m) overlying soft dark grey sandy clay with occasional shell fragments (**Unit 7**) (0.95 m).	Low
VC_60	2.28	Shelly sand (**marine**) (0.60 m) overlying very soft grey clay (**Unit 7**) (2.00 m) overlying firm to very stiff black sandy clay with occasional gravel and pockets of dark grey sand (**Unit 6, 5, 2 or 1**) (2.28 m).	Low
VC_61	2.4	Shelly sand (**marine**) (1.20 m) overlying very soft brown silty sandy clay (**Unit 7**) (2.40 m).	Low
VC_62	2.76	Shelly sand (**marine**) (1.20 m) overlying very soft grey clay (**Unit 7**) (2.76 m).	Low
VC_63	2.79	Shelly sand (**marine**) (1.00 m) overlying very soft brown slightly sandy silty clay with rare shell fragments (**Unit 7**) (2.79 m).	Low
VC_64	2.38	Shelly sand (**marine**) (0.50 m) overlying very soft grey clay (**Unit 7**) (2.38 m).	Low
VC_65	2.36	Dark grey clayey silty fine sand with rare shell fragments (**marine**) (0.09 m) overlying dark grey sandy silty clay (**Unit 7**) (0.30 m) overlying dark grey clayey silty fine sand with rare shell fragments (**Unit 7**) (1.10) overlying very soft sandy silty clay (**Unit 7**) (2.36 m).	Low
VC_66	2.56	Olive brown to olive grey clayey silty sand with occasional shell fragments (**marine**) (0.57 m) overlying very soft dark grey sandy silty clay with occasional shell fragments (**Unit 7**) (0.91 m) overlying very soft silty clay (**Unit 7**) (2.56 m).	Low
VC_67	2.63	Olive brown silty sand with occasional shell fragments (**marine**) (0.43 m) overlying very soft dark grey to olive grey very sandy silty clay with occasional shell fragments (**Unit VII**) (0.81 m) overlying very soft grey clay (**Unit 7**) (2.63 m).	Low
VC_68	2.81	Olive grey to dark grey silty sand with occasional shell fragments (**marine**) (0.32 m) overlying soft very dark grey very sandy organic silty clay (0.43 m) (**subunit 7A**) overlying olive grey to dark grey slightly clayey silty sand with frequent shell fragments (**Unit 7**) (0.96 m) overlying soft grey clay with occasional fine gravel (**Unit 7I**) (2.81 m).	High

Annex 2 Palaeolandscape Features of Archaeological Potential

ID	Classification	Archaeological Discrimination	Description
7125	Simple Cut and Fill	P2	The base of the unit is undulating and cuts into a possible glacial channel infill unit possibly relating to BGS Unit 6 interpreted from its acoustic character. Feature 7125 fill comprises a series of well-layered sediments up to 17 m thick and probably comprises sandy silty clay deposits possibly relating to BGS Unit 7, this is inferred from BGS data. The base of this feature is observed between seabed and 17.5 m sub-seabed. This feature coincides with vibrocores VC-27, VC-27A, VC-28 and VC-28a.
7126	Simple Cut and Fill	P2	An extensive undulating unit of well-defined and layered likely sandy, silty clay deposits possibly relating to BGS Unit 7, this is inferred from BGS data and the features acoustic character. The feature extends across the width of the OfTI 2018 Archaeology Study Area and probably overlies BGS Unit 6 (from BGS data) which is made up of unconsolidated glacial clay and silt sediments. The base of this unit is observed between the seabed and 9.6 m sub-seabed. This feature coincides with vibrocores VC-35, VC-35A and VC-36A.
7127	Simple Cut and Fill	P2	A smaller expanse of consolidated sediment layers observed on one survey line, likely made up of sandy, silty clay deposits from BGS Unit 7, inferred from the features acoustic character and BGS data. The base of the unit is fairly consistent and observed between the seabed and 6.4 m sub-seabed. This feature coincides with vibrocores VC-34 and VC34A.
7128	Simple Cut and Fill	P2	The base of this unit is frequently undulating across its extent and cuts into a possible glacial channel infill unit likely to be BGS Unit 6 (inferred from BGS data). The features acoustic character and BGS data indicates that feature 7128 is probably BGS Unit 7, comprising uniform layers of sandy, silty clays. In the centre of the feature a channel is observed with two layers of sediment fill, the primary fill is composed of very diffuse sediments that appear seismically chaotic with the secondary fill better layered and defined in the data. The base of the feature extends from the seabed to 17.4 m sub-seabed and the upper fill comprises up to 7.3 m of well layered sediments. This feature coincides with vibrocores VC-38, VC-38A, VC-39 and VC-39A.
7129	Simple Cut and Fill	P2	This is a large expansive feature with a typically undulating base cut into underlying likely till deposits from the acoustic character. The unit is typically 10 m thick comprising well stratified layers, probable sandy, silty clay deposits relating to BGS Unit 7, this is inferred from BGS data and vibrocore sampling. In the northernmost area of this feature a channel is observed with three layers of sediment fill. The channel is infilled to the seabed and the base is recorded at approximately 28 m sub-seabed. The deepest fill comprises up to 14 m of well stratified sediments and there is an associated area of acoustic blanking. The acoustic blanking is likely to be caused by shallow gas and is indicative of organic material within the unit. The second fill comprises a more seismically chaotic unit up to 7 m thick probably comprising coarser sands and gravels and indicates a possible change to depositional environment. The uppermost fill comprises up to 7 m of seismically transparent with occasional layers indicating possible silts and muds. This feature coincides with vibrocores VC-40 to VC-55.
7130	Simple Cut and Fill	P2	Feature 7130 has been interpreted to be BGS Unit 7 from vibrocore sampling and BGS data, the deposit containing sandy, silty clay sediments. Observed on a single line, this feature is visible as a circular depression in the bathymetry data and has an undulating base with a base depth of 7.4 m below the seabed. The feature has two fills visible within it, the primary observed as being seismically chaotic and indiscernible and the upper deposit more uniform and layered with sands and muds up to a depth of 3.6 m sub-seabed. This feature coincides with vibrocore VC-56.
7131	Simple Cut and Fill	P2	A small channel feature of a comparative appearance and depth to nearby Feature 7132, situated 180 m to the south. This is a simple cut and fill inferred to be BGS Unit 7 from the acoustic character and BGS data. This feature is made up of well layered and defined probable sandy, silty clay deposits with a base depth from the seabed to 4.7m sub-seabed.

ID	Classification	Archaeological Discrimination	Description
7132	Simple Cut and Fill	P2	A similar feature to 7131 and observed on one survey line, this is a 'u' shaped simple cut and fill unit containing well stratified probable sandy silty clay deposits interpreted to be BGS Unit 7 from BGS data and the acoustic character. The base of the feature is observed between seabed and 6.1 m below sub-seabed.
7133	Simple Cut and Fill	P2	A rough oval shape in plan this feature is observed on a main line and cross line and has two sequences of deposition within it. The primary fill, much like the other features on site, is seismically chaotic with less defined layering than the upper fill possibly comprising BGS Unit 7 inferred from BGS and vibrocore data. Feature 7133 is a wide 'u' shaped cut and fill with gently sloping sides and an undulating base that cuts into the below glacial deposits Interpreted to be BGS Unit 6 from the acoustic character and BGS data. The base of the feature is observed from the seabed to 10.9 m sub-seabed and the upper fill is seen from the seabed to 4.3 m sub-seabed. This feature coincides with vibrocore VC-61.
7134	Simple Cut and Fill	P2	Feature 7134 is seen on the very edge of a cross line. This has a single fill made up of well layered probable mud and sand sediments inferred to be BGS Unit 7 from BGS data and the features acoustic character. The feature has one steeply sloping side and one gentle and is observed from the seabed to 7.4 m sub-seabed.
7135	Simple Cut and Fill	P2	A large and winding 'S' shaped channel in plan that is also clearly seen in the bathymetry data. This feature 7135 has one sequence of deposition comprising well defined and layered probable sandy, silty clay interpreted from vibrocore and BGS data to be BGS Unit 7. The base of the feature is observed from seabed to 6 m sub-seabed. This feature coincides with vibrocore VC-62.
7136	Simple Cut and Fill	P2	A large expanse of feature inferred to be BGS Unit 7 from vibrocore and BGS data. The feature has a fairly undulating base, this unit contains very well layered (in parts) probable sandy, silty clay across the width of the geophysical survey extents. This feature is observed from the seabed to 12.3 m sub-seabed. This feature coincides with vibrocores VC-64 to VC-66.
7137	Simple Cut and Fill	P2	Feature 7137 is an irregular shaped channel feature in plan. This gently sloping sided cut and fill contains well layered probable sandy, silty clay sediments inferred from vibrocore and BGS data to be BGS Unit 7. The base of the feature is observed from the seabed to 4.1 m sub-seabed. This feature coincides with vibrocore VC-1.
7138	Simple Cut and Fill	P2	Small but distinct simple cut and fill feature with steeply sloping sides and a rounded base. This Feature contains well stratified likely sandy, silty clay inferred to be BGS Unit 7 from BGS data and the acoustic character. The base is observed from the seabed to 11.4 m sub-seabed.
7139	Simple Cut and Fill	P2	A large feature present in the nearshore area of the OfTI export cable corridor, this has a wide and undulating base with a well layered fill of probable sandy, silty clay deposits interpreted to be BGS Unit 7 from the acoustic character and BGS data. The deposit overlies highly seismically chaotic till material possibly related to BGS Unit 6 origin (from BGS data). The base of the feature is observed from the seabed to 7.3 m sub-seabed.
7140	Simple Cut and Fill	P2	Feature 7140 is a shallow simple cut and fill feature with gently sloping sides and well layered probable sandy silty clay deposits throughout inferred to be BGS Unit 7 from acoustic character and vibrocore data. The feature is clearly observed in the bathymetry dataset. The base of the feature is observed from the seabed to 6.2 m sub-seabed. This feature coincides with vibrocores VC-26 and VC-26A.
7141	Simple Cut and Fill	P2	A slight oval shaped channel in plan clearly seen in the bathymetry data. This cut and fill feature has two layers of sediment fill interpreted from BGS data to be composed of BGS Unit 7 sandy, silty clay sediments. The feature has steeply sloping sides and a rounded base. The base is observed from the seabed to 10.9 m sub-seabed.
7142	Simple Cut and Fill	P2	Small area of probable BGS Unit 7 sediments, this is inferred from vibrocore and BGS data. This is a distinct 'v' shaped cut and fill feature with one well stratified layer of possible sandy, silty clay deposits. The feature is observed from the seabed to 13.3 m. This feature coincides with vibrocore VC-6.

ID	Classification	Archaeological Discrimination	Description
7143	Simple Cut and Fill	P2	A large expanse of likely BGS Unit 7 deposits made up of well-defined and layered probable sandy, silty clay sediments, this is inferred from vibrocore and BGS data. The feature cuts into glacial channel infill interpreted from the acoustic character and BGS data to be BGS Unit 6 sediments. The base of the feature is observed from the seabed to 7.6 m sub-seabed and undulates frequently. This feature coincides with vibrocore VC-2.
7144	Simple Cut and Fill	P2	Feature 7144 is present across the very near shore area of the survey site and has been identified in both the 2014 and 2017 geophysical survey data. The unit has gently sloping sides and the fill probably comprises sandy, silty clay deposits of possibly BGS Unit 7 origin, this is inferred from the acoustic character and BGS data. The fill of the feature is seismically chaotic and indiscernible in parts across the inshore area of the OfTI. The base of the feature is observed from the seabed to 11.2 m sub-seabed.
7145	Simple Cut and Fill	P2	This feature has been identified in the 2017 inshore geophysical survey dataset. This is an isolated cut and fill feature likely to be made up of BGS Unit 7, this is inferred from BGS data and the acoustic character of the feature. The feature has an indistinct chaotic fill with one sloping edge visible and a rounded base. The depth of this feature reaches a maximum of 10.8 m below the seabed.

Annex 3 Seabed Features of Archaeological Potential

ID	Classification	Easting	Northing	Archaeological Discrimination	Length (m)	Width (m)	Height (m)	Magnetic Amplitude (nT)	Description
7000	Dark reflector	518754	6447556	A2	1.9	0.9	0.9	-	A distinct rectangular shaped dark reflector with a long and bright shadow, this is a very distinct anomaly located in sand mega ripples. Possible anthropogenic anomaly.
7001	Dark reflector	518542	6445710	A2	2.9	1.1	0.8	-	An oval shaped dark reflector feature with a rounded shadow, this anomaly is situated on an area of soft sediment in amongst mega ripples. Possible anthropogenic anomaly.
7002	Dark reflector	519027	6445729	A2	3.3	0.9	0.8	-	A small and distinct dark reflector with a bright shadow, the feature is a 'z' shaped anomaly that is isolated on a sand wave rich area of seabed. Possible anthropogenic anomaly.
7003	Debris	519498	6445794	A2	3.8	1.1	0.6	10	A curvilinear shaped dark reflector with a shadow situated in area of soft sediment. This feature is possibly associated with a small magnetic anomaly indicating ferrous debris.
7004	Dark reflector	518565	6445306	A2	3.1	1.5	0.7	-	An oval shaped dark reflector anomaly with a straight edged shadow and possible associated scour. This feature is situated in an area of sand waves and is possibly of anthropogenic origin.
7005	Dark reflector	518627	6445241	A2	7.9	2.4	0.3	-	A medium sized, indistinct curvilinear dark reflector with shadow, this feature is situated in an area of sand waves. Possible anthropogenic anomaly.
7006	Dark reflector	518667	6444870	A2	3.4	1.0	0.4	-	A thin, linear dark reflector anomaly with a rounded shadow. This feature looks more anthropogenic than the surrounding rocks in the vicinity, this is situated within an area of sand waves.
7007	Dark reflector	519190	6444688	A2	2.2	1.2	0.5	-	An indistinct small oval shaped dark reflector feature with a shadow and situated in a slight scour. Possible anthropogenic anomaly.
7008	Debris	519411	6443502	A2	6.4	1.3	0.1	-	A medium sized and distinct linear feature with a shadow. This is possibly a manmade piece of debris.
7009	Debris	518690	6443349	A2	2.7	0.7	0.9	-	A small and thin curvilinear dark reflector feature with a rounded shadow. There is some scour associated with this feature and it is a possible item of debris.
7010	Debris field	519609	6439342	A2	41.4	32.7	0.2	-	A large area of sandy seabed containing three distinct, dark reflector anomalies that may be a debris features. One of the anomalies is larger and very distinct. This debris field is situated within seabed scars.
7011	Magnetic	519364	6438560	A2	-	-	-	19	Small dipole with no surface expression, possibly buried ferrous object.

ID	Classification	Easting	Northing	Archaeological Discrimination	Length (m)	Width (m)	Height (m)	Magnetic Amplitude (nT)	Description
7012	Debris	519410	6437396	A2	2.6	2.4	0.6	555	An irregularly shaped dark reflector anomaly with a distinct shadow. This feature is situated within and area of sand waves and its full extent may be buried. The feature has a very large magnetic anomaly associated with it indicating ferrous debris.
7013	Magnetic	518846	6436616	A2	-	-	-	14	Small asymmetric dipole, possibly buried ferrous object.
7014	Magnetic	519698	6431866	A2	-	-	-	7	Small dipole, possibly buried ferrous object.
7015	Dark reflector	519995	6430538	A2	8.5	5.0	0.3	-	A medium sized, indistinct and irregularly shaped dark reflector feature with a shadow, possible anthropogenic anomaly situated on a featureless seabed.
7016	Magnetic	519860	6430476	A2	-	-	-	9	Small dipole with no surface expression, possibly buried ferrous object.
7017	Magnetic	519766	6428392	A2	-	-	-	20	Small dipole with no surface expression, possibly buried ferrous object.
7018	Magnetic	519570	6426636	A2	-	-	-	5	Small dipole with no surface expression, possibly buried ferrous object.
7019	Magnetic	519630	6425382	A2	-	-	-	6	Small dipole with no surface expression, possibly buried ferrous object.
7020	Magnetic	519798	6423632	A2	-	-	-	8	Small dipole with no surface expression, possibly buried ferrous object.
7022	Debris field	519921	6422901	A2	30.3	10.4	2.6	-	A large spread of likely debris objects, the largest feature measures 8.7 x 3.2 m, this is a distinct and possibly broken up dark reflector with a large shadow. There are a few very indistinct, smaller dark reflectors surrounding this. The debris field appears to be situated in a depression and its full extent may be covered by sands.
7023	Magnetic	520300	6420050	A2	-	-	-	14	Small dipole with no surface expression, possibly buried ferrous object.
7024	Magnetic	519836	6419230	A2	-	-	-	9	Small negative monopole with no surface expression, possibly buried ferrous object.
7025	Magnetic	519676	6418600	A2	-	-	-	10	Small dipole with no surface expression, possibly buried ferrous object.
7026	Dark reflector	519799	6418004	A2	2.6	1.7	1.1	-	A small and oval shaped dark reflector feature with a rounded shadow. Possible anthropogenic anomaly.

ID	Classification	Easting	Northing	Archaeological Discrimination	Length (m)	Width (m)	Height (m)	Magnetic Amplitude (nT)	Description
7027	Dark reflector	520102	6416827	A2	4.7	2.0	2.0	-	A medium sized square shaped dark reflector anomaly with a bright and tapered shadow, possibly anthropogenic anomaly.
7028	Dark reflector	520256	6415996	A2	4.8	1.2	0.4	-	Two small oval shaped dark reflector anomalies with prominent shadows directly next to one another, likely the same object broken up. Possible anthropogenic anomaly.
7029	Debris	519813	6413811	A2	9.0	3.3	0.0	-	An indistinct dark reflector anomaly that appears to be partially buried, the feature looks anthropogenic and is situated within a depression in soft sediment. Possible item of debris.
7030	Magnetic	520730	6412918	A2	-	-	-	6	Small positive monopole with no surface expression, possibly buried ferrous object.
7031	Magnetic	520888	6408808	A2	-	-	-	5	Small dipole with no surface expression, possibly buried ferrous object.
7032	Debris	520385	6406832	A2	14.4	5.2	0.5	-	A large piece of debris comprising a long and thin curvilinear main body dark reflector with shadow and a parallel, more indistinct curvilinear dark reflector next to this. There is some scouring associated with this feature orientated to the northeast and measuring 11.8 m.
7033	Debris	520077	6406187	A2	4.2	1.2	1.1	-	A medium sized and rectangular distinct dark reflector feature with a long and bright shadow. This is a possible item of debris isolated on a sandy and even area of seabed.
7034	Magnetic	519162	6405584	A2	-	-	-	6	Small negative monopole with no surface expression, possibly buried ferrous object.
7035	Dark reflector	518314	6402955	A2	2.8	1.1	0.9	-	A small, distinct and slightly irregular shaped dark reflector with a bright shadow. A possibly anthropogenic anomaly on a sandy and even area of seabed.
7036	Debris	520913	6402531	A2	8.5	0.8	0.4	-	Very distinct debris feature, a linear dark reflector anomaly with a bright shadow and a hook on one end is visible. This debris feature is situated on a sandy and even area of the seabed.
7037	Dark reflector	520975	6402499	A2	6.4	1.6	0.4	-	An indistinct dark reflector that appears to be partially buried or in two pieces. This is visible as a thin and short linear anomaly with a small shadow and situated in a slight depression, possibly anthropogenic anomaly.
7038	Dark reflector	520022	6402411	A2	1.9	0.9	0.3	-	A very small, but distinct dark reflector with a small shadow, the feature has jagged edging. Isolated possibly anthropogenic anomaly situated on a sandy and even area of seabed.
7039	Dark reflector	520870	6402426	A2	2.5	1.3	0.3	-	A small and indistinct dark reflector with a small shadow. This is a possibly anthropogenic feature isolated on a sandy and even area of the seabed.

ID	Classification	Easting	Northing	Archaeological Discrimination	Length (m)	Width (m)	Height (m)	Magnetic Amplitude (nT)	Description
7040	Debris	520274	6402149	A2	2.9	1.1	1.0	9	A distinct and slightly curvilinear dark reflector with a bright shadow. The possible item of debris has some slight scouring coming off it orientated to the east and is situated in a slight depression. This feature is possibly associated with a small magnetic anomaly indicating ferrous debris.
7042	Dark reflector	521048	6401366	A2	3.4	1.7	0.9	-	A distinct and slightly curvilinear shaped dark reflector with a strong and bright shadow. This feature is situated in a slight depression with small amounts of scour visible orientated to the southeast. Possibly anthropogenic in origin.
7043	Dark reflector	521432	6401040	A2	2.5	1.1	0.5		A small and distinct dark reflector with a shadow that is situated within a depression. This feature is isolated and anomalous to the surrounding seabed, with slight scouring visible and orientated to the south, possibly of anthropogenic origin.
7044	Debris	520890	6400784	A2	6.6	2.7	1.1	-	A medium sized possible item of debris. The oval shaped dark reflector has a distinct outer edge and a more indistinct inner composition which may be covered by sands. The debris feature is situated on a gravelly area of seabed.
7045	Dark reflector	521373	6400807	A2	2.0	1.2	0.3	-	A rectangular shaped dark reflector anomaly with a shadow. The feature is situated in slight scour may be of anthropogenic origin.
7046	Magnetic	521196	6400654	A2	-	-	-	10	Small dipole with no surface expression, possibly buried ferrous object.
7047	Debris	521805	6400458	A2	28.6	7.2	0.0	8	An indistinct, long and thin curvilinear feature which is possibly partially buried rope or chain remains or a large item of debris. The feature has some shadow visible in parts and is situated within a slight depression on a sandy seabed. This feature has a small magnetic anomaly associated indicating some ferrous material.
7048	Debris	522172	6400203	A2	6.0	3.0	1.0	-	A medium sized oval shaped dark reflector which appears to be partially buried. There are possibly further tiny circular dark reflectors along one edge of the debris feature.
7049	Dark reflector	522976	6399444	A2	4.5	0.7	0.2	-	An indistinct linear dark reflector feature with a shadow, isolated on a sandy and even part of the seabed. Possibly of anthropogenic origin.
7050	Debris	524229	6397193	A2	3.6	0.8	1.5	-	A medium sized, distinct curvilinear dark reflector with a very large shadow and height off the seabed. The feature is situated within a depression, isolated on a flat and even area of seabed.
7051	Bright reflector	523366	6397067	A2	6.3	3.7	0.0	-	A medium sized rectangular bright reflector anomaly with single circular dark reflector off one edge. Possibly item of debris.
7052	Dark reflector	524874	6396985	A2	3.6	1.0	1.0	-	An oval shaped dark reflector anomaly with a bright shadow. Possible anthropogenic feature.
7053	Magnetic	524485	6396492	A2	-	-	-	6	Small negative monopole with no surface expression, possibly buried ferrous object.

ID	Classification	Easting	Northing	Archaeological Discrimination	Length (m)	Width (m)	Height (m)	Magnetic Amplitude (nT)	Description
7055	Debris	524476	6396422	A2	4.5	1.1	0.4	-	An oval shaped dark reflector anomaly with one distinct edge and one indistinct, the feature has a very bright shadow and is located on small sand waves. The feature looks anomalous to the surrounding seabed and is a possible item of debris.
7056	Dark reflector	524504	6396364	A2	3.3	0.3	0.1	-	A distinct slightly curvilinear shaped dark reflector with a long and bright rectangular shadow. This is situated on a flat and even area of the seabed and is possibly anthropogenic.
7057	Dark reflector	524511	6396327	A2	3.3	1.1	0.7	-	A distinct and slightly right angled dark reflector feature with a shadow situated on a sandy and even part of the seabed. The feature has a slight depression located to its south and is possibly anthropogenic.
7058	Debris	524573	6396262	A2	18.1	2.2	0.5	12	A large and indistinct, possibly partially buried item of debris, comprising a long and thin, curvilinear dark reflector with thicker anomalies attached to the ends, all with shadows. There is a second indistinct dark reflector anomaly behind the main body. This has a magnetic anomaly associated indicating ferrous debris.
7059	Dark reflector	524520	6396209	A2	5.4	2.2	2.0	-	Medium sized distinct dark reflector, comprising two parallel and thin curvilinear dark reflectors with indistinct, dark internal reflectors and a bright shadow The feature looks more anthropogenic than surrounding seabed features and is visible in the MBES data.
7060	Debris	524525	6396157	A2	9.0	0.8	0.6	-	A large thick linear dark reflector with one right angled end and a square shaped, bright shadow, possibly anthropogenic.
7061	Bright reflector	524567	6396038	A2	9.2	6.7	0.0	-	A large and irregularly shaped bright reflector anomaly, looks anthropogenic and anomalous to the surrounding seabed, possibly debris feature.
7062	Magnetic	524341	6395999	A2	-	-	-	8	Small anomaly with no surface expression, possibly buried ferrous object.
7063	Dark reflector	524886	6395985	A2	2.1	0.9	0.7	-	A distinct and irregularly shaped linear anomaly with a very bright shadow. The feature looks anomalous to the surround seabed and may be anthropogenic.
7064	Dark reflector	524521	6395962	A2	6.8	0.5	0.8	-	A distinct, long, thin and curvilinear shaped dark reflector with a very long and bright shadow, this is situated close to a similar possibly anthropogenic anomaly (7065).
7065	Dark reflector	524529	6395961	A2	5.8	0.5	0.6	-	A distinct and thin curvilinear dark reflector with a large and bright shadow, this is possibly anthropogenic and situated close to a similar anomaly (7064).
7066	Debris field	525676	6395759	A2	21.9	17.3	2.6	-	A possible debris field containing a large, circular dark reflector with a 'T' shaped dark reflector attached to this and several further small circular and linear dark reflectors scattered around. All of the features have height off the seabed, possibly debris remains.

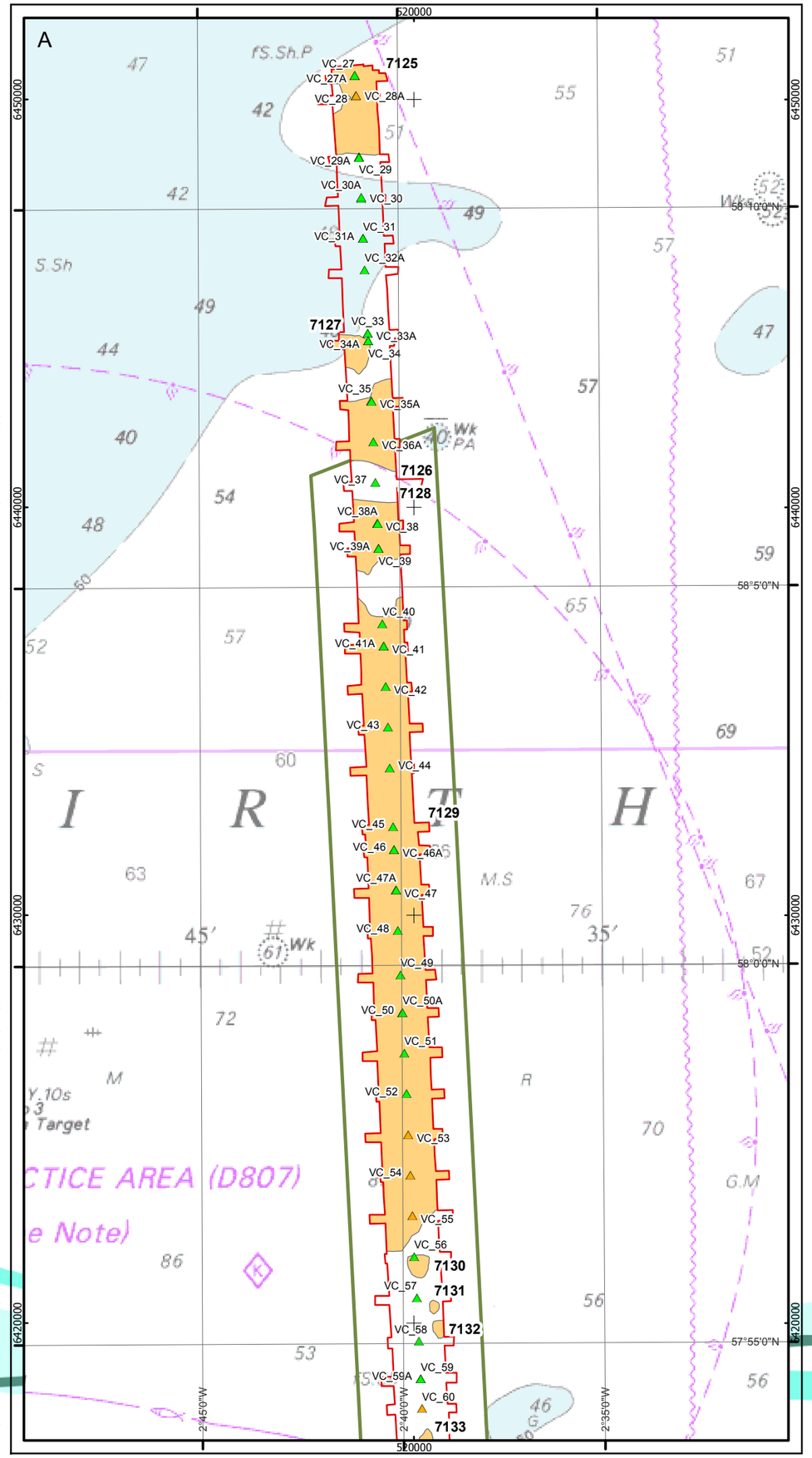
ID	Classification	Easting	Northing	Archaeological Discrimination	Length (m)	Width (m)	Height (m)	Magnetic Amplitude (nT)	Description
7067	Magnetic	524680	6395620	A2	-	-	-	306	Large negative monopole with no surface expression, possibly buried ferrous object.
7068	Magnetic	525342	6394978	A2	-	-	-	7	Small negative monopole with no surface expression, possibly buried ferrous object.
7069	Magnetic	524948	6394941	A2	-	-	-	15	Small dipole with no surface expression, possibly buried ferrous object.
7070	Magnetic	525187	6394843	A2	-	-	-	11	Small dipole with no surface expression, possibly buried ferrous object.
7071	Magnetic	525100	6394690	A2	-	-	-	6	Small dipole with no surface expression, possibly buried ferrous object.
7072	Magnetic	525198	6394627	A2	-	-	-	10	Small dipole with no surface expression, possibly buried ferrous object.
7073	Magnetic	525635	6394597	A2	-	-	-	58	Medium negative monopole with no surface expression, possibly buried ferrous object.
7074	Magnetic	525475	6394573	A2	-	-	-	13	Small anomaly with no surface expression, possibly buried ferrous object.
7075	Magnetic	525567	6394428	A2	-	-	-	350	Large dipole with no surface expression, possibly buried ferrous object.
7076	Magnetic	525601	6394377	A2	-	-	-	14	Small dipole with no surface expression, possibly buried ferrous object.
7077	Magnetic	526738	6394456	A2	-	-	-	6	Small asymmetric dipole with no surface expression, possibly buried ferrous object.
7078	Debris	526059	6394344	A2	2.2	0.2	0.1	-	Very distinct, thin linear dark reflector anomaly with a large and bright shadow. Located in an area of the seabed with frequent boulders but looks highly anthropogenic, possible item of debris.
7079	Magnetic	525636	6394321	A2	-	-	-	39	Medium dipole with no surface expression, possibly buried ferrous object.
7080	Magnetic	525660	6394289	A2	-	-	-	25	Small dipole with no surface expression, possibly buried ferrous object.

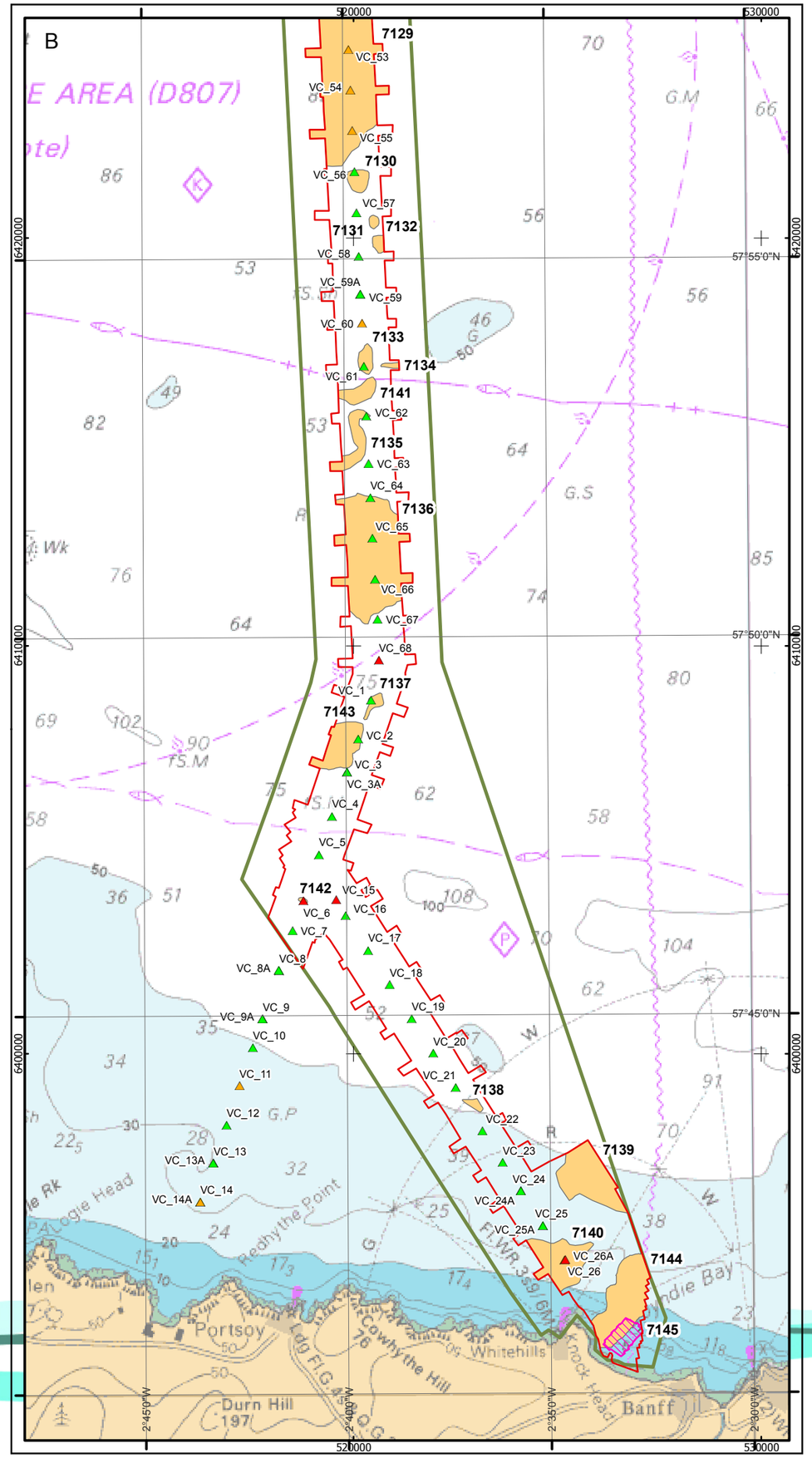
ID	Classification	Easting	Northing	Archaeological Discrimination	Length (m)	Width (m)	Height (m)	Magnetic Amplitude (nT)	Description
7081	Magnetic	525290	6394298	A2	-	-	-	12	Small asymmetric dipole with no surface expression, possibly buried ferrous object.
7082	Magnetic	525616	6394175	A2	-	-	-	20	Small asymmetric dipole with no surface expression, possibly buried ferrous object.
7083	Magnetic	526167	6394229	A2	-	-	-	11	Small anomaly with no surface expression, possibly buried ferrous object.
7084	Dark reflector	526540	6394275	A2	3.5	1.5	1.0	-	A semi-circular indistinct dark reflector with a bright shadow. Located on an area of the seabed with frequent geological outcroppings, however this looks more anthropogenic.
7085	Dark reflector	526829	6394349	A2	1.2	0.9	0.4	-	An irregularly shaped distinct dark reflector with a bright but short shadow, located on a sandy and even part of the seabed, possibly anthropogenic.
7086	Magnetic	525665	6393996	A2	-	-	-	19	Small dipole with no surface expression, possibly buried ferrous object.
7087	Magnetic	525677	6393889	A2	-	-	-	80	Medium positive monopole with no surface expression, possibly buried ferrous object.
7088	Magnetic	526582	6393956	A2	-	-	-	9	Small dipole with no surface expression, possibly buried ferrous object.
7089	Magnetic	526155	6393681	A2	-	-	-	91	Medium asymmetric dipole with no surface expression, possibly buried ferrous object.
7090	Debris field	526624	6393666	A2	15.0	3.0	0.5	-	A debris field comprising three aligned 'u' shaped dark reflectors with matching oval shadows and a larger possibly broken up linear anomaly with some smaller more diffuse dark reflectors surrounding them. Looks highly anthropogenic and is possibly modern debris.
7091	Magnetic	526072	6393631	A2	-	-	-	7	Small dipole with no surface expression, possibly buried ferrous object.
7092	Dark reflector	525883	6393550	A2	2.8	1.7	0.5	-	A distinct slightly 'v' shaped dark reflector with a bright shadow, the feature looks anomalous to the surrounding seabed and is possibly anthropogenic.
7093	Dark reflector	526761	6393484	A2	1.9	1.2	0.5	-	A distinctive slightly angular dark reflector with a short but bright shadow. Isolated anomaly on a flat, even and sandy part of the seabed.

ID	Classification	Easting	Northing	Archaeological Discrimination	Length (m)	Width (m)	Height (m)	Magnetic Amplitude (nT)	Description
7094	Debris	526354	6393382	A2	3.8	1.9	2.0	-	Very distinct 'v' shaped dark reflector with a very long and bright shadow located in a gravelly and boulder rich area of the seabed. This feature looks more anthropogenic than the surrounding geology and possibly has some associated scour. Possible item of debris.
7095	Magnetic	526208	6393346	A2	-	-	-	201	Large dipole with no surface expression, possibly buried ferrous object.
7099	Dark reflector	526473	6392552	A2	4.0	3.5	2.2	-	A curvilinear dark reflector feature with a large and very bright shadow. Looks more anthropogenic than surrounding seabed anomalies.
7100	Dark reflector	526676	6392824	A2	4.3	2.0	0.6	-	A slightly curvilinear shaped dark reflector with a very bright, long and tapered shadow. This anomaly is situated within a depression on the seabed and is possibly anthropogenic or could be a natural feature. This is visible in the MBES data as a very distinct, small and pointed mound feature within a small but deep depression (the depression measures 6.0 x 5.5 m).
7101	Dark reflector	526859	6392989	A2	2.8	1.7	1.0	-	This is a distinct and slightly right angled dark reflector object with a large, bright and tapered shadow. The anomaly is possibly anthropogenic, or could be a natural feature. It has significant height off the seabed and is situated within a slight depression. This feature is located close to a cable and may be related.
7102	Dark reflector	526853	6393003	A2	2.5	1.9	0.8	-	A small and triangular shaped dark reflector object with a long, bright shadow and significant height off the seabed. This is possibly anthropogenic or a natural feature, it is larger and more distinct than the surrounding seabed anomalies in this area. This feature is located close to a cable and may be related.
7103	Dark reflector	526796	6392981	A2	3.4	2.1	0.6	-	This is a medium sized and slightly angular shaped dark reflector with a bright shadow and substantial height off the seabed. This is possibly anthropogenic or a natural feature, the object is situated in a slight depression. In the MBES data this anomaly is visible as a small and pointed mound feature within a small depression.
7104	Dark reflector	526478	6392650	A2	2.3	0.7	0.4	-	This is a long and slightly tapered curvilinear dark reflector with a large but dull shadow. This feature looks more anthropogenic than the surrounding seabed features.
7105	Dark reflector	526913	6393190	A2	2.6	0.3	0.1	-	A long, thin and slightly curvilinear shaped dark reflector with a bright shadow, the object is isolated and distinct on a sandy area of seabed. This could be an anthropogenic object or a natural feature, it is located close to a cable and may be related.
7106	Dark reflector	526431	6393215	A2	4.0	2.9	1.0	-	A medium sized, oval shaped dark reflector with a bright and tapered shadow. This feature is very distinct on the seabed, it could be anthropogenic or a natural feature.

ID	Classification	Easting	Northing	Archaeological Discrimination	Length (m)	Width (m)	Height (m)	Magnetic Amplitude (nT)	Description
7107	Dark reflector	526851	6393165	A2	3.2	0.3	0.1	-	A small possible debris object visible as a thin and curvilinear shaped dark reflector with one looped end. The object has a slight shadow and is situated within a depression, isolated and distinct feature on a sandy area of seabed. This feature is close to a cable and may be related.
7108	Magnetic	526394	6393140	A2	-	-	-	29	Small asymmetric dipole with no surface expression, possibly buried ferrous object.
7109	Magnetic	526167	6392988	A2	-	-	-	8	Small dipole with no surface expression, possibly buried ferrous object.
7110	Magnetic	526339	6392836	A2	-	-	-	7	Small dipole with no surface expression, possibly buried ferrous object.
7111	Magnetic	526543	6392754	A2	-	-	-	6	Small dipole with no surface expression, possibly buried ferrous object.

1. Coordinates are in WGS 84 UTM 30N
2. Positional accuracy estimated ±10m





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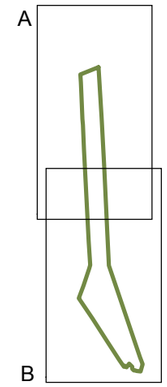


KEY

- OfTI Corridor
- OfTI 2018 Archaeology Study Area
- 2017 Geophysical Survey Area
- P2 Feature of possible archaeological interest

Vibrocore

- High priority
- Medium priority
- Low priority

Horizontal Scale: 1:125,000 A3 Chart

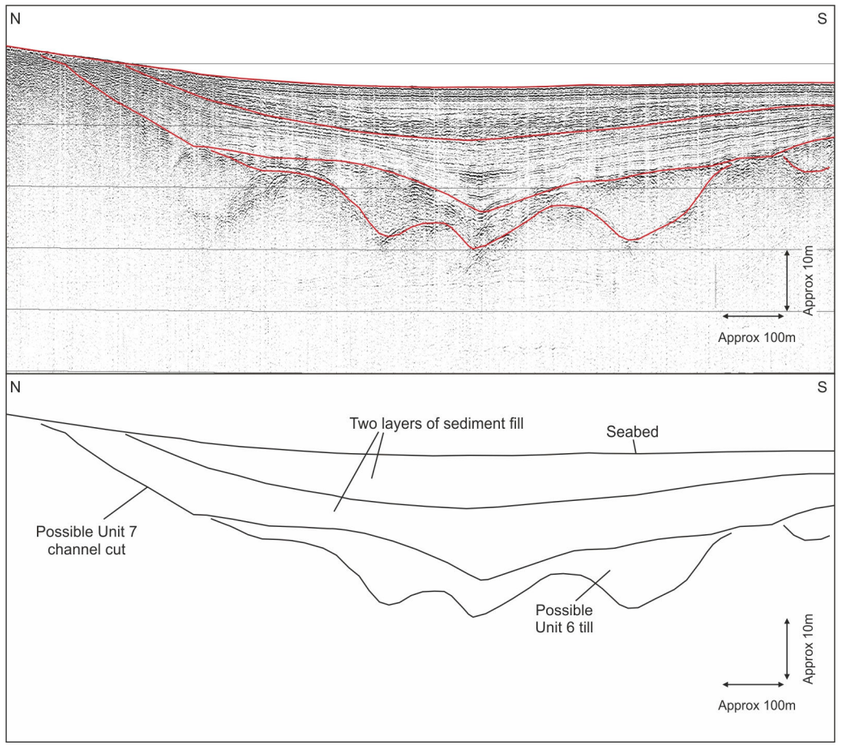
0 2,500 5,000 Meters

N

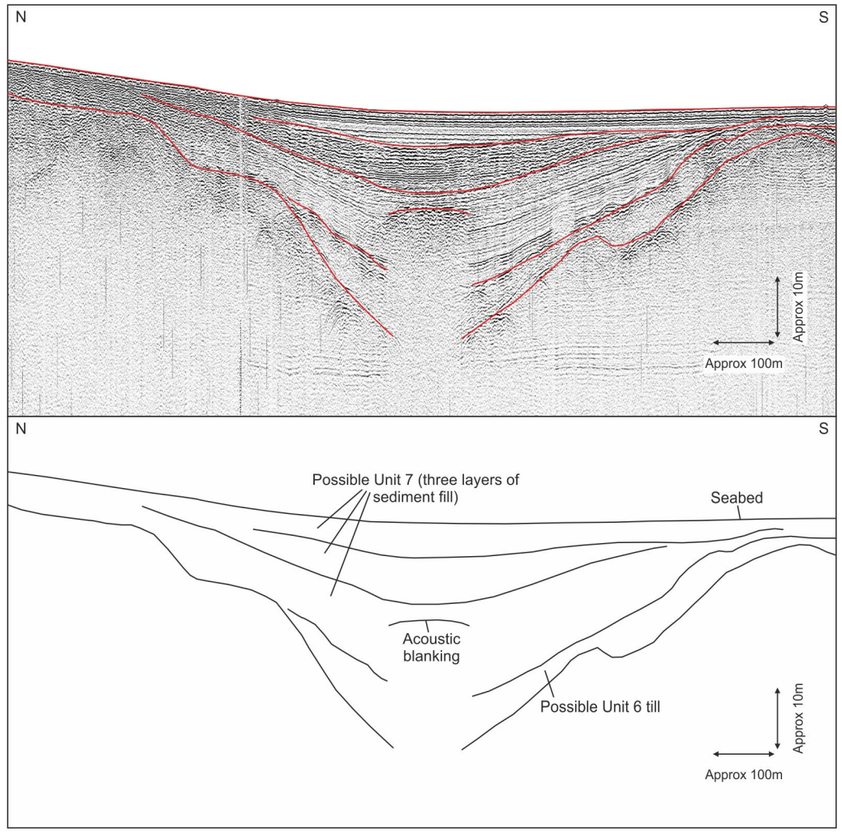
Geodetic Parameters:	WGS84 UTM Zone 30N
Redacted Reviewed: Approved:	
Date: 28/03/2018	Revision: DRAFT
REF: 8460001-XXXXXXX-XXX-MAP-XXX	

Figure 1:
Palaeolandscape features of archaeological potential

Moray Offshore Windfarm (East) Ltd

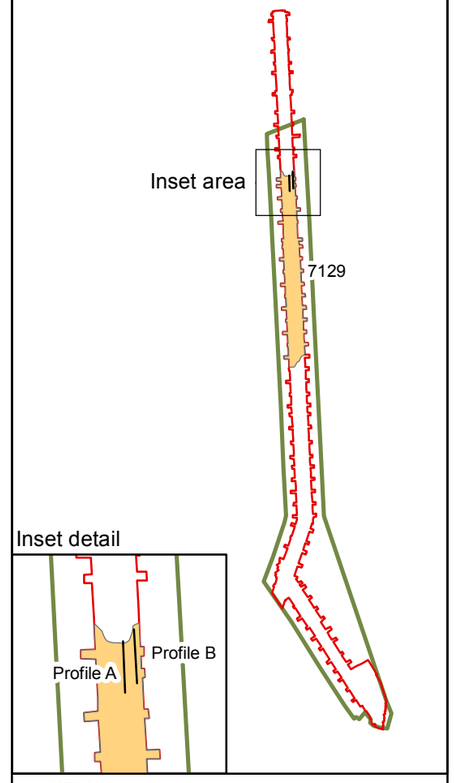


A. Sub bottom profiler data example demonstrating cut and fill feature **7129** in the offshore area



B. Sub bottom profiler data example demonstrating acoustic blanking in feature **7129** in the offshore area

MORAY EAST
OFFSHORE WINDFARM



KEY

- OfTI Corridor
- OfTI 2018 Archaeology Study Area
- P2 Feature of possible archaeological interest
- Profile location

Horizontal Scale: 1:500,000 A3 Chart

0 10,000 20,000 Meters

N

Geodetic Parameters: WGS84 UTM Zone 30N

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Reviewed:
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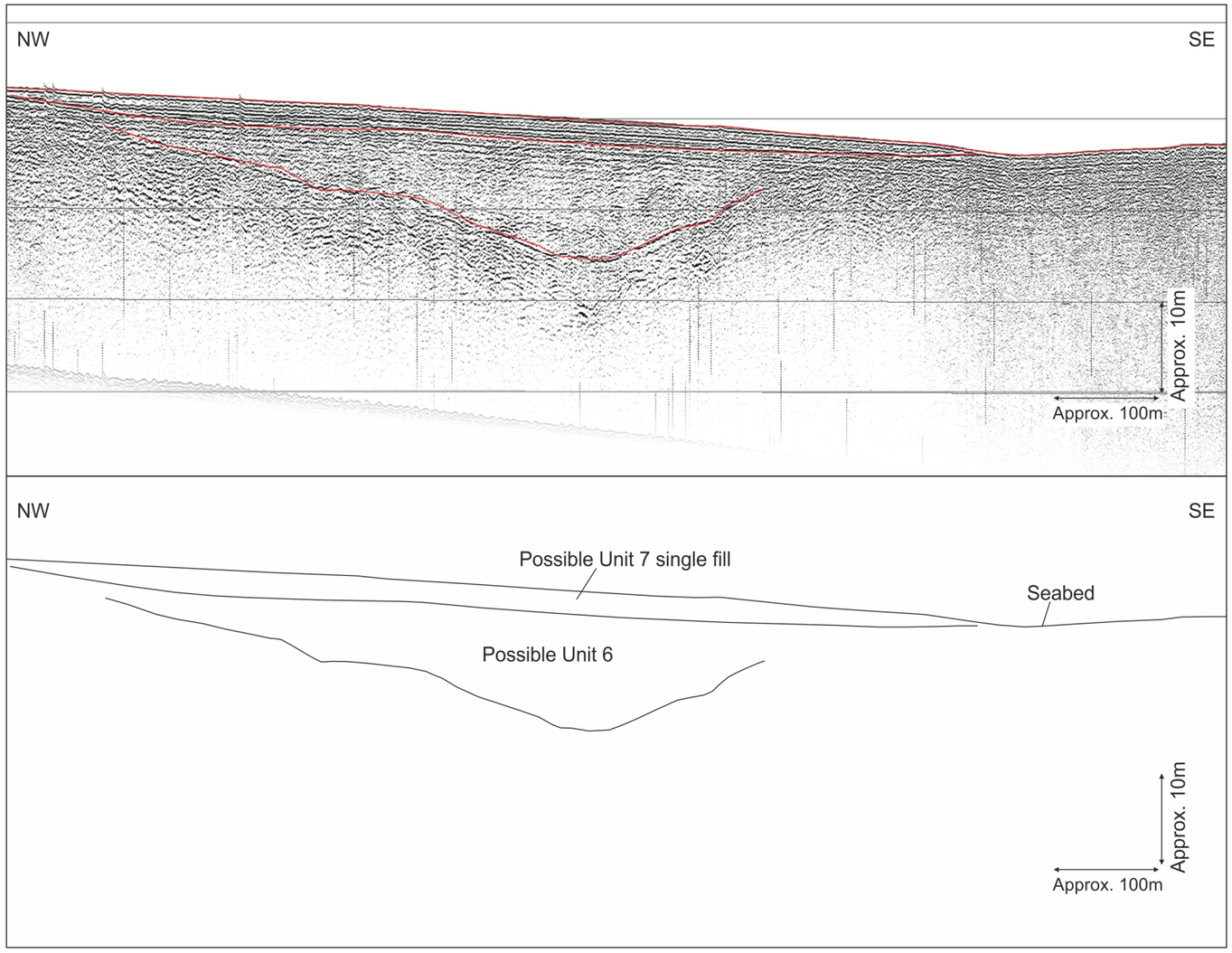
Date: 28/03/2018 | Revision: DRAFT

REF: 8460001-XXXXXXX-XXX-MAP-XXX

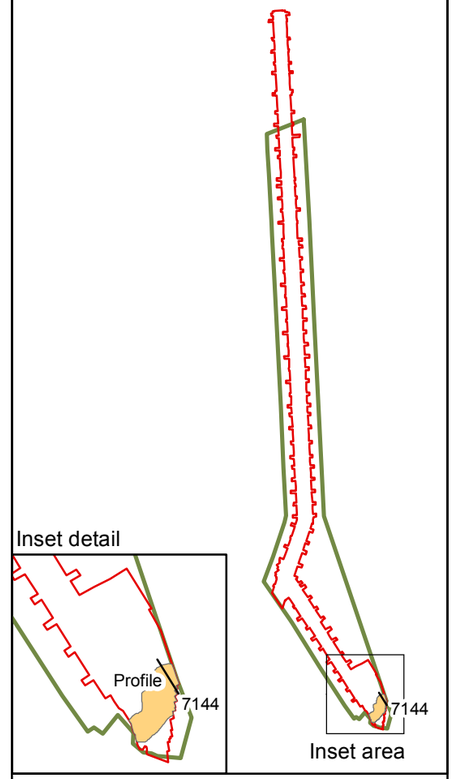
Figure 2: Sub-bottom profiler data examples

Moray Offshore Windfarm (East) Ltd



Sub bottom profiler data example demonstrating cut and fill feature **7144** in the inshore area

MORAY EAST
OFFSHORE WINDFARM



KEY

- OfTI Corridor
- OfTI 2018 Archaeology Study Area
- P2 Feature of possible archaeological interest
- Profile location

Horizontal Scale: 1:500,000 A3 Chart

0 10,000 20,000 Meters

N

Geodetic Parameters: WGS84 UTM Zone 30N

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Reviewed:
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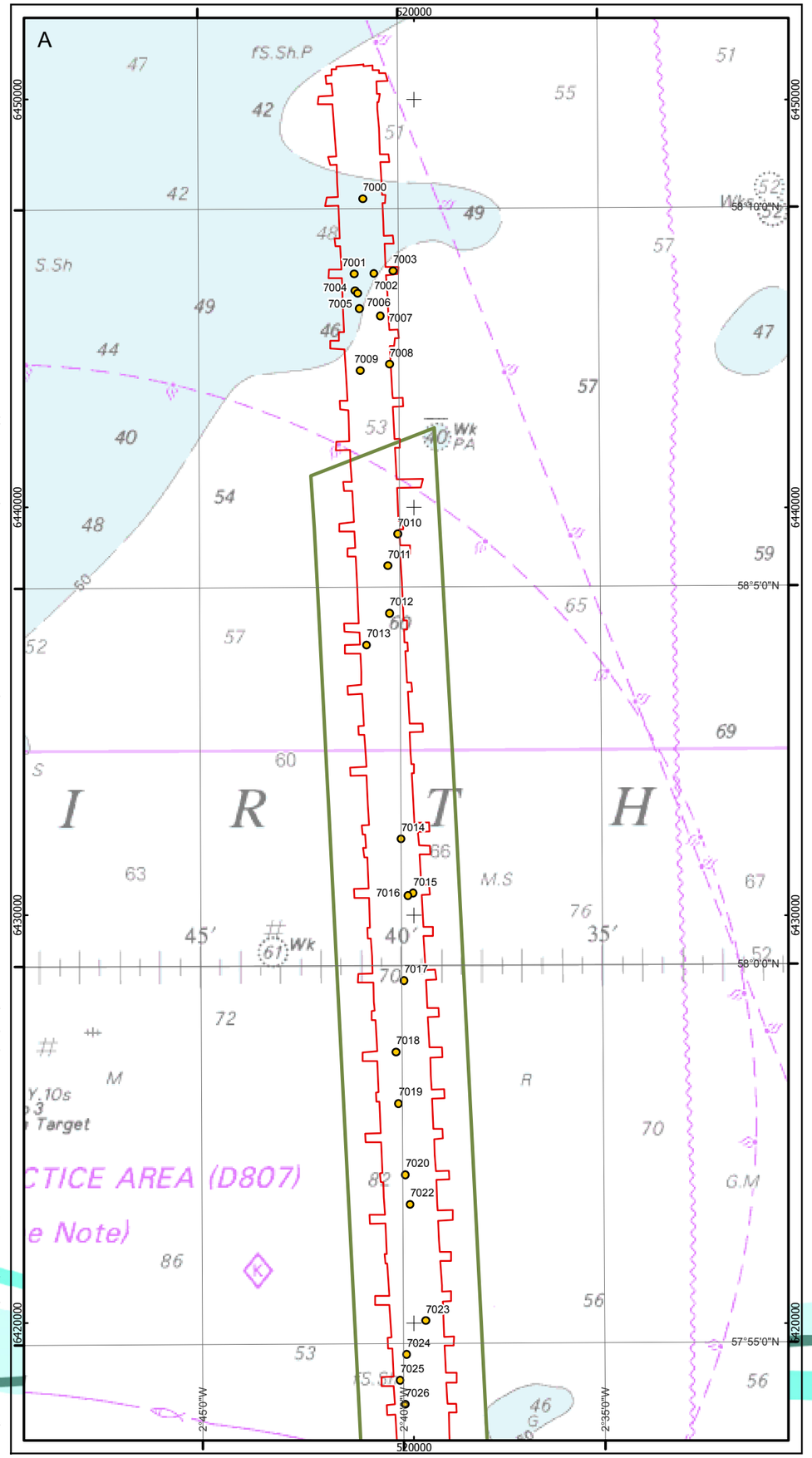
Date: 28/03/2018 | Revision: DRAFT

REF: 8460001-XXXXXXX-XXX-MAP-XXX

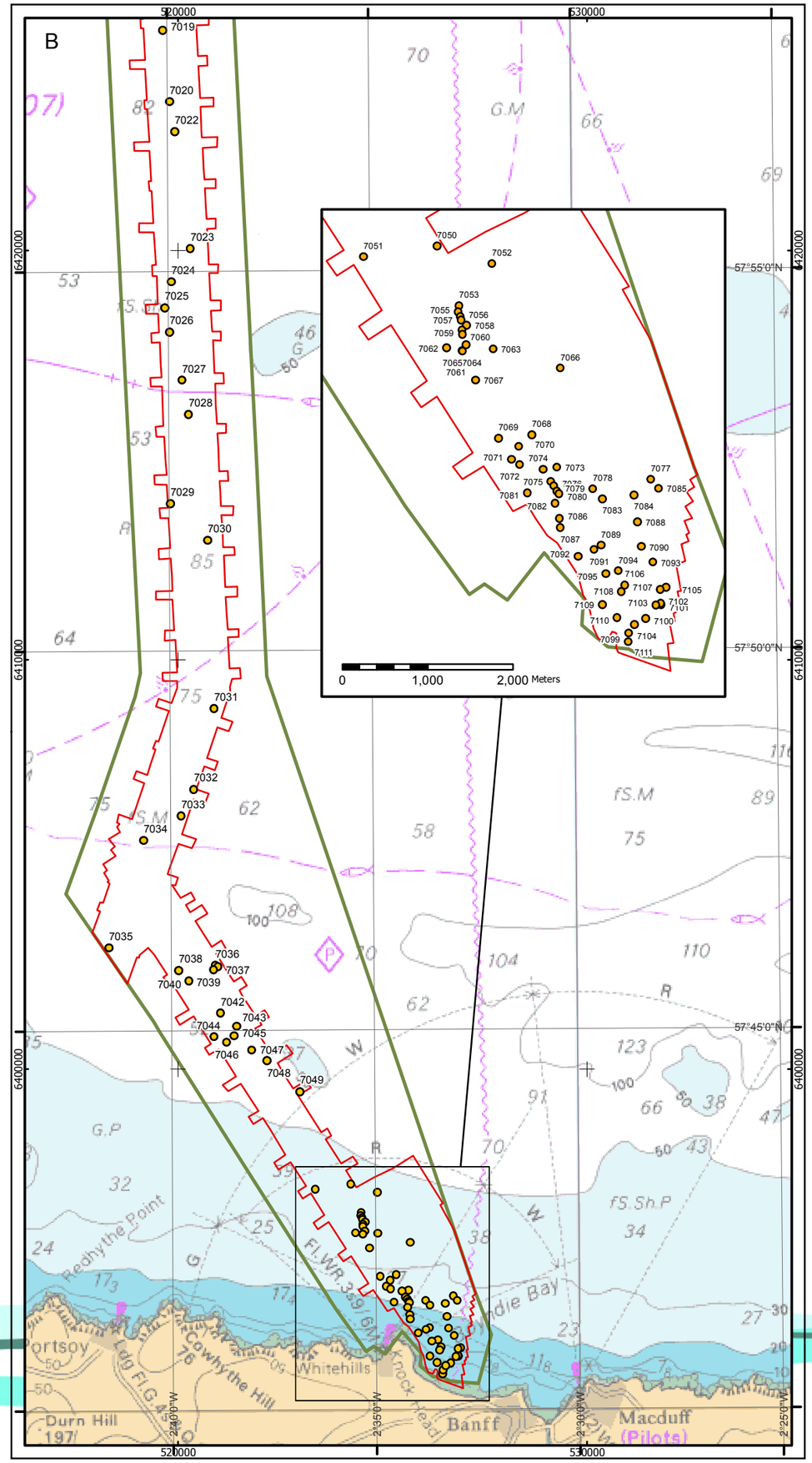
Figure 3:
Sub-bottom profiler data examples

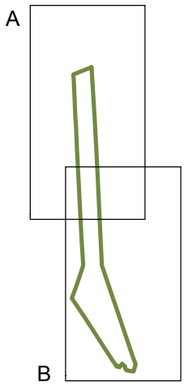
Moray Offshore Windfarm (East) Ltd

A



B





KEY

- OfTI Corridor
- OfTI 2018 Archaeology Study Area

WA Anomalies

- A2 - Uncertain origin of possible archaeological interest

Horizontal Scale: 1:125,000 A3 Chart

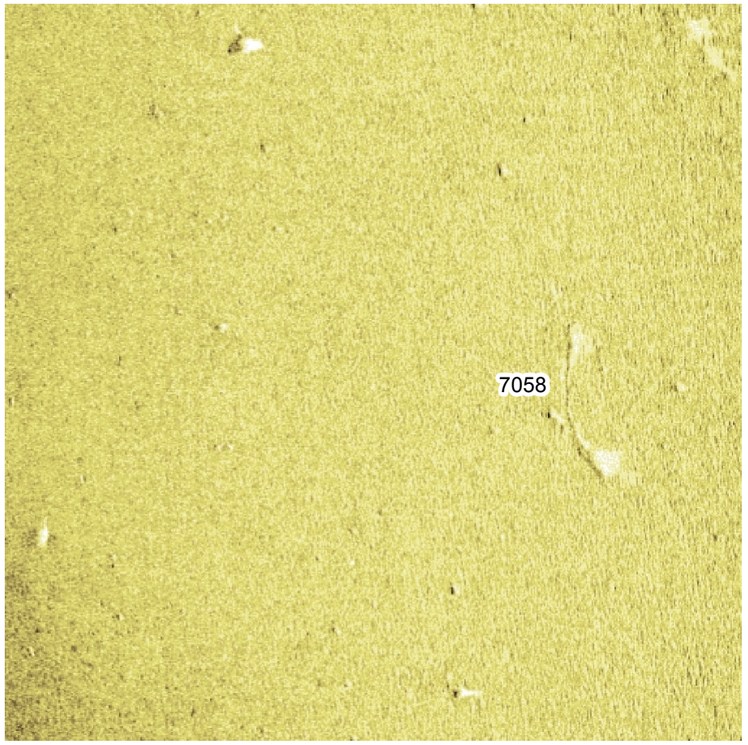
0 2,500 5,000 Meters

N

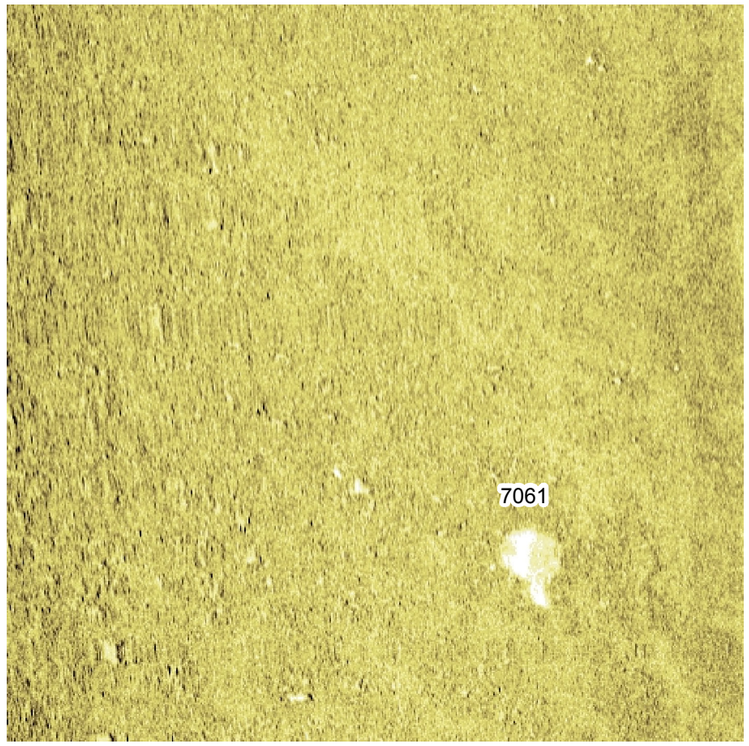
Geodetic Parameters:	WGS84 UTM Zone 30N
Redacted Reviewed: Approved:	
Date: 28/03/2018	Revision: DRAFT
REF: 8460001-XXXXXXX-XXX-MAP-XXX	

Figure 4: Geophysical anomalies of archaeological potential

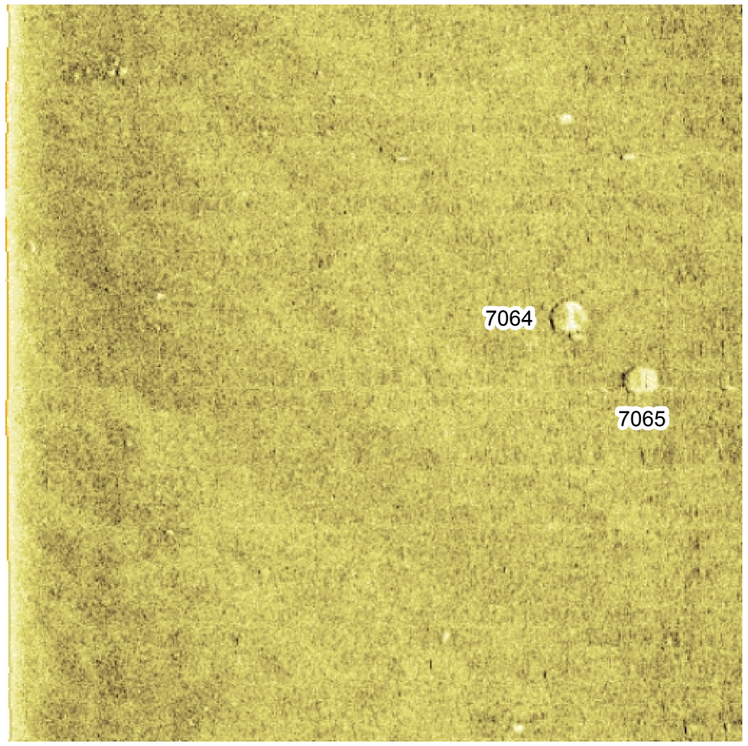
Moray Offshore Windfarm (East) Ltd



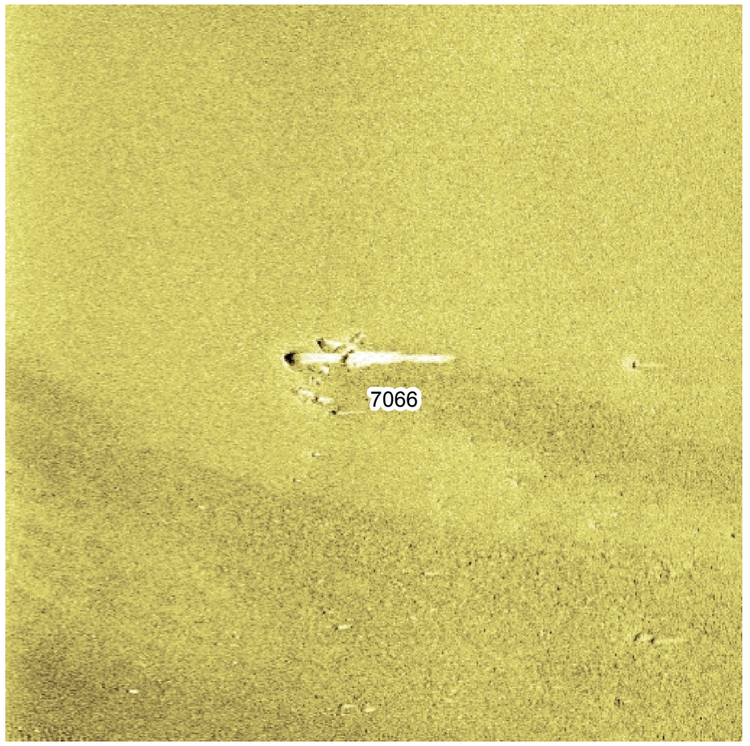
A. Sidescan sonar image of debris **7058** 18.1 x 2.2 x 0.5 m



B. Sidescan sonar image of bright reflector **7061** 9.2 x 6.7 m



C. Sidescan sonar image of dark reflectors **7065** and **7064** 5.8 x 0.5 x 0.6 m and 6.8 x 0.5 x 0.8 m



D. Sidescan sonar image of debris field **7066** 21.9 x 17.3 x 2.6 m

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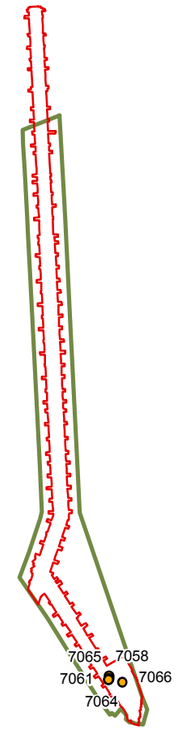

KEY

OfTI Corridor

OfTI 2018 Archaeology Study Area

WA Anomalies

A2 - Uncertain origin of possible archaeological interest

Horizontal Scale: 1:500,000 A3 Chart

0 10,000 20,000 Meters

N

Geodetic Parameters: WGS84 UTM Zone 30N

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Date: 28/03/2018 | Revision: DRAFT

REF: 8460001-XXXXXXX-XXX-MAP-XXX

Figure 5: Sidescan sonar data examples

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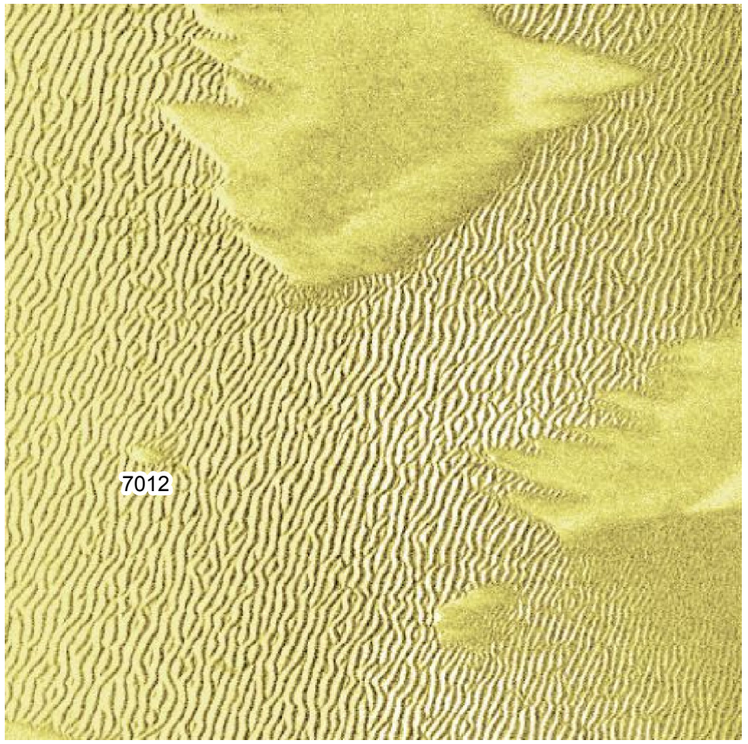
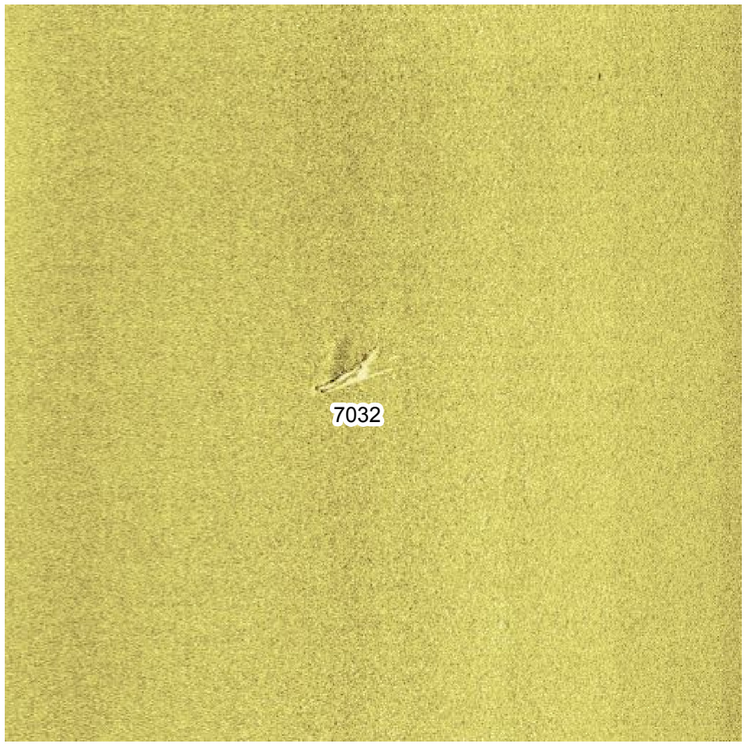
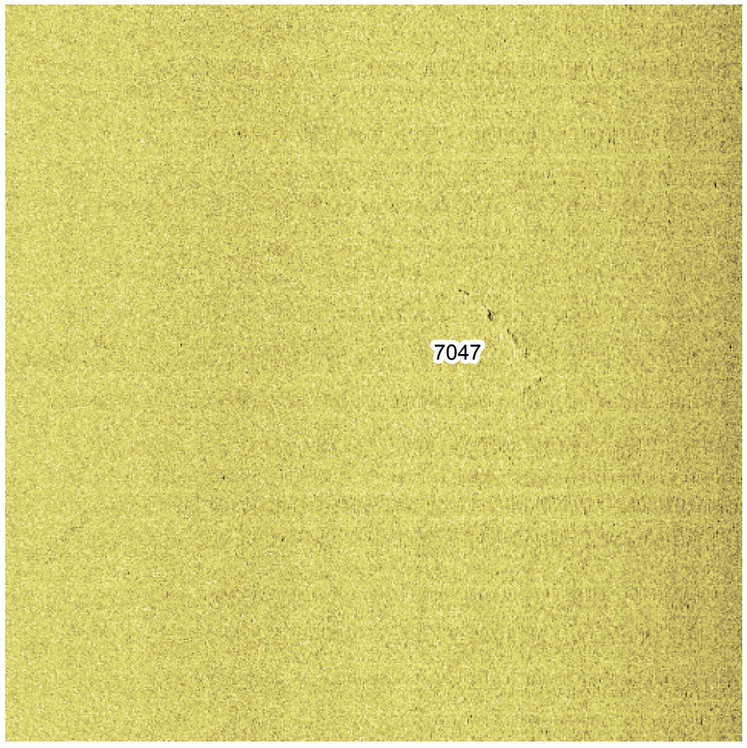


A. Sidescan sonar image of ferrous debris **7012**, 2.6 x 2.4 x 0.6 m

B. Magnetic profile of debris **7012**, 555 nT



C. Sidescan sonar image of debris **7032**, 14.4 x 5.2 x 0.5 m



D. Sidescan sonar image of ferrous debris **7047**, 28.6 x 7.2 m

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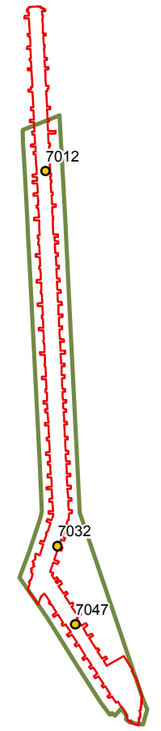

KEY

OfTI Corridor

OfTI 2018 Archaeology Study Area

WA Anomalies

A2 - Uncertain origin of possible archaeological interest

Horizontal Scale: 1:500,000 A3 Chart

N

0 10,000 20,000 Meters

Geodetic Parameters: WGS84 UTM Zone 30N

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Figure 6: Sidescan sonar debris data examples

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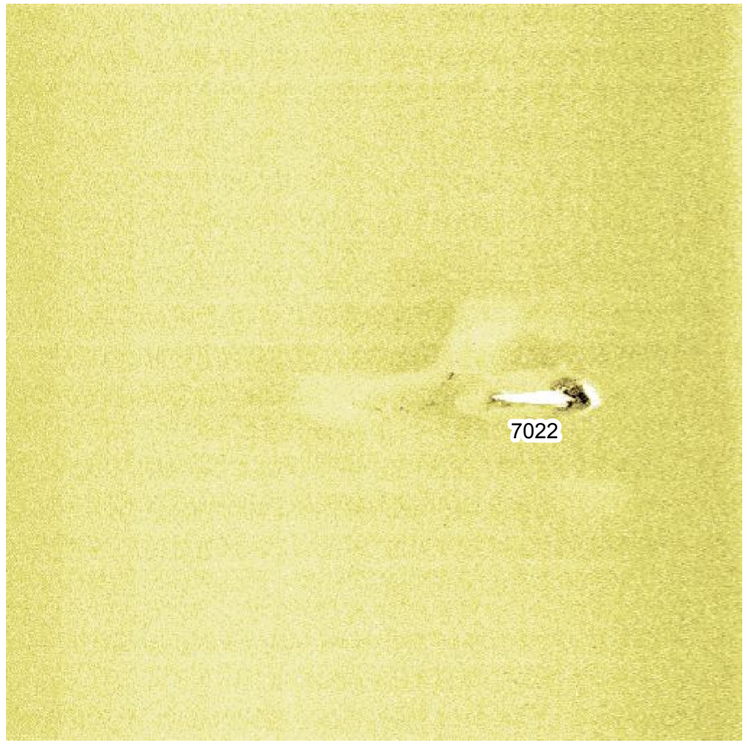
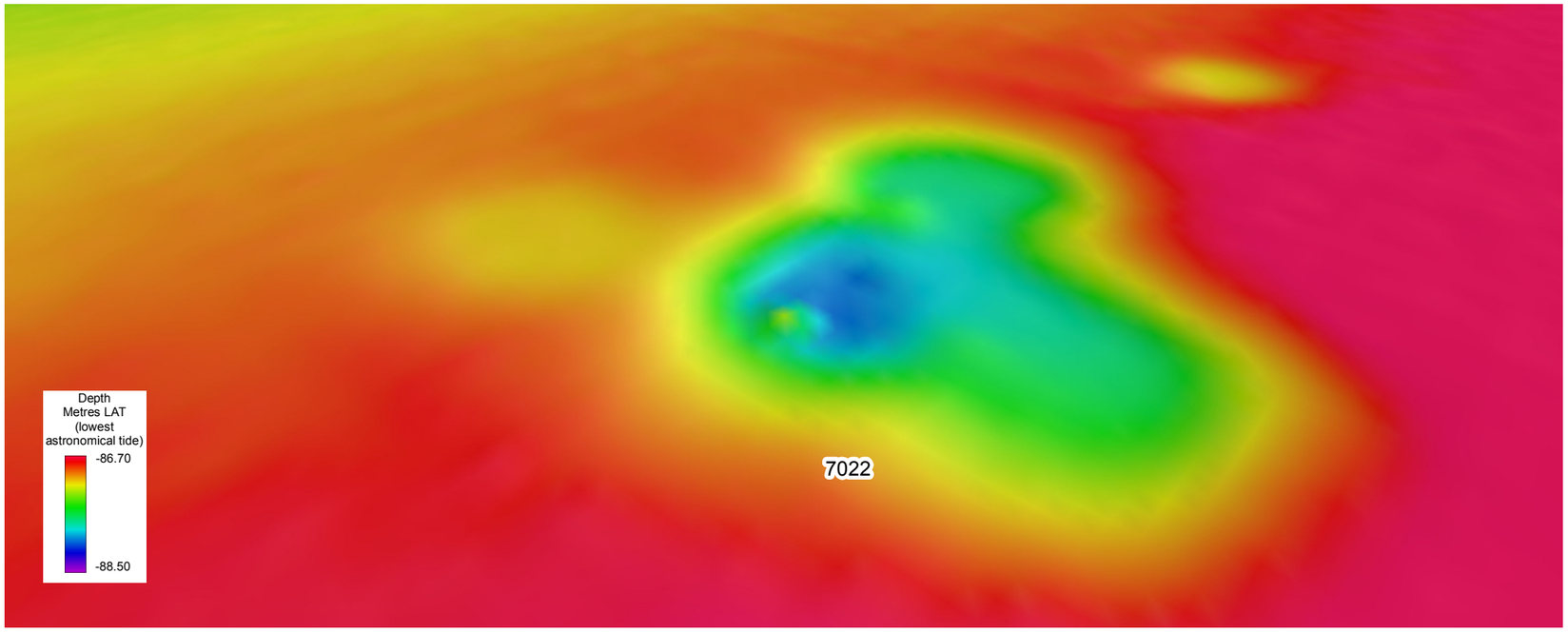


A. Sidescan sonar image of debris field **7022**, 30.3 x 10.4 x 2.6 m

B. Sidescan sonar image of possible fishing gear **7090**, 15.0 x 3.0 x 0.5 m



C. Multibeam bathymetry image of debris **7022**, looking southwest

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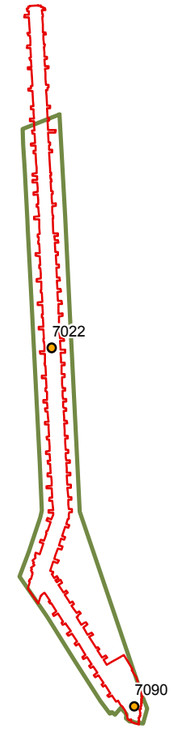

KEY

OfTI Corridor

OfTI 2018 Archaeology Study Area

WA Anomalies

A2 - Uncertain origin of possible archaeological interest

Horizontal Scale: 1:500,000 A3 Chart

0 10,000 20,000 Meters

N

Geodetic Parameters: WGS84 UTM Zone 30N

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Date: 28/03/2018 | Revision: DRAFT

REF: 8460001-XXXXXXX-XXX-MAP-XXX

Figure 7: Sidescan sonar debris field data examples

Moray Offshore Windfarm (East) Ltd

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Contact

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Tel: +44 (0)131 556 7602