


## Document Information

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# Awel y Môr Offshore Wind Farm

## Method Statement for Geoarchaeological Assessment of Geotechnical Site Investigations

### 1 INTRODUCTION

#### 1.1 Project background

1.1.1 Wessex Archaeology has been commissioned by GoBe Consultants Ltd on behalf of RWE Renewables UK (RWE), to produce a Method Statement for Geoarchaeological Assessment of Geotechnical Site Investigations in advance of survey works at the Awel y Môr Offshore Wind Farm (hereafter AyM) at Llandudno Conwy, North Wales. The works comprise the Array area and associated offshore export cable corridor (ECC). The Site is located between Anglesey and Liverpool Bay in the offshore Welsh Platform area of the Irish Sea (**Fig. 1**).

#### 1.2 Previous archaeological work

1.2.1 A series of archaeological works were previously undertaken within AyM. These archaeological works are presented in **Table 1** and summarised below.

**Table 1** Previous archaeological works in support of Project

Report type	Title	Report No	Reference
DBA	Awel y Môr Offshore Wind Farm Marine archaeological technical report	231900.01	Wessex Archaeology 2021a
Geological survey report	Awel y Môr Offshore Wind Farm Project, WPM1 Main Array Area – Seafloor and Shallow Geological Results	003616043.04	Fugro 2021a
Geological survey report	Awel y Môr Offshore Wind Farm Project, WPM2 & WPM3 – ECR East A and B – Seafloor and Shallow Geological Results Report	003700854.02	Fugro 2021b
Geological survey report	Awel y Môr Offshore Wind Farm Project, WPM4 – Export Cable Routes (Onshore) – Benthic Intertidal Results Report	0003700858.03	Fugro 2021c
WSI	Awel y Môr Offshore Wind Farm: Offshore Written Scheme of Investigation	231900.02	Wessex Archaeology 2022
Stage 1 and 2 Geoarchaeological Assessment	Awel y Môr Offshore Wind Farm: Stage 1 and 2 Geoarchaeological Assessment of Geotechnical Data	231907.01	Wessex Archaeology 2024

#### *Archaeological desk-based assessment (DBA) (Wessex Archaeology 2021a)*

1.2.2 The archaeological DBA was undertaken during the planning phase for Awel y Môr Offshore Wind Farm and was commissioned to determine the archaeological resource for the offshore and nearshore component of the scheme. The DBA determined that there was a potential for prehistoric archaeological material, alongside wreck material from the Neolithic to modern period, with shipwrecks and aircraft wrecks noted.

1.2.3 A sub-bottom profiler (SBP) data assessment also identified a possible sub-aerial cross-cutting deltaic landscape to the north-west of the Array zone that was tentatively identified as having formed during the early-mid Holocene, and being of high geoarchaeological

interest, with the possibility of both palaeoenvironmental evidence being preserved alongside evidence of Mesolithic Hunter-gatherer archaeology.

- 1.2.4 Three channel features that probably formed sometime between the Late Devensian to the mid-Holocene were identified as cutting through the ECC from north-east to south-west. These palaeochannels are of archaeological and geoarchaeological interest, with potential for archaeological finds to be associated with these channels (**Fig. 2**) and palaeoenvironmental material to be preserved within them.

*Geological surveys (Fugro 2021a; 2021b; 2021c)*

- 1.2.5 Previous geotechnical works undertaken by Fugro in 2021 identified preserved peat sediments in the nearshore area of the ECC route associated with the AyM OWF. This highlights the potential for additional organic or equivalent peat deposits to be preserved in situ within the nearshore area, or possibly further along the ECC route and in the Array area.

*Written Scheme of Investigation (WSI) (Wessex Archaeology 2022)*

- 1.2.6 In 2022, the locations of five boreholes were evaluated by Wessex Archaeology in order to determine the archaeological potential of the sedimentary archive based on published literature, BGS maps and submerged features identified through interpreted SBP data across the Array area (Wessex Archaeology 2021a). Based on this initial assessment, the locations of the boreholes were not deemed to be situated in archaeologically sensitive areas. No additional geoarchaeological works followed this preliminary evaluation.

*Geoarchaeological Stage 1 and 2 Assessment (Wessex Archaeology 2024)*

- 1.2.7 A programme of Stage 1 and Stage 2 geoarchaeological assessment and deposit modelling was undertaken for AyM in 2024, which included a review of 53 geotechnical boreholes logs (Fig. 2) and recording of samples from AYM-D04 and AYM-F06, identified as containing deposits of medium to high geoarchaeological potential. Superficial deposits across the Site were dominated by glacial till of the Cardigan Bay Formation and overlain in places by proglacial (glaciofluvial, glaciolacustrine and glaciomarine) sediments of the Western Irish Sea Formation. The SL1 and SL2 Members of the Surface Sands Formation were also identified overlying glaciogenic deposits, with the SL2 Member being correlated with a possible sub-aerial landscape in the Late Devensian to early Holocene (MIS 2-1), prior to the complete marine transgression of the Irish Sea Basin at c. 6 Kya.
- 1.2.8 A series of deposits associated with channel cut and fill features were identified in SBP data in the north-west of the Array (Wessex Archaeology 2021a). It was suggested that these deposits were emplaced in a sub-aerial environment in which a deltaic to braided river channel regime formed in the Late Devensian to mid Holocene. Deposits associated with these features were not positively identified during the Stage 1 or Stage 2 assessment; however, it may be that the drilling method employed (open-hole coring) in parts of the Array may have prevented identification of these channels, particularly in the north-west and north. It was further suggested that the SL2 Member may be related to the channel fills either by being deposited in the same features, or by reworking of associated material.
- 1.2.9 The presence of the SL2 Member in six boreholes (AYM-B02, AYM-D04, AYM-D07, AYM-F01, AYM-F06 and AYM-OSS) suggested that the distribution of the SL2 Member may be more widespread than was identified during the Stage 1 review, particularly in areas where open hole drilling was performed to depths deeper than 5 metres below sea floor. Because no undisturbed samples were extant, a Stage 3 palaeoenvironmental assessment was recommended for selected bag samples obtained from the SL2 Member.



### 1.3 Scope of document

- 1.3.1 This document is designed to be read in conjunction with the submitted offshore archaeological Written Scheme of Investigation (WSI) prepared by Wessex Archaeology (2022).
- 1.3.2 This geoarchaeological method statement has been prepared in line with the previously submitted WSI (Wessex Archaeology 2022), which was developed in consultation with the respective Archaeological Curators. The WSI followed on from a marine archaeological Desk-Based Assessment technical report (Wessex Archaeology 2021a) which was included as an appendix in the Preliminary Environmental Information Report (ES) (RWE 2021a), Volume 2: Chapter 11: Offshore Archaeology and Cultural Heritage (Application ref: 6.3.8).
- 1.3.3 The methodology presented in this method statement is applicable to the geotechnical surveys being carried out across AyM (**Fig. 1**). This includes proposed vibrocores from the Array area and ECC.
- 1.3.4 This geoarchaeological method statement conforms with current best practice and guidance for offshore development, as outlined in the WSI (Wessex Archaeology 2022). The current principal sources are:
- *Caring for Coastal Heritage* (Cadw 1999)
  - Joint Nautical Archaeology Policy Committee *Code for Practice for Seabed Development* (JNAPC 2006).
  - *Offshore Geotechnical Investigations and Historic Environment Analysis: Environment Guidance for the Offshore Renewable Energy Sector* (COWRIE 2011)
  - *Conservation Principles of the Sustainable Management of the Historic Environment in Wales* (Cadw 2011);
  - *Management of Research Projects in the Historic Environment* (MoRPHE; Historic England 2015a);
  - *Geoarchaeology: Using Earth Sciences to Understand the Archaeological Record* (Historic England 2015b);
  - *Preserving Archaeological Remains: Decision-taking for Sites under Development* (Historic England 2016);
  - *Conservation Principles for the Sustainable Management of the Historic Environment. Consultation Draft 10 November 2017* (Historic England 2017);
  - *Statements of Heritage Significance: Analysing Significance in Heritage Assets: Historic England Advice Note 12* (Historic England 2019);
  - *Deposit Modelling and Archaeology. Guidance for Mapping Buried Deposits* (Historic England, 2020);
  - *Managing the Marine Historic Environment of Wales* (Cadw 2020);
  - Chartered Institute of Field Archaeologists (ClfA) *Universal guidance for archaeological field evaluation* (ClfA 2023); and



- *Environmental Archaeology: A Guide to the Theory and Practice of Methods, from Sampling and Recovery to Post-excavation* (3rd edition) (Historic England 2025).

1.3.5 To help frame geoarchaeological investigations of this nature, Wessex Archaeology has developed a 5-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**).

1.3.6 This geoarchaeological method statement relates to Stage 1 and Stage 2 of this process.

**Table 2** Staged approach to marine geoarchaeological investigations

Stage	Description
<b>Stage 1:</b> Geoarchaeological 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.  Identify deposits or samples for Stage 2 works, and scale of any works proposed.
<b>Stage 2:</b> Geoarchaeological recording/monitoring	Archaeological recording of selected retained 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.  Identify if suitable deposits are present for Stage 3 works and the scale of any such works proposed.
<b>Stage 3:</b> 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.  Any recommendations for Stage 4 works will depend on the potential for further analysis and the project research objectives.
<b>Stage 4:</b> Palaeoenvironmental analysis	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.  Publication would usually follow from a Stage 4 report.
<b>Stage 5:</b> Publication	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.  The scope and location of the final publication will be agreed in consultation with the client and regulatory bodies where appropriate.

1.3.7 The principal aim of the combined Stage 1 and Stage 2 geoarchaeological assessment is to determine the geoarchaeological potential of deposits impacted by the geotechnical survey.



1.3.8 This will be achieved by addressing the following objectives:

- review geotechnical vibrocore logs to identify deposits of potential archaeological interest, assigning high, medium and low priority status (Stage 1);
- based on the Stage 1, request geotechnical vibrocore samples suitable for Stage 2 geoarchaeological recording;
- undertake a Stage 2 geoarchaeological recording of requested geotechnical vibrocore samples and archaeological dedicated vibrocores; and,
- make recommendations for Stage 3 palaeoenvironmental assessment, where necessary.

## 1.4 Scope of works

1.4.1 A programme of marine geotechnical investigation (GI) works consisting of a geotechnical survey campaign is planned across the Array and ECC for AyM. This technical survey is primarily being undertaken for engineering purposes with archaeology being considered alongside in line with principles of the marine WSI. The preliminary purpose of the survey is to confirm that no new obstructions have appeared on the seabed since the original marine surveys were undertaken in 2021, and to inform detailed route engineering in relation to seabed conditions, bathymetry and other seabed features.

1.4.2 As part of these proposed GI works, ~110 locations will be acquired across AyM. This will comprise ~80 vibrocores from the Array and ~30 vibrocores from the ECC. These logs will impact down to a maximum penetration depth of ~6 m below seabed (mBSB) in the Array and ~5 mBSB in the ECC.

1.4.3 Recent archaeological investigations (see **Section 1.2.7**) have demonstrated the potential for submerged landscapes of high archaeological potential to be preserved within the Array (see Fig. 2 and Table 3). As deposits possibly representing former terrestrial landscapes were not thoroughly investigated following the Stage 1 and 2 geoarchaeological assessment (Wessex Archaeology 2024) it was recommended, following discussions with the Client, that selected locations would be re-targeted for archaeological purposes during the upcoming geotechnical survey to mitigate against any impacts on deposits of geoarchaeological interest (i.e., SL2 Member identified in AYM-B02, AYM-D04, AYM-D07, AYM-F01, AYM-F06 and AYM-OSS) (Fig. 3). These vibrocores will be recovered and sealed in core liners of up to 1m in length, optimal for determining changes in depositional environment and sub-sampling for Stage 3 palaeoenvironmental assessment. The six locations recommended for targeted archaeological vibrocores is shown in Figure 3.

1.4.4 No geotechnical vibrocores were reviewed from within the ECC but interpreted SBP datasets (Wessex Archaeology 2021a) demonstrated the presence of palaeolandscape features, including channels, simple cut and fill features and an area of high amplitude reflector possibly representing preserved organics of high archaeological potential (Table 3). To further understand the depositional history of these features, a series of dedicated archaeological vibrocores are also recommended, specifically targeting channel features, and within the area containing high amplitude reflectors.

1.4.5 A Stage 1 geoarchaeological review of geotechnical survey vibrocores will also be undertaken to identify and understand the extent of deposits of archaeological interest across the Array and ECC. Any deposits of possible archaeological interest will be



highlighted to the Client and geotechnical contractor and recommended for Stage 2 geoarchaeological recording.

- 1.4.6 Such Quaternary geological deposits across this area remain poorly understood but have potential to contain in situ or reworked archaeology, as well as environmental remains reflective of past human activity, landscapes and environments. Assessment of the archaeological resource associated with Quaternary and Early Holocene deposits is 'deposit-led', and requires multidisciplinary 'geoarchaeological' approach combining archaeological, geological, geophysical and palaeoenvironmental investigative techniques.
- 1.4.7 The geotechnical works are therefore likely to impact upon Quaternary and Early Holocene deposits, predominantly sub-glacial, but with potential for post-glacial sediments such as those laid down in a range of environments including formerly sub-aerially exposed landscapes.
- 1.4.8 The proposed programme of works comprises:
- A desk-based geoarchaeological review of the geotechnical vibrocore logs, with the aim of establishing the likely presence of horizons of archaeological interest and broadly characterising them (Stage 1); and,
  - Stage 2 geoarchaeological recording comprising:
    - Selected core samples identified during the Stage 1 review as containing deposits of archaeological interest
    - Dedicated archaeological vibrocores targeting deposits formerly assigned high geoarchaeological potential within the Array (Wessex Archaeology 2024) and palaeolandscape features within the ECC (**Table 3**).

**Table 3** Palaeogeographic features of archaeological potential within AyM

ID Number	Classification	Depth Range (mBSB)		Archaeological Rating	Interpreted age	Section
		From	To			
71000	Channel complex	0.4	5.7	P2	Late Devensian/ Early Holocene	Array area
71001	Channel complex	0.5	1.4	P2	Late Devensian/ Early Holocene	Array area
71002	Channel complex	0.4	2.5	P2	Late Devensian/ Early Holocene	Array area
71003	Channel complex	0.4	3.2	P2	Late Devensian/ Early Holocene	Array area
71004	Channel complex	0.5	2.5	P2	Late Devensian/ Early Holocene	Array area
71005	Channel complex	0.4	2.9	P2	Late Devensian/ Early Holocene	Array area
71006	Fine grained deposit	0.6	3.7	P2	Late Devensian/ Early Holocene	Array area
71007	Fine grained deposit	0.5	4.7	P2	Late Devensian/ Early Holocene	Array area
71008	Fine grained deposit	0.5	1.5	P2	Late Devensian/ Early Holocene	Array area
71009	Fine grained deposit	0.6	2.0	P2	Late Devensian/ Early Holocene	Array area



ID Number	Classification	Depth Range (mBSB)		Archaeological Rating	Interpreted age	Section
		From	To			
71010	Fine grained deposit	0.5	3.6	P2	Late Devensian/ Early Holocene	Array area
71011	Fine grained deposit	0.5	1.7	P2	Late Devensian/ Early Holocene	Array area
71012	Fine grained deposit	0.9	2.0	P2	Late Devensian/ Early Holocene	Array area
71013	Simple cut and fill	0.5	4.2	P2	Early Holocene	Array area
71014	Complex cut and fill	0.5	4.2	P2	Early Holocene	Array area
71015	Complex cut and fill	0.9	3.5	P2	Early Holocene	Array area
71016	Simple cut and fill	0.5	2.8	P2	Early Holocene	Array area
71017	Simple cut and fill	0.5	2.9	P2	Early Holocene	Array area
71018	Simple cut and fill	0.6	2.5	P2	Early Holocene	Array area
71019	Simple cut and fill	0.5	2.8	P2	Early Holocene	Array area
71020	Simple cut and fill	1.1	3.0	P2	Early Holocene	Array area
71021	Complex cut and fill	0.6	3.9	P2	Early Holocene	Array area
71022	Simple cut and fill	0.6	2.7	P2	Early Holocene	Array area
71023	Simple cut and fill	0.5	2.6	P2	Early Holocene	Array area
71024	Complex cut and fill	2.0	5.5	P2	Early Holocene	Array area
71025	Complex cut and fill	0.6	3.9	P2	Early Holocene	Array area
71026	Simple cut and fill	1.4	2.6	P2	Early Holocene	Array area
71027	Simple cut and fill	1.2	6.7	P2	Early Holocene	Array area
71028	Simple cut and fill	1.1	3.2	P2	Early Holocene	Array area
71029	Simple cut and fill	1.9	5.0	P2	Early Holocene	Array area
71029	Simple cut and fill	1.9	5.0	P2	Early Holocene	ECC
71030	Simple cut and fill	0.3	2.4	P2	Early Holocene	ECC
71031	Channel	0.4	3.9	P1	Early Holocene	ECC
71032	Simple cut and fill	0.3	2.7	P2	Early Holocene	ECC
71033	Channel	0.2	11.0	P1	Early Holocene	ECC
71034	High amplitude reflector	1.0	4.0	P1	Early Holocene	ECC
71035	Simple cut and fill	0.5	10.1	P1	Early Holocene	ECC
71036	Simple cut and fill	0.5	4.2	P1	Early Holocene	ECC
71037	Simple cut and fill	0.6	3.4	P2	Early Holocene	ECC
71038	Simple cut and fill	0.7	1.7	P2	Early Holocene	ECC
71039	Simple cut and fill	0.8	5.8	P2	Early Holocene	ECC
71040	Channel	0.4	7.6	P1	Early Holocene	ECC
71041	Simple cut and fill	1.0	2.0	P2	Early Holocene	ECC
71042	Simple cut and fill	0.5	1.9	P2	Early Holocene	ECC
71043	Simple cut and fill	0.6	1.8	P2	Early Holocene	ECC
71044	Simple cut and fill	0.4	1.9	P2	Early Holocene	ECC



## 2 BASELINE SUMMARY

### 2.1 Introduction

2.1.1 This section provides a geoarchaeological and archaeological background for AyM, based upon the DBA (Wessex Archaeology 2021a) and Stage 1 and 2 geoarchaeological assessment (Wessex Archaeology 2024).

### 2.2 Chronology

2.2.1 Geoarchaeological investigations are typically undertaken with reference to geological periods (e.g., Quaternary), epochs (e.g., Pleistocene) and sub-epochs (e.g., Devensian) that reflect major climate sea-level and/or environmental changes. Here we adopt British nomenclature correlated to the Marine Isotope Stage (MIS) record to distinguish between different climatic periods, with dates given in Kya BP (thousands of years before present).

2.2.2 Marine Isotope Stages are deduced from marine palaeoclimatic records and reflect alternating warm (interglacial and interstadial) and cold (glacial and stadial) periods throughout the Quaternary (**Table 4**).

2.2.3 Where age estimates are available these are expressed in millions of years (Mya), thousands of years (Kya) and within the Holocene epoch as either years Before Present (BP), Before Christ (BC) and Anno Domini (AD). These are linked to the global MIS chronological framework.

**Table 4** British Quaternary chronostratigraphy

Geological Period	Chronostratigraphy		Age (Kya)	MIS	
Holocene	Holocene interglacial		11.7 – present	1	
Late Pleistocene	Devensian Glaciation	Loch Lomond Stadial	11.7 – 12.9	2 – 5d	
		Windermere Interstadial	12.9 – 15		
		Dimlington Stadial	15 – 26		
		Upton Warren Interstadial	40 – 43		
		Early Devensian	60 – 110		
	Ipswichian interglacial		115 – 130	5e	
Middle Pleistocene		Unnamed cold stage	130 – 374	6	
		Aveley interglacial		7	
		Unnamed cold stage		8	
		Purfleet interglacial		9	
		Unnamed cold stage		10	
		Hoxnian interglacial		374 – 424	11
		Anglian glaciation		424 – 478	12
	Cromerian Complex	478 – 780	13 – 19		

### 2.3 Palaeolandscape context

2.3.1 The Pleistocene geological history of the Irish Sea basin is dominated by repeated glacial/interglacial cycles, resulting in rising and falling sea levels and the deposition of terrestrial, marine, and glacial sediments. Across the study area there is evidence of at least three phases of glaciation, which occurred during the Anglian (478,000–424,000 years BP; MIS 12), Late Middle Pleistocene (362,000–126,000 years BP; MIS 10-6) and Devensian (110,000–13,000 years BP; MIS 2) when ice extended into the Irish Sea.

2.3.2 Despite recurrent ice advancements into the Irish Sea throughout the Quaternary, superficial deposits associated with most recent geological processes during the Devensian are best preserved in this study area as unconformably overlying bedrock (Mellett *et al.* 2015). Geomorphological evidence and radiocarbon dating of sediments indicate that the

study area was covered by ice during the Late Devensian (c. 30–22 Kya), during which period reworked sediments predominantly comprising glacial diamict, were deposited (Clark *et al.* 2004). Proglacial deposits associated with meltwater channels are also mapped across the area with heterogeneous infill consisting of clays, sands and gravels (Mellett *et al.* 2015).

- 2.3.3 As ice retreated north following the Last Glacial Maximum (LGM; c. 27 Kya), a proglacial environment developed at the Site. This has been illustrated through interpreted sub-bottom profiler (SBP) data which demonstrate the presence of either glaciomarine or glaciolacustrine deposits associated with the Western Irish Sea Formation (Wessex Archaeology 2021a; **Table 5**). Although glaciomarine sediments are considered to have low archaeological priority given deposition occurred in a fully marine environment, glaciolacustrine deposits have the potential to preserve inorganic microfossils (i.e. diatoms and ostracods) suitable for palaeoenvironmental assessment.
- 2.3.4 Based on interpreted SBP data acquired from the Site, a complex system of cross-cutting channel features was identified to the north and northwest of the Array area (Wessex Archaeology 2021a). Acoustically structured deposits interpreted as possible fine-grained sediments were further identified as both cutting into or overlying these complex channel features. Collectively, these features reinforce suggestions that this landscape was subaerially exposed both following the LGM and prior to Holocene marine transgression (Flemming 2005).
- 2.3.5 Although interpreted as either a delta top or braid plain deposits, the age and thus associated archaeological potential of these sediments is undetermined (Wessex Archaeology 2021a). However, it is possible that these features correlate with either a localised Holocene deltaic system or Late Glacial fluvial channels reactivated during the Holocene. These features were collectively identified through detailed bathymetric data assessed during the West Coast Palaeolandscape Survey (WCPS; *Fitch et al.* 2011).
- 2.3.6 A series of channel features oriented northeast to southwest were also identified cutting across the ECC to the west of the Rhyll Flats Offshore Wind Farm (Wessex Archaeology 2021a). The largest of these channels is relatively steep sided which suggests it may have been originally created by glacial processes, and contains multiple phases of fill. The uppermost layers of the lower fill is represented by high amplitude reflects, possibly indicative of an organic deposit. The presence of organic, or possible peat deposits, throughout the wider Array and this section of the ECC is unknown. Peat deposits have previously been recovered from the intertidal area (Fugro 2021c) and demonstrate the potential of equivalent deposits to be preserved across the connecting ECC and Array area.
- 2.3.7 A deposit of overlying seabed sediment is present throughout the ECC, ranging from a thin veneer close to the coastline to a relatively thick area of mega-ripples and sand waves towards the Array area. As a post-transgression sedimentary deposit, the seabed sand is not considered of archaeological potential in itself; however, it has the potential to bury archaeological sites (e.g. shipwrecks) in areas where the sediment is sufficiently thick and mobile and contain reworked material from older underlying geological units.



**Table 5** Interpreted shallow stratigraphy within AyM

Unit	Unit name	Geophysical Characteristics <sup>(1)</sup>	Interpreted Sediment Type <sup>(2)</sup>	Archaeological Potential
6	Holocene Seabed Sediments – Posttransgression (Holocene, MIS 1)	Observed as either a veneer or deposit of mobile sediment a few metres thick. Contains cross bedded reflectors in areas sand waves.	Sand and gravelly sand with shell fragments.	Considered of low potential in itself, but possibly contains reworked artefacts and can cover wreck sites and other cultural heritage.
5	Holocene Sediments – Pre-transgression (Early Holocene, MIS 2 – 1)	Generally identified as channel features with either chaotic or layered fills Also includes internal high amplitude reflectors.	Possible fluvial/terrestrial sediments, including potential layers of organic clay.	Potential to contain <i>in situ</i> and derived archaeological material, and palaeoenvironmental material.
4	Channel Complex Deposits (Late Devensian/Early Holocene, MIS 2 – 1)	Extensive layer of cross-cutting channel features. Well defined basal reflectors with acoustically transparent fills.	Potential delta-top or braid-plain, comprising sandy channels and possible associated fine grained deposits.	Potential depends on the age of the deposit – may be too glacial proximal for human habitation, but if later may contain both <i>in situ</i> and derived artefacts.
3	Western Irish Sea Formation – Prograded facies (Late Devensian, MIS 2 – 1)	Variable geophysical characteristics, ranging from chaotic to internal dipping reflectors. Generally a strong basal reflector.	Potential delta front deposit comprising muddy sands.	Likely a glacial proximal deposit, and so low potential for <i>in situ</i> archaeological material, but may contain derived material depending on age.
2	Western Irish Sea Formation – Chaotic facies (Late Devensian, MIS 2 – 1)	Homogenous, acoustically transparent unit.	Potentially glaciomarine /glaciolacustrine sands and gravels.	Likely a glacial proximal deposit, and so low potential for archaeological material.
1	Cardigan Bay Formation – Upper Till (Devensian, MIS 5d – 2)	Thick unit identified across most of the study area. Irregular upper reflector, basal reflector not identified. Generally characterised as acoustically chaotic.	Stiff to hard glacial till.	Unlikely to contain archaeological material.
<p><sup>(1)</sup> Based on geophysical data (Wessex Archaeology 2021a)</p> <p><sup>(2)</sup> Based on geophysical characteristics, Jackson <i>et al.</i> (1995), and Mellett <i>et al.</i> (2015)</p>				



## 2.4 Geoarchaeological context

- 2.4.1 The southern Irish Sea is known to contain relatively well preserved palaeolandscape features such as fluvial channels that formed during periods of lower sea level when the Irish Sea was free of ice and sea levels were significantly lower (Fitch *et al.* 2011).
- 2.4.2 The presence of Palaeolithic cave sites along the North Wales coast indicate that occupation of the Irish Sea during times of low relative sea level may have been possible. In particular, early Neanderthal remains discovered in Pontnewydd Cave near St Asaph, Denbighshire, dating from c. 225 Kya before present (BP), indicate hominin presence in the area during the Early Middle Palaeolithic (Lynch *et al.* 2000, Flemming 2005).
- 2.4.3 Archaeologically, it is known that Wales was occupied at least during the earlier Weichselian, with Neanderthal finds dating from 50 Kya BP identified from Coygan Cave near Tenby, and modern human remains dating from 26 Kya BP discovered in Paviland Cave on the Gower Peninsular, both in South Wales (Lynch *et al.* 2000, Flemming 2005).
- 2.4.4 The Mesolithic record of the British Isles suggests a strong relationship between human activity and coasts, wetlands, rivers and streams, and evidence of human occupation of the river Mersey, which drains into the eastern Irish Sea, has previously been discovered (Cowell and Innes, 1994). Sites of national significance include Rhuddlan on the north Wales coastline where an early Mesolithic assemblage was recovered adjacent to the River Clyde (Bell 2007). During the early Mesolithic, the site at Rhuddlan was positioned approximately 10km from the coastline and highlights the potential significance of any surviving deposits associated with submerged palaeochannels or shoreline features to contain both *in situ* and derived artefacts deposited at a time when this area formed a suitable landscape for occupation.
- 2.4.5 Further, it has been suggested that submerged caves formerly occupied during periods of exposure may be present across the wider landscape. This is supported by evidence for Mesolithic occupation in Southern Cumbria, where caves forming in carboniferous hardground were identified as containing archaeological finds (Salisbury 1997; Young 2002).
- 2.4.6 In addition to these submerged coastal landscapes, the Mesolithic archaeological record potentially contains examples of coastal or sea going craft made from dugout logs or hide covered wooden frames.
- 2.4.7 By the end of the Mesolithic, the Irish Sea would have been completely submerged, with coastlines approximately close to their present-day positions, and archaeological evidence from the Neolithic onwards will be of an increasingly maritime nature. However, evidence for the continued use of the intertidal zone surrounding the Irish Sea has been found in the form of preserved human footprints on the foreshore at Formby Point, Merseyside, dating from the Neolithic/Bronze Age (Roberts *et al.* 1996). Further offshore, any artefacts from this period not related to maritime activity are likely to be derived and re-deposited after introduction to the area by fluvial processes or coastal erosion.



### **3 GEOARCHAEOLOGICAL METHODOLOGY**

#### **3.1 Geotechnical coring strategy**

3.1.1 The aim of the geotechnical survey is to determine the composition of superficial sediments within the Array and ECC of AyM. The geotechnical survey will comprise the recovery of vibrocores and cone penetration test (CPT) samples from the seabed.

##### *Cone penetration tests and vibrocoreing*

3.1.2 As part of these proposed GI works, ~110 vibrocores (~80 vibrocores from the Array and ~30 vibrocores from the ECC) are proposed for this scope of work. These vibrocores will impact down to a maximum penetration depth of ~6 mBSB in the Array and ~5 mBSB in the ECC.

3.1.3 The vibrocore and CPT locations within the Array will be taken within 15-20 m of the previous borehole locations as outlined in **Figure 2**. The planned survey locations within the ECC are currently unspecified.

3.1.4 Dedicated archaeological vibrocores will be left undisturbed and delivered to Wessex Archaeology's laboratory on completion of the survey campaign.

3.1.5 The geotechnical contractor will ensure that geotechnical vibrocore samples are logged, photographed, capped and sealed, and stored for further onshore laboratory description and testing.

3.1.6 Sediment logs will be produced by the geotechnical contractor and supplied to Wessex Archaeology, together with photographs of the cores, for a Stage 1 geoarchaeological review. An open dialogue will be maintained between the Client, geotechnical contractor and Wessex Archaeology to prevent samples of archaeological potential from being discarded.

3.1.7 For samples acquired above bedrock, one half of each longitudinally split core should be retained, unsampled, until a Stage 1 geoarchaeological review has been completed by Wessex Archaeology.

3.1.8 Sub-samples for geotechnical testing should be taken from the other, longitudinally split, half of the split core, leaving one half intact.

3.1.9 Samples from bedrock need not be retained, because geoarchaeological assessment will not proceed to Stage 2.

#### **3.2 Stage 1 geoarchaeological review of vibrocores**

3.2.1 Core logs of vibrocores acquired in the geotechnical survey will be reviewed by a suitably trained geoarchaeologist from Wessex Archaeology to identify the presence of deposits of geoarchaeological potential.

3.2.2 The logs will be assigned a high, medium or low priority status by Wessex Archaeology based on the geoarchaeological potential of the contained deposits. Of greatest geoarchaeological potential are sediments from former terrestrial and semi-terrestrial depositional environments, as well as certain features or inclusions of possible archaeological and palaeoenvironmental potential, specifically including the following criteria:



- peat layers;
- organic-rich deposits (e.g. highly organic clays and silts that may have formed in low energy back swamp environments);
- deposits containing other organic material such as wood fragments, roots, dark organic staining etc;
- clay or silt deposits, especially those containing laminated features such as lacustrine varves or tidal rhythmites;
- inorganic fossils such as molluscs;
- osseous organics (faunal remains)
- concentrations of charcoal;
- individual artefacts such as lithics (although finding these items in cores is extremely rare, and
- any other feature thought to indicate a terrestrial depositional environment.

- 3.2.3 Wessex Archaeology will complete Stage 1 review of the logs produced within seven (7) days of receipt of all logs and photographs and inform the geotechnical contractor if any samples (undisturbed halves of longitudinally split core lengths) are recommended for Stage 2 geoarchaeological recording because they contain features of archaeological significance.
- 3.2.4 Such samples represent longitudinally split core lengths that have been determined to have medium or high geoarchaeological potential.
- 3.2.5 Longitudinally split core liners will be wrapped in plastic film and placed within an extruded black plastic liner. All sample information will be kept attached to the liner, including indications of top and bottom.
- 3.2.6 Split core liners will be stored within 1 m long channelled plastic core boxes with lids and stacked on pallets. They will be stored within a temperature and humidity-controlled environment whilst active recording is being undertaken (16-22°C, 45-65% humidity).
- 3.2.7 All location information will also be provided in the geotechnical logs, including where possible corrected water depth (meters lowest astronomical tide (LAT) or similar) and coordinate data (e.g., Eastings/Northings).
- 3.2.8 These samples will be retained by the geotechnical contractor at their onshore laboratory, undisturbed, until it is agreed with the Client whether Stage 2 geoarchaeological recording will be undertaken (if required).
- 3.2.9 If required for Stage 2 recording, samples will be transferred to Wessex Archaeology's Amesbury Laboratory, for storage in humidity and temperature-controlled conditions, until instruction to dispose of cores is received from the Client, or provision will be made for them to be sampled at the contractors logging facility.



### 3.3 Stage 2 geoarchaeological recording

- 3.3.1 Stage 2 geoarchaeological recording will be undertaken on dedicated archaeological vibrocores recommended to mitigate against any impacts to identified deposits and/or palaeolandscapes features of archaeological interest (Wessex Archaeology 2021a; 2024), and any vibrocore sequences or samples requested during the Stage 1 review of geotechnical data (see **Section 1.4**).
- 3.3.2 Dedicated archaeological vibrocores and requested core sequence and/or samples will be delivered to Wessex Archaeology's laboratory at Amesbury where they will be split, recorded (described and photographed) and interpreted. The recording will be undertaken by a suitably trained geoarchaeologist, taking care to identify any deposits of high geoarchaeological priority not apparent at the preceding core logging stage. Vibrocore sequences will be assigned a unique series and sample number and stored in core boxes..
- 3.3.3 All dedicated archaeological vibrocores delivered to Wessex Archaeology will be opened under red light conditions optimal for luminescence dating, as outlined by Nelson *et al.* (2019) and in the *Scientific Dating of Pleistocene Sites: Guidance for Best Practice* published by Historic England (Grant and Marshall 2025).
- 3.3.4 One longitudinal half (i.e., split lengthways) of the core will be wrapped in opaque liner to protect the core from light. The other core half will be wrapped in clear liner and subsequently retrieved for palaeoenvironmental sampling, if required. Both will be stored together in opaque core boxes and stored flat.
- 3.3.5 Deposits of geoarchaeologist interest will be set aside for further geoarchaeological recording and palaeoenvironmental sub-sampling, if appropriate. A full list of palaeoenvironmental techniques and a brief description of each is outlined in **Appendix 1**.
- 3.3.6 Sediment descriptions for vibrocores described by Geoarchaeologists in the geotechnical laboratory, or retained for Geoarchaeological description, will include information such as:
- Depth;
  - Texture;
  - Composition;
  - Colour;
  - Inclusions;
  - Structure (bedding, ped characteristics etc); and
  - Contacts between deposits.



## 4 PROTOCOL FOR ARCHAEOLOGICAL DISCOVERIES

- 4.1.1 A Protocol for Archaeological Discoveries (PAD) will be in place throughout the marine geotechnical survey, in order to ensure that unexpected discoveries of archaeological material – including submerged prehistoric material, shipwreck material aircraft remains, and any other archaeological material – are managed in a timely, appropriate and proportionate manner. The broader procedures for the PAD including onwards measures and reporting regarding recovered finds are set out in the project Written Scheme of Investigation (Wessex Archaeology 2022) with this method statement providing operational details.
- 4.1.2 Project Staff on all relevant vessels will be informed of the PAD by the Retained Archaeologist during a pre-mobilisation briefing (via MS Teams, or similar). This will include details of how they might encounter finds, the find types that may be of archaeological interest, and the potential importance of any archaeological material encountered. Project Staff will be made aware of what constitutes an appropriate find, understand how to record them, and are aware of the reporting process. A copy of all relevant material and forms will be provided during the toolbox talk.
- 4.1.3 An internal reporting chain will be in place in order for the PAD to be operationally effective. A flow chart outlining the general procedure is included in **Appendix 2** and a quick reference guide is shown within **Appendix 4**.
- 4.1.4 Contact details, including those of the Site Champion, Nominated Contact, and the Retained Archaeologist, are presented in **Table 6**.

**Table 6** PAD Implementation contacts

Name	Role	Company	Contact Number	Email / Notes
	Offshore Consent Manager	RWE		
	Site Champion (i.e. Vessel Master, Party Chief)	TBC		
	Nominated Contact (Client Representative)	TBC		
-	<b>PAD Report Submissions</b>	<b>Wessex Archaeology</b>	-	<a href="mailto:PAD.report@wessexarch.co.uk">PAD.report@wessexarch.co.uk</a>
Hayley Hawkins	Retained Archaeologist-Geoarchaeologist	Wessex Archaeology		<a href="mailto:h.hawkins@wessexarch.co.uk">h.hawkins@wessexarch.co.uk</a>
	Contractor Project Manager	TBC		

- 4.1.5 When discoveries are made by Project Staff, either on the seabed or onboard a vessel, they are to be reported to the Site Champion (e.g. Vessel Master) on their vessel. The Site Champion will have authority to cease temporarily works around archaeological discoveries and shall ensure that the occurrence is recorded in the vessel log. The Site Champion will compile a Preliminary Record (**Appendix 3**) and inform the Nominated Contact.



- 4.1.6 The Nominated Contact is a person who has been formally identified by the Developer and / or their representative to co-ordinate the implementation of the PAD (e.g. the Client Rep). The Nominated Contact will then report any discoveries to the Retained Archaeologist and the Developer and the Contractor Project Manager(s).
- 4.1.7 Reporting of discoveries should be done **immediately** (as soon as practical, but no later than the end of the same working day) enabling the Retained Archaeologist to provide a timely advice and minimise disruption to the work programme. The Retained Archaeologist will in turn liaise with the Nominated Contact, the Developer and the relevant Archaeological Curator and others, as necessary. Provision will be made by the Developer and the Contractor, in accordance with the PAD, for the prompt reporting / recording of archaeological remains encountered or suspected during the works.
- 4.1.8 The Retained Archaeologist will review all information relating to the occurrence in conjunction with geophysical and / or desk-based information and advise the Nominated Contact of any further actions that may be required, including:
- advice on immediate actions to be taken in respect of the discovery, including any recovered finds; and,
  - advice on the identification of finds and the character of their seabed locations.
- 4.1.9 If the recovered find constitutes 'wreck' within the terms of the *Merchant Shipping Act 1995*, the Developer must generate a Report of Wreck and Salvage and send to the Maritime and Coastguard Agency (MCA) Receiver of Wreck within 28 days of the find's recovery.
- 4.1.10 Should a find comprise material suspected to be from an aircraft lost while in military service, the Ministry of Defence (MoD) will be notified, as the material could be protected under the *Protection of Military Remains Act 1986*.
- 4.1.11 For discoveries of high archaeological importance, call-out investigations could be instituted, following discussions with the Archaeological Curator(s).
- 4.1.12 Where ordnance is encountered, operational UXO procedures shall take precedence, with PAD reporting undertaken only if it is safe to do so.
- 4.1.13 Wherever possible, archaeological material should remain in situ, as disturbance may accelerate deterioration. All finds must be handled carefully and minimally. Fragile materials, particularly waterlogged organics such as wood, are especially vulnerable and must not be allowed to dry out. Further information on artefact handling and storage is set out briefly in **Appendix 5**.



## 5 REPORTING

5.1.1 Following completion of the Stage 1 and 2 geoarchaeological assessment and the consideration of the evidence recovered, a draft evaluation report will be submitted for approval to the Client for comment within six (6) weeks. Once approved, a final version will be submitted to the MMO and their advisors, Historic England, within three (3) months of the completion of assessment, for comment. The report will be produced in accordance with relevant guidelines (ClfA 2020a).

5.1.2 The report will include the following elements:

- an abstract summarising the scope and results of the Stage 1 and 2 geoarchaeological assessment
- an introduction including geotechnical campaign location, an account of the background and circumstances of the work, a description of impacts of the proposed works, the scope and date of the assessment and the personnel involved;
- relevant background information including palaeolandscape and geoarchaeological context;
- a review of the aims and objectives of the Stage 1 and 2 assessment;
- the methodology employed and any constraints on the assessment;
- the results of the results of the assessment. This will include a lithostratigraphic framework for the deposits recorded, an appendix with the full lithostratigraphic sequences for each vibrocore, and a review of further work recommended;
- a discussion which, where possible, will correlate the deposits recorded with the broader palaeolandscape reconstruction, and considers the geoarchaeological resource present;
- a conclusion that summarises the results of the assessment and, if required, recommendations for further geoarchaeological works (i.e., Stage 3 palaeoenvironmental assessment).
- archive preparation and deposition arrangements;
- appendices, including borehole descriptive tables;
- illustrations, including include a plan of the area subject to investigation in relation to the Marine Scheme; and
- references.

### OASIS

5.1.3 If no further work (Stage 2 geoarchaeological recording) is recommended, an OASIS online record will be created, with key fields completed, within two (2) weeks of approval by the MMO and their advisor, Historic England. Recommendation to proceed to Stage 3-5 is contingent on the results of the Stage 2 assessment. Subject to any contractual requirements on confidentiality, copies of the OASIS record will be integrated into the relevant local and national records and published through the Archaeology Data Service ArchSearch catalogue.



## 6 ARCHIVE STORAGE AND CURATION

### 6.1 Preparation and deposition

6.1.1 In an agreed timeframe of the completion of all aspects of the installation of the Marine Scheme, the complete project archive, which will include paper records, photographic records, graphics, and digital data, will be prepared, compiled and presented in accordance with nationally recommended guidelines (SMA 1995; Brown 2011; ADS 2013; ClfA 2020b). Archive deposition will be arranged in consultation with the Archaeology Data Service (ADS) and conform to their deposition requirements (ADS 2013 and online guidance). The proposed assessment will general digital data (rather than involving the digitisation of original paper records) and will therefore not require the deposition of a paper archive.

#### *Physical archive*

6.1.2 If material resulting from the geotechnical campaign is not required for geotechnical testing, and is recommended for Stage 2 geoarchaeological recording, storage facilities will be provided to temporarily house the material archive (cores and subsamples for palaeoenvironmental assessment) for the duration of the assessment, in suitable conditions (i.e. temperature-controlled storage for vibrocores).

#### *Digital archive*

6.1.3 The digital archive generated by the project will be deposited with a Trusted Digital Repository, in this instance the Archaeology Data Service (ADS), to ensure its long-term curation. Digital data will be prepared following ADS guidelines (ADS 2013 and online guidance), supported by Dig Digital guidance (DigVenture 2019), and accompanied by metadata.

#### *Selection strategy*

6.1.4 It is widely accepted that not all the records and materials collected or created during the course of an archaeological project require preservation in perpetuity. In this case, the material archive is dependent on whether cores are recovered that have geoarchaeological potential, and that they are not required in their entirety for geotechnical testing.

6.1.5 Any records and materials remaining will be subject to further selection after the end of the project, in order to establish what will be retained for long-term curation, with the aim of ensuring that all elements selected to be retained are appropriate to establish the significance of the project and support future research, outreach, engagement, display and learning activities, i.e., the retained archive should fulfil the requirements of both future researchers and the receiving repository.

6.1.6 The selection strategy, which details the project-specific selection process, is underpinned by national guidelines on selection and retention (Brown 2011, Section 4) and generic selection policies (SMA 1993; Wessex Archaeology's internal selection policy) and follows ClfA's *Toolkit for Selecting Archaeological Archives*. This should be agreed by all stakeholders as detailed in the WSI (Wessex Archaeology 2022) and fully documented in the project archive.

6.1.7 In this instance, because palaeoenvironmental potential will be evaluated during Stage 2 assessment, decisions on selection will be deferred until after geoarchaeological recording is undertaken, if recommended, and therefore no detailed strategy is presented here. This will be addressed following the completion of any work proceeding to Stage 3 palaeoenvironmental analysis (see **Appendices 1 and 2**).



6.1.8 All cores will be retained until all stages of assessment have been completed and all associated reports signed off by the Archaeological Curators.

*Security copy*

6.1.9 In line with current best practice (e.g., Brown 2011), on completion of the project a security copy of the written records will be prepared in the form of a digital PDF/A file. PDF/A is an ISO-standardised version of the Portable Document Format (PDF) designed for the digital preservation of electronic documents through omission of features ill-suited to long-term archiving.



## **7 COPYRIGHT**

### **7.1 Archive and report copyright**

- 7.1.1 The full copyright of the written/illustrative/digital archive relating to the project will be retained by Wessex Archaeology under the *Copyright, Designs and Patents Act 1988* with all rights reserved. The client will be licenced to use each report for the purposes that it was produced in relation to the project as described in the specification. The museum, however, will be granted an exclusive licence for the use of the archive for educational purposes, including academic research, providing that such use conforms to the *Copyright and Related Rights Regulations 2003*.
- 7.1.2 Information relating to the project will be deposited with the ADS where it can be freely copied without reference to Wessex Archaeology for the purposes of archaeological research, or development control within the planning process.

### **7.2 Third party data copyright**

- 7.2.1 This document, the evaluation report and the project archive may contain material that is non-Wessex Archaeology copyright (e.g., Ordnance Survey, British Geological Survey, Crown Copyright), or the intellectual property of third parties, which Wessex Archaeology are able to provide for limited reproduction under the terms of our own copyright licences, but for which copyright itself is non-transferable by Wessex Archaeology. Users remain bound by the conditions of the *Copyright, Designs and Patents Act 1988* with regard to multiple copying and electronic dissemination of such material.



## 8 WESSEX ARCHAEOLOGY PROCEDURES

### 8.1 External quality standards

8.1.1 Wessex Archaeology is registered as an archaeological organisation with the Chartered Institute for Archaeologists (CIfA) and fully endorses its *Code of Conduct* (CIfA 2022) and *Regulations for Professional Conduct* (CIfA 2024). All staff directly employed or subcontracted by Wessex Archaeology will be of a standard approved by Wessex Archaeology, and archaeological staff will be employed in line with the CIfA codes of practice and will normally be members of the CIfA.

### 8.2 Personnel

8.2.1 The geoarchaeological recording will be undertaken by experienced geoarchaeologists from Wessex Archaeology's core staff. The overall responsibility for the conduct and management of the project will be held by one of Wessex Archaeology's project managers. The appointed manager, geoarchaeologists and palaeoenvironmental specialists will be involved in the investigation through to its completion.

8.2.2 Wessex Archaeology reserves the right, due to unforeseen circumstances (e.g., annual leave, sick leave, maternity, retirement etc) to replace nominated personnel with alternative members of staff of comparable expertise and experience.

8.2.3 Wessex Archaeology reserves the right, where necessary due to unforeseen circumstances, to replace nominated personnel with alternative members of staff of comparable expertise and experience.

### 8.3 Internal quality standards

8.3.1 Wessex Archaeology is an ISO 9001 accredited organisation (certificate number FS 606559), confirming the operation of a Quality Management System which complies with the requirements of ISO 9001:2015 – covering professional archaeological and heritage advice and services. The award of the ISO 9001 certificate, independently audited by the British Standards Institution (BSI), demonstrates Wessex Archaeology's commitment to providing quality heritage services to our clients.

8.3.2 Wessex Archaeology assigns responsibility to individual managers for the successful completion of all aspects of a project including reporting. This includes monitoring progress and quality; controlling the budget from inception to completion; and all aspects of health and safety for the project. At all stages, the project manager will carefully assess and monitor performance of staff and adherence to objectives, timetables and budgets, while the manager's own performance is monitored by the team leader or regional director. The technical managers in the Graphics, Research, GeoServices and IT sections provide additional assistance and advice.

8.3.3 All staff are responsible for following Wessex Archaeology's quality standards but the overall adherence to and setting of these standards is the responsibility of the senior management team who, in consultation with the team leaders/regional directors, also ensure projects are adequately programmed and resourced within Wessex Archaeology's portfolio of project commitments.



## **8.4 Health and Safety**

- 8.4.1 All works will be undertaken in accordance with the *Health and Safety at Work Act 1974*; the *Management of Health and Safety at Work Regulations 1999*; and all other applicable health and safety legislation.
- 8.4.2 Wessex Archaeology is an ISO 45001 accredited organisation (certificate number OHS 744383), confirming the operation of an Occupational Health and Safety Management System that complies with the requirements of ISO 45001:2018. The award of the ISO 45001 certificate, independently audited by the British Standards Institution (BSI), demonstrates Wessex Archaeology's commitment to delivering effective risk management across all its activities.
- 8.4.3 Where required, Wessex Archaeology will, produce one or more task and site-specific risk assessments and method statements (RAMS), which will ensure our staff can work safely if required to be present on site or at the geotechnical contractors logging facility or laboratory. A copy of the RAMS and our Health and Safety Policy can be provided to the client. All staff on our sites will be made fully familiar with the RAMS before work commences.
- 8.4.4 We aim to work collaboratively on health and safety with clients and, where separately appointed, with principal contractors. We expect clients to provide in good time all the necessary risk information about a site that may affect the archaeological work, such as locations of utilities or any known ground contamination. We will comply with the project specific Personal Protective Equipment (PPE) requirements, and any other specific additional requirements of the Principal Contractor.
- 8.4.5 All fieldwork staff are certified through the Construction Skills Certification Scheme (CSCS) and have undergone UKATA Asbestos Awareness Training. Staff who carry out specific tasks are suitably trained and competent to do so through training accredited by the Construction Industry Training Board (CITB), Institution of Occupational Safety & Health (IOSH) and the National Plant Operators Recognitions Scheme (NPORS).

## **8.5 Insurance**

- 8.5.1 Wessex Archaeology holds Employers Liability (£15,000,000), Public Liability (£15,000,000) and Professional Indemnity (£10,000,000) policies.

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## APPENDICES

### Appendix 1: Palaeoenvironmental analytical techniques

Advice will be provided directly from the Retained Archaeologist to the offshore site investigation contractor on how to identify the appropriate samples required for analysis.

The palaeoenvironmental analytical techniques anticipated for the site require relatively small volumes of sediment to be extracted, with a series of samples taken at set intervals from undisturbed cores. Bag samples are not appropriate, as the material lacks the spatial resolution required for palaeoenvironmental investigations.

The principal aim of analysis is to date key deposits and determine the preservation and concentration of the various remains outlined below. This provides a framework for establishing the potential of any given deposit to contribute towards themes and questions outlined in national and regional archaeological research agenda.

#### Plant macrofossils

For plant macrofossils, 2 cm thick sections of a core will be extracted from peat deposits and processed through a nest of sieves to recover plant remains. Sampling usually focuses on one half of a split core in order that sufficient material remains for other techniques. Large plant remains preserved in peat are typically of plants growing locally and at the assessment stage are primarily assessed for the purpose of selecting suitable short-lived material for AMS (Accelerator Mass Spectrometry) radiocarbon dating.

However, plant macrofossils also provide information on local vegetation and evidence for possible human activity (perhaps suggested by the presence of edible plants). Plant macrofossils can occur in alluvial deposits, but these could have been transported over long distances in the water column and are not considered appropriate for AMS dating.

#### Radiocarbon dating

Suitable terrestrial plant remains (representing short-lived plants) are submitted for AMS dating providing a secure chronological context for the deposits under investigation. Where thick peats (e.g. more than a few centimetres) are present in a core sample, AMS dates from the top and base of a peat are recommended, whereas one date usually suffices from thin and relatively short-lived peats.

#### Pollen analysis

Pollen is one of the principal techniques used in environmental archaeology to investigate past vegetation environments and the impact of human communities on the landscape. Pollen analysis has successfully been undertaken in the Irish Sea (e.g. Walney Offshore Windfarm; Wessex Archaeology, 2010) to establish environmental change in a now submerged landscape. Pollen is best preserved in the peat and each pollen sample requires a 1 cm<sup>3</sup> volume for laboratory extraction. Several pollen samples may be taken depending upon the deposit thickness.

#### Diatoms, foraminifera and ostracods

Diatoms (unicellular algae), foraminifera (marine protozoa) and ostracods (bivalve Crustacea) occur in a wide range of marine and semi-terrestrial environments (e.g. saltmarsh) and provide important indicators on past coastal and riverine change. For example, they can help to distinguish freshwater from marine environments and help to understand past patterns of sea-level and coastal change.

These techniques each require roughly 50 g of sediment per sample and can be taken from a range of substrates, except very coarse sediments, depending on the preservation condition.

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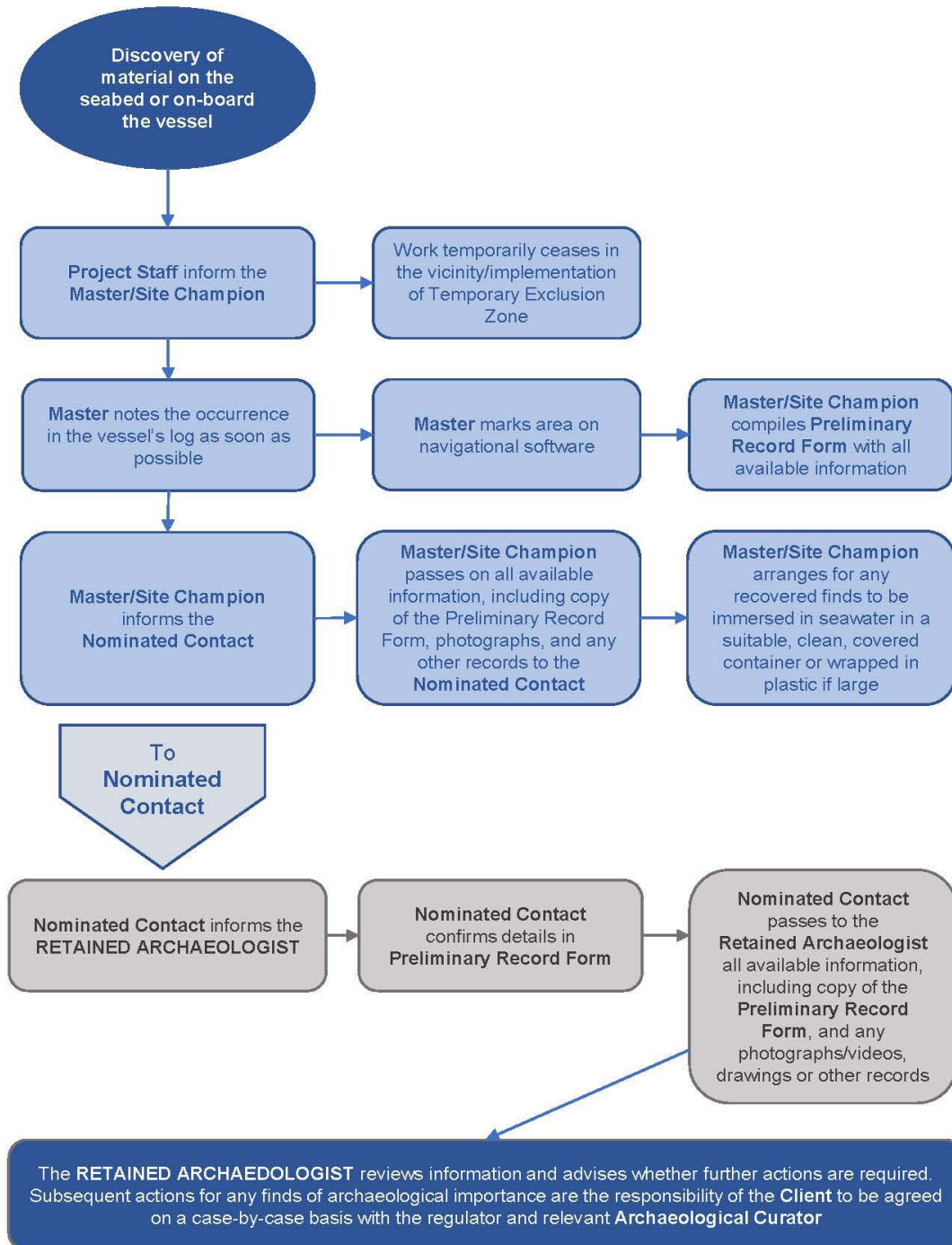
### Optically Stimulated Luminescence (OSL)

OSL dating is an established technique for dating sediments that are too old to be dated using conventional methods such as radiocarbon dating. The advantage of OSL dating is that the method does not require organic material and has an upper range from around 100,000 to 300,000 years. OSL dating is therefore a key dating technique to provide a chronological framework for the longterm physical development of the submerged landscape north of Wales, Irish Sea, over multiple glacial-interglacial cycles.



## Appendix 2: Protocol for Archaeological Discoveries: Actions when a Discovery is Made

### Protocol for Archaeological Discoveries: actions for discoveries on the seabed or on-board a vessel





### Appendix 3: Preliminary Recording Form

<h1>Protocol for Archaeological Discoveries: Offshore Renewables Projects</h1> <p>Preliminary Record Form Page 1 of 2</p>
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#### 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

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# Protocol for Archaeological Discoveries: Offshore Renewables Projects

Preliminary Record Form Page 2 of 2

## 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: _____

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Also available at:

[https://www.wessexarch.co.uk/sites/default/files/field\\_file/2\\_Protocol%20For%20Archaeological%20Discoveries.pdf](https://www.wessexarch.co.uk/sites/default/files/field_file/2_Protocol%20For%20Archaeological%20Discoveries.pdf)

## Appendix 4: Protocol for Archaeological Discoveries, quick reference note

# ARCHAEOLOGICAL CHANCE FINDS

*How to distinguish archaeological material you can find during construction*

Prehistory	Shipwrecks	Airplanes, etc.
<p>Look out for organic sediment (peat, timber, etc.)</p> <p>Typical artefacts include:</p> <ul style="list-style-type: none"><li>- worked timber</li><li>- bone and antler</li><li>- worked flint</li><li>- ceramics</li></ul>  <p>Antler axe</p> <p>Flint axes</p> <p>Flint arrowheads</p> <p>Ceramic beaker</p>	<p>Look out for worked timber. Most ship timbers show signs of fastenings like wooden nails, etc.</p> <p>Other artefacts, such as ceramics, metal objects, etc. might be associated with a shipwreck!</p>  <p>Ship timbers</p> <p>Bar shot</p> <p>Pipkin</p>	<p>Look out for aluminium objects, such as parts of the fuselage, etc.</p>  <p>Parts of HS-299 Flying Rocket</p> <p>Propeller (Ju-88)</p>

## *In case of an archaeological chance find:*

Stop all work and inform site Champion of find and exact location!

Inform the Nominated Contact

Take photographs of the finds, fill in Preliminary Record Form and submit all information. Keep finds wet and handle with care!

Submit PAD Reports to: [PAD.report@wessexarch.co.uk](mailto:PAD.report@wessexarch.co.uk)



## Appendix 5: Guidelines for Artefact Handling and Storage

It should be noted that 'time is of the essence' in terms of the recovery of wet archaeological material. If organic objects such as wood are allowed to dry out, this can cause irreparable damage. Care in handling items is therefore paramount. A recovered object should be handled and stored in the following manner, particularly those identified as major archaeological finds:

- Handle all material with care;
- Do not remove any rust, sediment, concretion or marine growth and do not separate 'groups' of items;
- All objects should be kept completely immersed in fresh tap water, or sea water as an alternative; if this is not possible because of the objects' size, they should be kept damp and wrapped in plastic to prevent them drying out;
- Objects should be kept in clean storage containers, preferably rigid plastic boxes with lids, which should be kept in a safe, sheltered location (preferably cool and dark); large objects that will not fit in containers should be kept covered so that they do not dry out;
- Each object should be marked with its unique number, either by means of a tag attached to the object(s) or by writing the number on the bag that it is stored on. If this is not possible, photographs of the artefact with a label clearly displayed on it should be taken, in order for the artefact to be identified later;
- Each small object should be kept in its own labelled zip-lock plastic bag immersed in tap water;
- Any sediments of interest should be collected and double-bagged into labelled zip-lock bags, if possible. Sediments should not be immersed in water; and
- If particularly delicate or significant items are recovered, the retained archaeologist should be contacted as soon as possible for further advice.