Partners in UK offshore wind

MONA OFFSHORE WIND PROJECT

Preliminary Environmental Information Report

Volume 6, annex 13.1: Marine archaeology technical report

Image of an offshore wind farm

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Final

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Glossary

Term	Meaning
Esker structures	Ridges of glaciofluvial sediment deposited in ice-walled channels or subglacial tunnels.
Gazetteer	A geographical index or dictionary.
Glaciolacustrine	Sediments deposited into lakes that have come from glaciers are called glaciolacustrine deposits. These lakes include ice margin lakes or other types formed from glacial erosion or deposition. Sediments in the bedload and suspended load are carried into lakes and deposited.
Glaciomarine	An environment containing both glacial ice and marine water.
Grounding fans	Originate from subglacial and basal stream tunnels at grounding lines of glaciers terminating in a marine environment.
Morraines	Material left behind by a moving glacier.
Nadir	The lowest or most unsuccessful point.
Palaeochannel	A geological term describing a remnant of an inactive river or stream channel that has been filled or buried by younger sediment.
palaeoenvironmental	An environment of a past geological age.
Periglacial	Ice edge.
Prograding fans	Depositional trend for regressions and is defined as the building forward or outward toward the sea of a shoreline or coastline.

Acronyms

Acronym	Description
AAIs	Areas of Archaeological Importance
AD	Anno Domini
ADS	Archaeology Data Service
AEZ	Archaeological Exclusion Zone
AMAPs	Areas of Maritime Archaeological Potential
BC	Before Christ
BGS	British Geological Survey
BLF	Bardsey Loom Formation
BP	Before Present
BULSI	Build, Use, Loss, Survival, and Investigation
CBF	Cardigan Bay Formation
CPT	Cone Penetration Test
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
ES	Environmental Statement
FBF	Caernarfon Bay Formation
HE	Historic England
HSC	Historic Seascape Characterisation
LGM	Last Glacial Maximum
MCA	Maritime and Coastguard Agency
MBES	Multi-beam Echo Sounder
MCAA	Marine and Coastal Access Act
MLWS	Mean Low Water Springs
MMO	Marine Management Organisation
MOD	Ministry of Defence
MPS	Marine Policy Statement
NMRW	National Monuments Record Wales
NRHE	National record of the Historic Environment
ORR	Offshore Regional Report
PAD	Protocol for Archaeological Discoveries
PEIR	Preliminary Environmental Information Report
PWA	The Protection of Wrecks Act
RCAHMW	Royal Commission on the Ancient and Historical Monuments of Wales
RoW	Receiver of Wreck
RSL	Relative sea level
SBP	Sub-bottom Profiler
SLIPs	Sea level index points
SSS	Side Scan Sonar
STG	St George's Channel Formation
UHRS	Ultra High Resolution Seismic
UKHO	United Kingdom Hydrographic Office
USBL	Ultra Short Baseline
UXO	Unexploded Ordnance
WCPS	West Coast Palaeolandscape Study
WIS-A	Western Irish Sea Formation A
WIS-B	Western Irish Sea Formation B
WSI	Written Scheme of Investigation

Units

Unit	Description
%	Percentage
km	Kilometres
km^2	Square kilometres
m	Metres
nm	Nautical miles (distance; 1nm = 1.852km)

1 MARINE ARCHAEOLOGY TECHNICAL REPORT

1.1 Introduction

1.1.1.1 This marine archaeology technical report presents baseline information in relation to Mona Offshore Wind Project in the east Irish Sea in order to inform the Preliminary Environmental Information Report (PEIR) process. The scope of the Mona marine archaeology technical report covers the offshore elements of the Mona Offshore Wind Project seaward of Mean Low Water Springs (MLWS). The archaeology and cultural heritage assessment of the onshore and the intertidal zone will be addressed in volume 7, annex 19.1: Historic environment technical report of the PEIR.

1.1.1.2 The aim of this Mona marine archaeology technical report is to provide an overview of the archaeological baseline associated with Mona Offshore Wind Project.

1.1.1.3 The objectives of this report are to:

- Summarise the potential for submerged prehistoric archaeology to be encountered within the Mona marine archaeology study area (Figure 1.1)
- Identify known maritime and aviation sites and based on the maritime history of the Mona marine archaeology study area and the wider area, assess the potential for the existence of unknown sites and materials within the limits of the Mona marine archaeology study area
- Present site-specific geophysical data from surveys across the Mona Array Area that identify anomalies of archaeological interest and characterise these anomalies integrating the results of the site-specific data, with the findings of the desktop study described above
- Review available site-specific geophysical data of the Mona Array Area for sediments of archaeological and paleoenvironmental interest and integrate the results with the findings of the desktop study.

1.2 Legislation, policy and guidance

1.2.1.1 This section sets out the legislation, policy, guidance and any development plans relevant to marine archaeology in the context of offshore renewable energy development.

1.2.1.2 States have jurisdiction in respect of marine archaeology within their territorial waters. For example, with regard to marine licensing ‘English waters’ is the classed as the area of sea within the limits 12nm of the English coastline. This also includes any area of sea beyond 12nm, that is within the exclusive economic zone (EEZ) and the UK sector of the continental shelf (up to 200nm). This excludes the waters of any devolved administration.

1.2.1.3 Beyond the UK’s territorial waters archaeology is generally subject to international legislation and policy, with two exceptions:

- The Merchant Shipping Act 1995
- The Protection of Military Remains Act 1986.

1.2.1.4 Outside the UK territorial waters the regulation and reporting of marine archaeology is governed by international legislation and guidance, such as the United Nations Convention on the Law of the Sea 1982 (UNCLOS, 1982), the European Convention on the Protection of the Archaeological Heritage (Revised) 1992 (the Valletta Convention) and the United Nations Educational, Scientific and Cultural Organisation’s Convention on the Protection of Underwater Cultural Heritage 2001 (UNESCO, 2001).

1.2.2 Legislation

Protection of Wrecks Act 1973

1.2.2.1 Section one of the Protection of Wrecks Act 1973 (PWA) states that wrecks and wreckage of historical, archaeological or artistic importance can be protected by way of designation and that is an offence to carry out certain activities in a defined area surrounding a wreck that has been designated, unless a licence for those activities has been obtained. Section two of PWA provides protection for wrecks that are designated as dangerous due to their contents and is administered by the Maritime and Coastguard Agency (MCA) through the Receiver of Wreck (RoW).

Ancient Monuments and Archaeological Areas Act 1979 (as amended)

1.2.2.2 This Act is primarily land based, but in recent years it has also been used to provide some level of protection for underwater sites. Scheduled Monuments and Areas of Archaeological Importance (AAIs or their equivalent) are afforded statutory protection by the Secretary of State, and consent is required for any works. The law is administered by the Secretary of State within the Department of Culture, Media and Sport generally via their statutory advisor’s.

Protection of Military Remains Act 1986

1.2.2.3 Under the Protection of Military Remains Act 1986, all aircraft that have crashed in military service are automatically protected. Maritime vessels lost during military service are not automatically protected although the Ministry of Defence (MOD) has powers to protect any vessel that was in military service when lost. The MOD can designate ‘controlled sites’ around wrecks whose position is known and can designate named vessels as ‘protected places’ even if the position of the wreck is not known. It is not necessary to demonstrate the presence of human remains at either ‘controlled sites’ or ‘protected places’. The provisions of the Protection of Military Remains Act 1986 regarding Controlled Sites are applicable in international waters, though they are only enforceable with respect to British-controlled ships, British citizens and British companies.

The Merchant Shipping Act 1995

1.2.2.4 This Act details the procedures for determining the ownership of maritime finds that turn out to be ‘wreck’ offshore, onshore including the intertidal zone of UK territorial waters. It includes all craft, parts of these, their cargo or equipment. If any maritime finds are brought onshore the RoW must be notified, and the finds must be kept until the RoW determines ownership or requests that they be given to the RoW. The act is administered by the MCA.

1.2.2.5 Beyond the 12nm limit the Merchant Shipping Act 1995 covers wreck found or taken into possession outside UK waters and stipulates that, if brought into UK waters, finds must be reported to the RoW.

1.2.3 Policy

National Policy Statements

1.2.3.1 NPS EN-1 (Overarching National Policy Statement for Energy) and NPS EN-3 (National Policy Statement for Renewable Energy Infrastructure) include guidance on what is to be included in the Environmental Statement and as such they are described in detail in Volume 6, Chapter 13: Marine Archaeology of the PEIR.

Marine Policy Statement 2011

1.2.3.2 The Marine Policy Statement (MPS) was published by all UK governments in March 2011 as part of a system of marine planning across UK seas. The MPS is the overarching framework for preparing Marine Plans and making decisions affecting the marine environment. The MPS also states that Marine Plans must ensure a sustainable marine environment that will protect heritage assets.

1.2.3.3 Section 2.6.6 of the MPS relates to the historic environment in marine planning and advises that heritage assets should be conserved through marine planning in a manner appropriate and proportionate to their significance. It advises that when considering the significance of a heritage asset and its setting, the marine plan authority should take into account the particular nature of the interest in the assets and the value they hold for this and future generations.

1.2.3.4 Designated archaeological assets in coastal/intertidal zones and inshore/offshore waters may include scheduled monuments, designated wrecks and sites designated under the Protection of Military Remains Act 1986. Non-designated archaeological assets of equivalent status should be considered under the same policy principles as designated archaeological assets.

1.2.3.5 Where the loss of the whole or material part of an archaeological asset's significance is justified, suitable mitigation measures should be put in place.

Welsh National Marine Plan 2019

1.2.3.6 The Welsh National Marine Plan sets out policy for the next 20 years for the sustainable use of Welsh seas. Policy SOC-05: Aims to preserve and enhance historic assets and "recognises the importance of appreciating and protecting our coastal and underwater historic environment and making it accessible to present and future generations".

1.2.4 Guidance

1.2.4.1 There are a number of guidance documents that are relevant to marine archaeology in the context of offshore renewable development, which have been considered in the production of this technical report, these include:

- International:
  - The World Heritage Convention 1972
  - United Nations Convention on the Law of the Sea 1982
  - International Council of Monuments and Sites (ICOMOS) Charter on the Protection and Management of Underwater Cultural Heritage 1996 (the Sofia Charter)
  - UNESCO Convention on the Protection of the Underwater Cultural Heritage 2001
  - European Convention on the Protection of the Archaeological Heritage (Revised) 1992 (the Valletta Convention)
  - European Directive for Environmental Impact Assessments (2014/52/EU)
  - Code of Practice for Seabed Development (Joint Nautical Archaeology Policy Committee (JNAPC) 2006).
- UK:
  - Conservation Principles for the Sustainable Management of the Historic Environment in Wales (Cadw, 2011)
  - Code of Conduct (Chartered Institute for Archaeologists, 2014)
  - Standard and Guidance for Historic Environment Desk Based Assessment (Chartered Institute for Archaeologists, 2014 (updated 2020))
  - COWRIE Historic Environment Guidance for the Offshore Renewable Energy Sector (Wessex Archaeology, 2007a)
  - Offshore Renewables protocol for Archaeological Discoveries (The Crown Estate, 2010)
  - Offshore Geotechnical Investigations and Historic Environment Analysis: Guidance for the Renewable Energy Sector (Gribble and Leather, 2010)
  - Archaeological Written Schemes of Investigation for Offshore Wind Farm Projects (The Crown Estate, 2021).

1.3 Methodology

1.3.1 Mona marine archaeology study area

1.3.1.1 The Mona marine archaeology study area consists of the Mona Array Area and the Mona Offshore Cable Corridor up to Mean Low Mater Springs (MLWS) with an additional 2km buffer. This is shown in Figure 1.1. This was used as the search area for obtaining records from relevant archive databases. This wider Mona marine archaeology study area allows for a greater understanding of the wider archaeological baseline environment, with the dual purpose of enabling any archaeological trends within the region to be recognised and to allow any archaeological sites identified to be represented in a broader archaeological context.

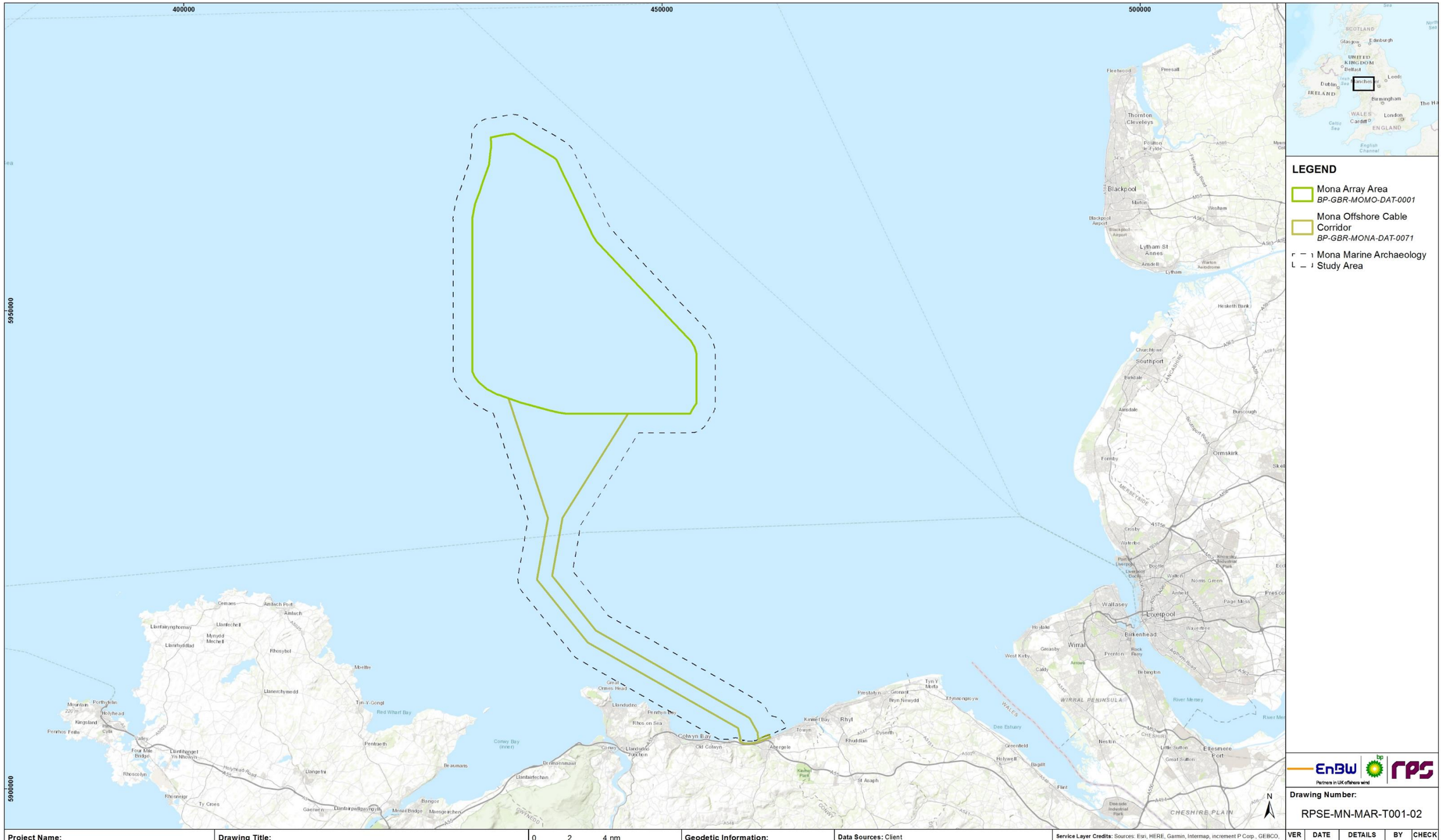

Figure 1.1: Mona marine archaeology study area.

1.3.2 Desktop study

1.3.2.1 Marine archaeology is considered within the following categories:

- Submerged prehistoric archaeology: This includes paleochannels and other inundated terrestrial landforms that may preserve sequences of sediment of paleoenvironmental interest, Palaeolithic and Mesolithic sites and artefacts.
- Maritime archaeology: relates generally to craft or vessels and any of their associated structures and/or cargo.
- Aviation archaeology: this comprises all military and civilian aircraft crash sites and related wreckage.

Data sources

1.3.2.2 A number of sources were consulted in order to inform the desktop study of the Marine archaeology technical report and are provided in Table 1.1.

Table 1.1: Summary of key desktop sources.

Title	Source	Year	Author
UKHO Wreck and Obstructions Data	UKHO	2022	United Kingdom Hydrographic Office (UKHO)
Historic Environment Record Data	National Record of the Historic Environment (NRHE)	2021	Historic England
Historic Environment Record Data	National Monuments Record Wales (NMRW)	2021	Royal Commission on the Ancient and Historical Monuments of Wales (RCAHMW)
Historic Seascape Characterisation: The Irish Sea (English Sector)	Archaeology Data Service (ADS)	2011	Historic England
Submerged Landscapes Data	EMODnet Geology	2022	British Geological Survey

1.3.2.3 The data available for the submerged prehistoric archaeology assessment includes:

- Ultra High Resolution Seismic (UHRS) data acquired with a line spacing of 250m with cross lines every 500m, and a vertical resolution of 1m. Collected for the Mona Array Area.
- Shallow Cone Penetration Test (CPT) data
- Legacy boreholes and oil and gas wells
- Ground model outputs, currently based on interpretation of the UHRS data, including:
  - Wood (2022): Technical File Note Preliminary Ground Model Morgan & Mona Windfarm Development Irish Sea
  - The British Geographic Survey (BGS) have taken three boreholes and 36 cores from within the Mona marine archaeology study area boundaries, the data from which has been utilised for the submerged prehistoric archaeology assessment in section 1.4. Additionally, BGS undertook seismic surveys of the area to inform the Offshore Regional Report (ORR) for the area (Jackson *et al*., 1995) which has also been included in the assessment.

1.3.2.4 Previous development led studies have also been incorporated into the assessment. Geoarchaeological review cores collected within the nearby Walney extension offshore wind farm which lies c. 25km to the northeast of the site (MSDS Marine, 2019), and archaeological assessments associated with the Rhiannon offshore wind farm (Development Consent Order (DCO) application submission), which incorporated part of the current Mona marine archaeology study area and extended to the west of the Mona marine archaeology study area (Wessex Archaeology 2012 and 2013). Further to this, a review of prehistoric archaeological remains within Strategic Environmental Assessment Area 6 (SEA6) which partially covers the Mona marine archaeology study area was undertaken in 2005 (Flemming, 2005) and the West Coast Palaeolandscape Study (WCPS) (Fitch *et al*., 2011) covered the south and east parts of the Mona Array Area.

Data structure

1.3.2.5 In order to compile a marine archaeological baseline for the purposes of this Marine archaeology technical report, these sources were compiled into gazetteers.

1.3.2.6 The historic environment records have been classified between records where material is known to be on the seabed and ‘recorded losses’. Recorded losses are events of vessels that are known to have been lost in the area, but with which no accurately located remains are associated.

1.3.2.7 Where multiple entries across the datasets occur that relate to the same archaeological receptor, the coordinates from the UKHO dataset have been used, as they are most frequently updated with the latest survey positions.

1.3.3 Site-specific surveys

1.3.3.1 Survey data were collected across the pre-defined Mona Array Area only of 500km^2 by Gardline between 09 July 2021 and 08 September 2021, and XOcean between 12 June 2021 and 16 March 2022. The data consisted of full coverage by Sidescan Sonar (SSS), Multibeam Bathymetry (MBES), and Sub-bottom Profiler (SBP). Limited Magnetometer data was collected at geotechnical sampling locations as part of the clearance process; however, this data was not available for interpretation at the time of writing.

1.3.3.2 Geophysical survey of the Mona Offshore Cable Corridor was undertaken April – October 2022, the assessment of which will be incorporated into the Technical Report for the Environmental Statement.

Technical specifications

1.3.3.3 All data were collected to a specification that fulfils the requirements of Section 3 of Archaeological Written Schemes of Investigation for Offshore Wind Farm Projects (Wessex Archaeology, 2021).

1.3.3.4 Line spacing was approximately 250m across the survey area for SSS and SBP data producing a minimum of 100% coverage, excluding the nadir. MBES data were collected at a line spacing to ensure 100% coverage with sufficient overlap of data. The equipment specification is shown in Table 1.2.

Table 1.2: Mobilised survey equipment.

Contractor	Vessel	Sidescan Sonar	UHRS	Pinger	MBES	USBL
Gardline	Ocean Resolution	Edgetech 4200 122/410kHz	AAE DuraSpark	GeoAcousitcs 5430A	Kongsberg EM2040C	Kongsberg HIPAP 502
XOcean	XO-04, XO-05, XO-06, XO-11	N/A	N/A	N/A	Norbit Winghead B51s	N/A

1.3.3.5 The data were collected to a specification appropriate to achieve the following interpretation requirements:

- Sidescan Sonar: ensonification of anomalies > 0.3m
- Multibeam Bathymetry: ensonification of anomalies > 2.0m
- Sub-bottom Profiler: penetration was achieved up to 200m with a vertical resolution of 1m
- All data were collected and referenced relative to ETRS89 UTM Zone 30N.

1.3.3.6 The SSS used an Ultra Short Baseline (USBL) positioning system to ensure positional accuracy throughout the survey. USBL ensures the actual position of the sensor is recorded, as opposed to when the position is estimated based upon the direction of the vessel and the amount of cable out (layback).

1.3.3.7 Although the accuracy of the USBL system is dependent on the angle, and the distance of the beacon from the transceiver, tolerances of between 0.5m and 2.0m can be achieved.

1.3.3.8 Positional accuracy is further increased through the correlation of the SSS dataset with the MBES dataset.

Data quality

1.3.3.9 The data collected to inform the Mona Offshore Wind Project archaeological assessment were generally of average to good quality. In areas the SSS data showed interference along the outer edges, likely caused through the simultaneous use of other sensors, this was however largely constrained to the outer edges of the data where the high frequency data did not extend to. The MBES data was affected by motion across much of the survey area, the impacts of which are amplified towards the edge of the data where the distance from the sensor to the seabed is greater. It is not considered that these issues impacted the ability to undertake an effective archaeological assessment.

1.3.3.10 Small offsets were noted in places between the SSS and MBES data, however this is usual and positions for medium and high potential anomalies were always taken from the MBES data.

1.3.3.11 The topography and geology of the Mona Offshore Wind Project survey extents meant some small areas were obscured by shadow within the SSS data. The MBES data were used to identify any anomalies which may have been hidden.

1.3.3.12 It was possible to view a range of high, medium, and low potential contacts within the survey extents. Overall, the data were deemed suitable for archaeological interpretation. It must be noted that there is always the potential for contacts of archaeological potential to not be visible in the data, this possibility is increased in areas of poor data quality or variable topography.

1.3.3.13 Following data collection navigation and offsets were applied, and the data quality controlled before being delivered to MSDS Marine, who undertook the geophysical survey interpretation, in the formats presented in Table 1.3.

Table 1.3: Data deliverables.

Sensor	Deliverables
Sidescan Sonar	Navigation corrected, unprocessed high and low frequency lines (.xtf) Georeferenced mosaic at 2m resolution (.tif) Seabed features (.csv)
Multibeam Bathymetry	Navigation corrected, unprocessed points (.pts) Georeferenced mosaic at 2m resolution (.tif) Seabed features (.csv)
Sub-bottom Profiler	Navigation corrected, unprocessed lines (.sgy) Navigation corrected, processed lines (.sgy) Horizon grids and unit interpretations (.grd / .shp)

1.3.3.14 In addition, MSDS Marine were provided with operations and interpretations reports produced by the survey contractor and an SSDM geo-database containing all information, and data, relating to the survey campaigns.

Processing

1.3.3.15 The archaeological assessment of data was undertaken by a qualified and experienced maritime archaeologist with a background in geophysical and hydrographic data acquisition, processing, and interpretation.

1.3.3.16 Following delivery of the required datasets, an initial review was undertaken to gain an understanding of the geological and topographic make-up of the survey area. Within the extent of the survey area the potential for variations in the seabed are high and can affect the interpretation of anomalies.

1.3.3.17 Whilst this report focuses on those anomalies identified within the boundaries of the Mona Array Area the purpose of the assessment is to characterise the historic environment and therefore all of the data collected was assessed even that which extend beyond the limits of the Mona Array Area.

Sidescan sonar

1.3.3.18 SSS is considered the best tool for the identification of anthropogenic anomalies on the seabed due to the ability to ensonify small features and as such forms the basis

of any archaeological assessment of data. SSS data in .xtf format were imported into Chesapeake SonarWiz 7.9 software, navigation and positioning were checked and corrected where required, and optimal gains were applied to ensure the consistent presentation of data.

1.3.3.19 Data were reviewed on a line by line basis, and all anomalies of potential anthropogenic origin identified and recorded. Records include at a minimum an image of the anomaly, dimensions, and a description. An archaeological potential was assigned to the anomaly following the criteria outlined in Table 1.4 below.

1.3.3.20 Following assessment of the individual lines, a mosaic was created and a Geotiff exported to allow for the checking of positional accuracy against the MBES data and to identify the extents of any anomalies that may have extended past the limits of individual lines.

Multibeam bathymetry

1.3.3.21 Due to the minimum anomaly detection size of MBES data being larger than that of SSS data, the primary use during archaeological assessment, outside of seabed characterisation, is the corroboration of anomalies identified within other datasets and the visualisation of anomalies that may otherwise be obscured by shadow.

1.3.3.22 Navigation corrected, but unprocessed, MBES data were provide to MSDS Marine as .xyz files, the data were imported in QPS Fledermaus where it was gridded and a hill-shaded surface applied, shading was adjusted to ensure the optimal presentation of data. The resulting 3-Dimensional image was viewed on a block by block basis, and all anomalies of potential anthropogenic origin identified and recorded.

1.3.3.23 Records include, at a minimum, an image of the anomaly, dimensions, and a description. An archaeological potential was assigned to the anomaly following the criteria outlined in Table 1.4 below. Where the interpretation of an anomaly was unclear, the data were imported into point cloud visualisation software such as Cloud Compare, in order to view the un-gridded data. The gridded surface image was exported as a Geotiff to allow further assessment alongside other datasets.

Table 1.4: Criteria for the assessment of archaeological potential.

Potential	Characterisation
Low	An anomaly potentially of anthropogenic origin but that is unlikely to be of archaeological significance. Examples may include discarded modern debris such as rope, cable, chain, or fishing gear; small, isolated anomalies with no wider context; or small boulder-like features with associated magnetometer readings
Medium	An anomaly believed to be of anthropogenic origin but that would require further investigation to establish its archaeological significance. Examples may include larger unidentifiable debris or clusters of debris, unidentifiable structures, or significant magnetic anomalies
High	An anomaly almost certainly of anthropogenic origin and with a high potential of being of archaeological significance. High potential anomalies tend to be the remains of wrecks, the suspected remains of wrecks, or known structures of archaeological significance

Assumptions and limitations

1.3.3.24 Data used to compile this report consists of primary geophysical survey data and secondary information derived from a variety of sources, only some of which have been directly examined for the purposes of this assessment. The assumption is made that the secondary data, as well as that derived from other secondary sources, is reasonably accurate.

1.3.3.25 The records held by the UKHO, NRHE and NMRW and the other sources used in this assessment are not a record of all surviving cultural heritage assets, rather a record of the discovery of a wide range of archaeological and historical components of the marine historic environment. The information held within these datasets is not complete and does not preclude the subsequent discovery of further elements of the historic environment that are, at present, unknown. In particular, this relates to buried archaeological features.

1.3.3.26 The interpretation of geophysical and hydrographic data is by its very nature, subjective. However, by using an experienced specialist who can analyse the form, size and characteristics of an anomaly, a reasonable degree of certainty can be achieved. Measurements can be taken in most data processing software, and whilst largely accurate, discrepancies can occur. Where there is uncertainty as to the potential of an anomaly or its origin, a precautionary approach is always taken to ensure the most appropriate mitigation for the historic environment is recommended. There may be instances where a contact may exist on the seabed but not be visible in the geophysical data. This may be due to the anomaly being covered by sediment or being obscured from the line of sight of the sonar, or due to poor quality data.

1.4 Marine archaeological assessment: submerged prehistoric archaeology

1.4.1 Geology and seabed topography

1.4.1.1 The geological processes which form a sequence of seabed deposits provide baseline information to inform an understanding of the Mona marine archaeology study areas submerged prehistoric archaeological potential. This section therefore describes the seabed geological sequence and seabed topography within the Mona marine archaeology study area, as a foundation for the sections which follow. It has been informed by a characterisation of the results of the project specific geophysical surveys, as described in section 1.3, and by relevant documentary sources.

1.4.1.2 The Mona marine archaeology study area lies within the east Irish Sea. Bedrock comprises Triassic material, including the Sherwood Sandstone Group and Mercia Mudstone Group. The Sherwood Sandstones are present in a restricted area of the west part of the Mona Array Area, with the majority of the bedrock within the Mona Array Area boundaries dominated by the Mercia Mudstone Group (Wood, 2022). This interpretation is supported by borehole/core sampling undertaken by the BGS in 2014. Different members have been identified within the Mercia Mudstone Group, including an upper member, and lower member. Faulting is common within the group, and multiple faults have been identified across the site.

1.4.1.3 Within the north part of the Mona Array Area moraines and possible esker structures have been identified, trending northeast to southwest. These structures continue to the central part of the Mona Array Area. The south area has a different character, and

shallow basins are present, with multiple phases of cut and fills evident. Prograding fans have also been identified and together the deposits and patterns of deposition indicate the presence of a former glacial lake in this area, followed later by glaciomarine environments. Grounding fans within the south part of the Mona Array Area may demonstrate a former ice-edge environment (Woods, 2022).

1.4.1.4 The site-specific geophysical survey recorded evidence of ribbed and ice-push moraines, kettle holes, floodplain terraces and flutes within the Mona Array Area (Woods, 2022). Features such as these could represent relict periglacial conditions (ice edge environments) during periods when the seabed was potentially exposed, and it is these areas that could have been exploited by early hominins.

Quaternary sequence

1.4.1.5 Sequences of Quaternary deposits have been recorded in the east Irish Sea comprising Holocene Sediments, deposits of the Surface Sand Formation; Weichselian Sediments, deposits of the Western Irish Sea Formation A (WIS-A), the Western Irish Sea Formation B (WIS-B), the Cardigan Bay Formation (CBF); Saalian to Eemain Sediments, deposits of the CBF; Saalian Sediments, deposits of the St George's Channel Formation (STG); Elsterian Sediments, deposits of the Caernarfon Bay Formation (FBF) and pre-Elsterian Sediments, deposits of the Bardsey Loom Formation (BLF).

1.4.1.6 Seismic data from the Mona Array Area demonstrates that five Quaternary units overly the bedrock, including both Pleistocene and Holocene deposits. Together these units average 5-10m thick across the site. However, there are variations in thickness across the Mona Array Area, with Quaternary deposits entirely absent in some areas, and extending to c. 50m in thickness in other areas (Wood 2022). This broadly reflects the findings of BGS sampling and seismic data within the Mona Array Area (British Geological Survey, 2014).

1.4.1.7 Holocene material varies greatly in thickness across the site, ranging from absent in places to 14m thick in the southeast. The average thickness of these deposits across the site is c. 0.5m, though the Holocene sands are absent in many places, and thickest in the southeast of the site (Wood, 2022). The absence of Holocene sands may be due to activities in the area such as fishing, trawling and aggregate dredging as evidenced in the Historic Seascape Characterisation (section 1.5.2.1).

1.4.1.8 The Quaternary sequence within the Mona Array Area is shown in Table 1.5 and full details of the deposits can be found in Wood (2022). The information presented in Table 1.5 is preliminary and will need to be verified through the proposed pre-construction geotechnical surveys.

Table 1.5: Quaternary sequence.

Unit	Lithology	Correlated Formulation	Correlated Member	Age	Depositional Environment
I	Loose to dense gravelly sand	Surface Sands	Sediment Layer 1 (SL1) Sediment Layer 2 (SL2)	Holocene	Intertidal to active marine
II	Dense to very dense gravelly sand	Western Irish Sea A	Western Irish Sea - A (WIS-A)	Devensian	Glaciomarine to Marine
III	Low to high strength clay with rare gravel	Western Irish Sea B	Lower Incision Infill	Devensian	Glaciolacustrine to Glaciomarine
IV	Low to high strength clay with rare gravel	Western Irish Sea B		Devensian	
V	Extremely high strength clay with rare gravel	Cardigan Bay	Upper Till; OR	Devensian	Glacial to Subglacial
			Bedded and Infill	Late Wolstonian/Early Ipswichian or Devensian	

1.4.2 Palaeolandscape assessment

1.4.2.1 This section characterises the potential for submerged prehistoric archaeology to be present within the Mona marine archaeology study area. For example, deposits containing archaeological material (e.g., flint tools), or submerged landscapes. This section is informed by the geophysical baseline data and desk-based review of secondary sources cited within the text.

1.4.2.2 Geological periods referred to in this section are defined by the date ranges presented in Table 1.6. Dates are referred to as BP (Before Present).

Table 1.6: Geological periods.

Period	Date Range	Notes
Holocene	10,000 BP to Present Day	Mesolithic, Neolithic, Bronze Age, Iron Age, Roman, Medieval, Post Medieval and Modern periods. The Holocene is the current time period within the larger geological time scale known as the Quaternary Period.
Devensian from Post Late Glacial Maximum to Late Glacial Interstadial	18,000 BP to 10,000 BP	Coincides with the Late Upper Palaeolithic and the early Mesolithic.
Devensian up to Late Glacial Maximum	c. 73,000 to 18,000 BP	Arrival in the UK of Late Middle Palaeolithic Neanderthals, who were followed approximately 31,000 BP by Early Upper Palaeolithic, anatomically modern humans (Homo sapiens).
Ipswichian (interglacial)	c. 130,000 to c. 115,000 BP	Last interglacial in the UK. Overlaps with the Late Middle Palaeolithic.
Wolstonian	c. 374,000 to c. 130,000 BP	Predominantly Pleistocene glaciation. Incorporates the earliest period of the Late Middle Palaeolithic.

Late Middle Palaeolithic (186,000- 45,000 BP)

1.4.2.3 Deposits representing the final glacial stage of the Wolstonian glaciation are present within the Mona marine archaeology study area, indicating that the area was subglacial during this period and therefore uninhabitable by humans.

1.4.2.4 While most deposits within the Mona marine archaeology study area are thought to relate to the Devensian and Holocene periods, Unit V may relate to deposits that are associated with the Cardigan Bay Formation, laid down during the transition into the Ipswichian Interglacial. Improvements in climate during the Ipswichian Interglacial may have allowed for environments which were more conducive to human activity. However, no such activity or deposits associated with human activity have been identified within the UK dating to this period (Marshall *et al*., 2020). The analysis of seismic data from within the Mona Array Area and evidence from the wider area therefore suggests that deposits representing environments favourable for human occupation dating to the Late Middle Palaeolithic are not likely to be present within the Mona marine archaeology study area (Jackson *et al*., 1995; Mellett *et al*., 2015; Wood, 2022).

Upper Palaeolithic (45,000-10,000 BP)

1.4.2.5 The Devensian glaciation coincides with the Upper Palaeolithic and follows the Ipswichian Interglacial, which was the last period of glaciation to affect the UK. A glacial lake lies in the south half of the Mona Array Area during this period evidenced by, the glaciolacustrine to glaciomarine deposit, Unit III which has been correlated to the WIS-B formation. The areas around lakes represent attractive environments for human habitation and the paleoenvironmental potential has been demonstrated through the recovery of floral and faunal remains within Unit III (Jackson *et al*., 1995), Palaeoenvironmental analysis of borehole samples collected from c. 10 km to the east of the Mona Array Area have also yielded pollen sequences dating to the Upper Palaeolithic (c. 34,000 BP) (Wessex Archaeology, 2013). However, the proximity of the Mona marine archaeology study area to areas of glaciation would suggest a very low potential for human occupation or activity, and therefore the presence of submerged prehistoric archaeological material, during this period.

1.4.2.6 Sea level and landscape changes within the Mona marine archaeology study area and its surrounding environments during the Upper Palaeolithic are not conclusively understood. Some studies suggest that it would have been an entirely marine environment during this time, whilst other evidence indicates that it would have been a terrestrial environment dominated by fluvial systems and related floodplains (Brooks *et al*., 2011; Jackson *et al*., 1995; Mellett *et al*., 2015; Fitch *et al*., 2011). The West Coast Palaeolandscape Study supports the latter in finding that areas of Liverpool Bay would have been terrestrial following the Last Glacial Maximum (LGM) and therefore capable of supporting human habitation. The date around which the final submergence of the area took place is also not conclusive, with some studies (Brooks *et al*., 2011, (see Figure 1.2)) indicating submergence of the Mona Array Area c. 13,000 BP and others arguing for c. 6000-7000 BP (Shennan and Horton, 2002).

1.4.2.7 Figure 1.2 (Brooks *et al*., 2011; EMODnet Geology, 2019) shows that at 16,000 BP the southeast areas of the Mona Array Area would have been a terrestrial environment, with final submergence occurring c. 13,000 BP. The Mona Offshore Cable Corridor would have been a partially terrestrial environment throughout the Upper Palaeolithic with final submergence only occurring c. 6000 BP. This indicates that there is a slightly higher potential for the survival of prehistoric archaeological remains within the Mona Offshore Cable Corridor, with the potential increasing with proximity to the current coastline.

1.4.2.8 The evidence from the geophysical survey data collected for the Mona Offshore Wind Project appears to support the theory as held by studies such as Brooks *et al*. (2011) and shown in Figure 1.2 that the Mona marine archaeology study area could have formed part of a terrestrial environment during these periods as suggested by the presence of a glacial lake.

1.4.2.9 If the evidence for the Mona marine archaeology study area having been a partially terrestrial environment during the Upper Palaeolithic is accepted, it may not have been a favourable environment for human exploitation. Permafrost would have been present in the area, limiting the growth of vegetation and therefore the availability of resources for human exploitation.

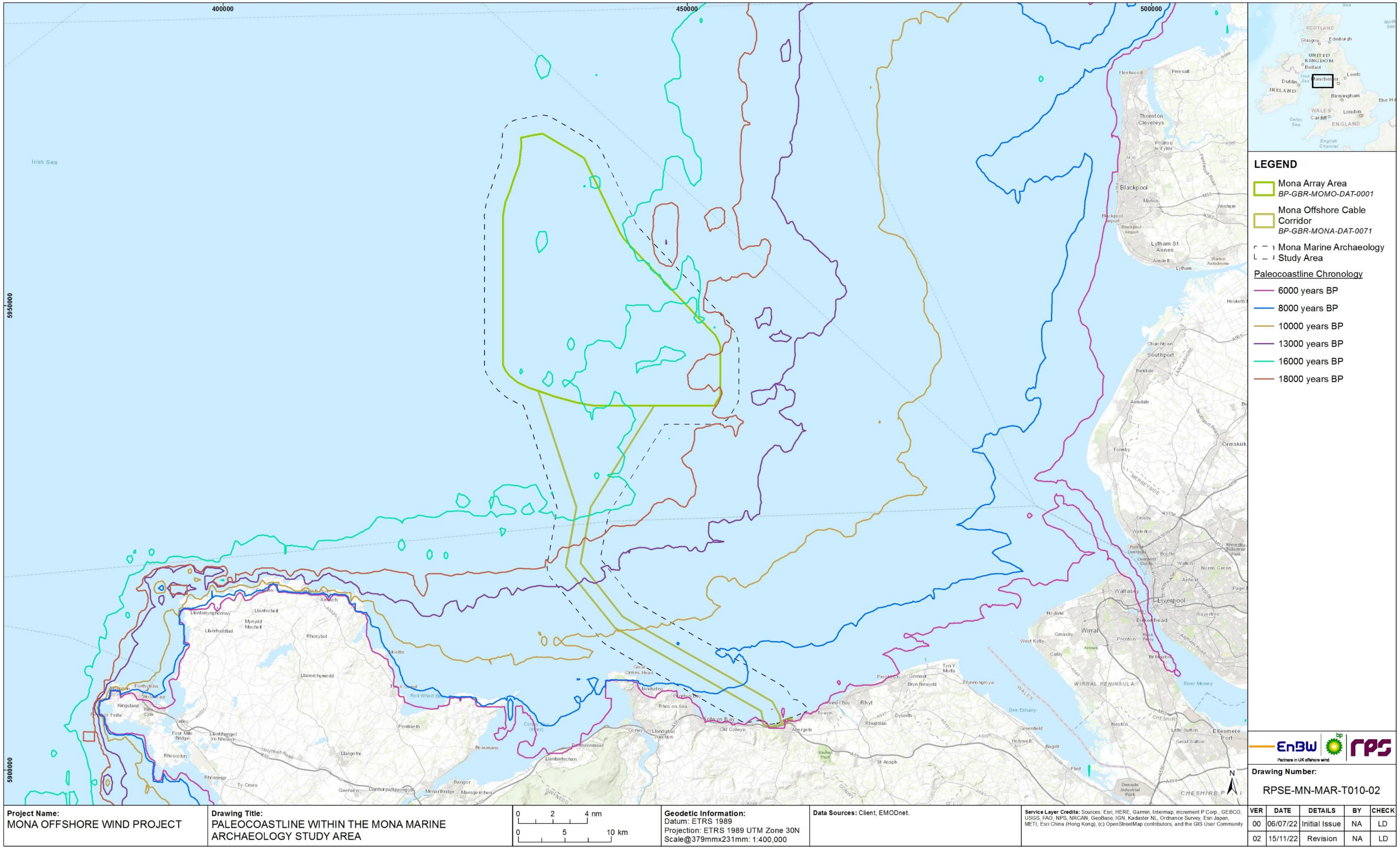

Figure 1.2: Paleocoastlines within the Mona marine archaeology study area (EMODnet Geology, 2019).

Mesolithic (10,000 – 6000 BP)

1.4.2.10 The debated chronology for the submergence of the Mona marine archaeology study area is significant for this period as if the earlier date of 13,000 BP is accepted then the area would have been fully submerged by the advent of the Mesolithic and therefore incapable of sustaining human occupation. However, if the later date of 7000 to 6000 BP is accepted then the partially terrestrial environment may well have been inhabited by humans and represent the potential for the survival of archaeological remains.

1.4.2.11 Improvements in climate conditions at this time would have brought about environments in which vegetation could thrive. Landscape modelling undertaken by the West Coast Palaeolandscape Study suggests the southeast part of the Mona marine archaeology study area was intertidal during the Mesolithic. The intertidal zone represents an environment that is rich in available resources for human exploitation, access to the sea would provide humans a food source in the form of fish and shellfish. The intertidal zone is also an environment which encourages the growth of vegetation that could be utilised for food and resources.

1.4.2.12 The SL1 and SL2 members of the Holocene Surface Sands Formation have been correlated to Unit I and represent the final marine transgression of the Irish Sea. The SL2 member is interpreted as intertidal to marine. Peat within the SL2 member was identified in a BGS borehole c. 30km south of the site (70/07) which is believed to represent a reed swamp dating to 9200 BP (Jackson *et al*., 1995 and Mellett *et al*., 2015). These indicate the potential for both paleoenvironmental and archaeological remains to be present.

Mona Offshore Cable Corridor

1.4.2.13 A similar geological sequence can be inferred for the Mona Offshore Cable Corridor, although it should be noted that there will be a greater potential for peat closer to shore and therefore the potential for the survival of archaeological material will be higher. Data collected from the geophysical surveys and supported by studies such as Brooks *et al*, 2011 (Figure 1.2) also appears to support the theory that the Mona Offshore Cable Corridor would have been part of a terrestrial environment up until 6000 BP. This increases the potential for the survival of archaeological remains within the Mona Offshore Cable Corridor.

1.5 Marine archaeological assessment: maritime and aviation archaeology

1.5.1 Maritime archaeological potential

1.5.1.1 The maritime archaeology of the UK is the product of a complex interplay of constantly evolving coastal and marine activities, international links and patterns of shipping, and sea use since the earliest human occupation of the UK during the late Palaeolithic to modern periods. This section reviews the potential presence of maritime archaeology within the Mona marine archaeology study area associated with these maritime activities, such as ship and aviation wrecks and associated material. Military remains are also covered within the scope of maritime archaeology considered in this section.

1.5.1.2 Through this section, the maritime archaeological record of the Mona marine archaeology study area has been considered chronologically for the following broad temporal phases as described in Table 1.7. However, as the survival of maritime archaeological evidence during the Palaeolithic and Mesolithic is extremely rare, these chronological periods have been considered under the term Early Prehistoric.

1.5.1.3 Records of known wreck sites and losses in UK waters are biased towards the Post-Medieval and Modern periods and therefore the precise locations of most wrecks pre-dating these periods in UK waters are not known. The majority of known and recorded wreck sites lie relatively close to the coast. The proximity of many historical sailing routes to the coast and the natural hazards of the east Irish Sea can be expected to have been a determining factor in many maritime casualties in the past (Wessex Archaeology, 2008).

1.5.1.4 Archaeology is considered in terms of periods that represent timeframes which are defined and categorised by the culture of the people of the time, notable changes in culture and activities are indicated by changes in chronological periods. Dates are referred to as BC (Before Christ), or AD (anno domini).

1.5.1.5 The chronological periods and their corresponding date ranges that are considered within the report are provided in Table 1.7.

Table 1.7: Overview of British archaeological chronology.

Period	Date Range
Palaeolithic	c. 900,000 to 12,000 BC
Mesolithic	12,000 to 4000 BC
Neolithic	4000 to 2500 BC
Bronze Age	2500 to 800 BC
Iron Age	800 BC to AD 43
Romano-British	AD 43 to 410
Early Medieval	AD 410 to 1066
Medieval	AD 1066 to 1500
Post-medieval	AD 1500 to 1800
19th century	AD 1800 to 1899
Modern	AD 1900 to present day

Early prehistory (Palaeolithic to Mesolithic)

1.5.1.6 There is currently no evidence in the UK for maritime archaeological remains pre-dating the start of the Holocene. However, there are examples from elsewhere in the world which suggest that primitive watercraft were in use by the Middle Palaeolithic period, such as the suggestion that the colonization of Australia approximately 40,000 BP involved island-hopping in or on primitive watercraft (Lourandos,1997).

1.5.1.7 During the Late Upper Palaeolithic (approximately 12,000 BC), it is possible that simple watercraft such as log boats or rafts were used for coastal journeys and fishing

within the British Isles (Wessex Archaeology, 2007b and Dunkley, 2016), however no evidence of Palaeolithic sea-faring craft is currently known.

1.5.1.8 The first archaeological evidence for the use of watercraft in the UK dates to the Mesolithic and is from Star Carr in Yorkshire where fragments of a wooden oar have been identified (Van de Noort, 2011 and Wessex Archaeology, 2007b). A late Mesolithic/early Neolithic burial in a partially burnt dugout canoe was found in St. Albans, Hertfordshire in 1988 (Dunkley, 2016). Finds in Germany and Denmark suggest that logboats were used for coastal journeys.

1.5.1.9 Watercraft may have been used in the rivers and estuaries during the Mesolithic for coastal journeys, fishing expeditions, and possibly longer journeys in favourable weather. The evidence of the exploitation of the coastal resource by this period suggests the possible use of watercraft during this period. They are likely to have become increasingly important to the Mesolithic inhabitants with rising sea levels. However due to the paucity of evidence and fluvial activity across the Mona marine archaeology study area, the potential for the survival of any archaeology associated with the maritime environment from the Palaeolithic and Mesolithic periods is considered low.

Neolithic and Bronze Age

1.5.1.10 No evidence of Neolithic or Bronze Age maritime activity has been recorded within the Mona marine archaeology study area.

1.5.1.11 Direct archaeological evidence for the exploitation of the marine environment and maritime activity within the Neolithic is rare and limited to logboat finds (Johnstone, 1980; Wilkinson and Murphy, 1995; Bradley *et al*., 1997) and shell middens containing the faunal remains of deep sea fish (Ellmers, 1996). Little is known of watercraft or vessels from this period and archaeological evidence of them is so rare that all examples of craft would be considered of high value, however the potential for these discoveries within the Mona marine archaeology study area is low.

1.5.1.12 The Bronze Age (approximately 2200 to 700 BC) was a period of technological innovation and of expansion of trade and exchange networks, facilitated by the introduction of new forms of boats both for ocean and coastal/riverine trade. Clear advances occurred in maritime technology during this period and an increasingly substantial maritime archaeological record allows a less speculative understanding of maritime culture than for earlier periods.

1.5.1.13 Evidence of Bronze Age maritime activity has been recorded throughout England in the discovery of a number of inland watercraft and sea faring vessels. Five sewn plank boats have been discovered at Ferriby in North Yorkshire known collectively as the Ferriby Boats. The Dover Boat is considered to be the world's oldest sea-faring boat dating to c. 3500 BC which was excavated in 1992 during the construction of the A20 road link between Folkstone and Dover. A further eight Bronze Age boats dating to 3000 BC were discovered on the outskirts of Peterborough in 2013 (The Guardian, 2013). No such examples have been recorded in the vicinity of the Mona marine archaeology study area, however it is possible that similar crafts would have been utilised to traverse the area. The potential for the discovery of maritime archaeology from the Bronze Age is considered to be low.

Iron Age and Romano-British

1.5.1.14 Evidence of Iron Age maritime activity has been discovered in the form of Romano-Celtic boats which are examples of a new form of ship construction that was emerging in northwest Europe at the time. In 1962 the remains of a seagoing trading vessel named the Blackfriars boat were excavated in London (Marsden, 1994). Slightly closer to the Mona marine archaeology study area, a smaller example of a Romano-Celtic boat named the Barlands Farm boat was discovered in the Severn estuary and is considered to have also been capable of coastal and sea journeys (Lawer and Nayling 1993).

1.5.1.15 The Poole logboat is one of the largest logboats to have been discovered in Britain and radiocarbon dating has dated it to c. 295 BC, making it an excellent example of Iron Age watercraft (Poole Museum). The discovery of boats such as these indicates that maritime transport was an important part of Iron Age life, however the organic construction materials used mean that the potential for the survival of Iron Age maritime archaeology within the Mona marine archaeology study area is low.

1.5.1.16 The County Hall ship, discovered in London and dendrochronologically dated to the 3rd century AD is an example of a boat demonstrating a typically Mediterranean construction method, however the dendrochronological evidence shows that it was constructed in Britain during the Roman period (Marsden, 1974). The ship was carvel built, with the planks being held together by mortice and tenon joints. Roman maritime evidence has also been discovered in Wales, in Porth Felen, Gwynedd a lead anchor stock was recovered (Boon, 1977).

1.5.1.17 The Roman occupation of Britain was by necessity a maritime endeavour, which would have required continuous transportation of resources and people to the military and civilian sites established by the Romans. Sites such as these can be found along Liverpool Bay and therefore it stands to reason that there would have been substantial Roman maritime traffic in this area. However, as stated above, the use of organic construction materials means that the potential for the survival of maritime archaeology material from this period is low to moderate with the exception of areas where peat survives, as peat creates an anaerobic environment which facilitates the preservation of organic material.

Early Medieval and Medieval

1.5.1.18 The early medieval period marks a change in ship construction techniques evidenced within the archaeological record and coinciding with the end of the Roman occupation in the 5th century AD and an increasing Anglo-Saxon presence in the form of Norse and Danish Vikings. Influences on ship construction came from Scandinavian connections and with them the increased emphasis on clinker construction. Several examples have been discovered in Britain, including the Snape boat grave (5th to 6th century AD), the famous Sutton Hoo (7th century AD) and Graveney boat (8-9th century AD).

1.5.1.19 The Snape boat grave derives its name from its location of discovery at Snape Common, near Aldeburgh in East Anglia. It is clinker-built and about 15m long (Bruce and Mitford, 1952).

1.5.1.20 The Sutton Hoo boat burial is arguably one of Britain's most important archaeological discoveries. Found near Woodbridge, Suffolk and dating to the 7th century AD, it is a

clinker built vessel and was over 27m long. The Sutton Hoo boat burial formed part of a horde of grave goods, the study of which radically re-evaluated ideas on Anglo-Saxon technology. The Graveney boat discovered in Kent is an 8th-9th century AD clinker built vessel of about 14m in long. The Graveney boat is particularly unique in that it is an example of a trading vessel as opposed to the high-status warships of the previous examples (Fenwick, 1978). All of these boats would have been capable of sea-voyages and indicate an increase in long-distance trade and exploration during this time. A trend that continues to increase during the medieval period.

1.5.1.21 With the medieval period came a boom in maritime trade across Europe and further afield with the establishment of several trading confederations such as the Hanseatic league at this time. Trading networks across Europe expanded during the medieval period and several important trading routes emerged. Trade expanded across the Irish Sea at this time also, with Dublin becoming an increasingly important commercial port, contributing to the maritime transportation of goods through the Irish Sea.

1.5.1.22 Increased demand for goods meant that ship construction advanced rapidly during this period to accommodate larger cargoes. Examples of types of boats dating from early medieval and medieval include larger clinker-built merchant vessels called keels, cogs and possibly reverse clinker-built vessels termed hulks (Friel, 2003). Examples of trading vessels from this period include the Magor Pill, a 12th century clinker built vessel with a cargo of iron ore found on the banks of the Severn Estuary near Newport, in South Wales, and the protected wreck located at Pwll Fanog in the Menai Strait, Gwynedd. The remains of a clinker built boat with a cargo of slate which was found by divers in 1976, with subsequent research giving a probable fourteenth or fifteenth century date for the vessel (Fenwick and Gale, 1998).

1.5.1.23 The rapid technological advances in ship construction during the medieval period can also be attributed to increased military campaigns. This is particularly true in the Irish Sea where the campaigns of Edward I and Edward II against the Scots in the fourteenth century were supplied with men and resources from Ireland. Due to the large increase of maritime traffic that would have occurred in the Irish Sea during the early medieval and medieval period, the potential for the discovery of archaeological remains dating from this period is considered to be moderate.

Post medieval and modern

1.5.1.24 The post-medieval and modern periods present the greatest potential for unrecorded archaeology to be discovered. The increasing incorporation of metal structural elements into vessel designs during this period means that wrecks for the 19th and early 20th centuries are also often more visible on the seabed than their wooden predecessors. They are visible to bathymetric and geophysical survey, and also generate strong magnetic anomalies, and this greater visibility is reflected in the increased number of known wrecks (i.e. those that have been located on the seabed) in contrast to earlier periods.

1.5.1.25 International trade with ports around the Irish Sea becomes increasingly important in the post medieval period. An example of an international trade ship that was discovered in the Irish sea is the Tal-y-Bront or Bronze Bell wreck which is thought to be a Genoese wreck depicted on an Admiralty chart from the eighteenth century close to Sarn Badrig reef. The wreck was discovered in Cardigan Bay, south of the Mona marine archaeology study area with a cargo of uncut blocks of Italian Carrera marble. The wreck site has undergone several archaeological investigations and was designated in 1978 (Wessex Archaeology, 2005).

1.5.1.26 Another designated wreck from the post medieval period is located closer to the south of the Mona marine archaeology study area. The wreck of the Royal yacht Mary sank when it struck the Skerries off Anglesey in 1675. The Mary was built by the Dutch East India Company (VOC), purchased by the City of Amsterdam, and given to Charles II upon his restoration to the throne. It was used for royal duties for a year and was then employed as a transport vessel for officials between Dublin and Chester. The wreck was discovered in 1971 by divers and was designated as a protected wreck in 1974 under the Protection of Wrecks Act 1973.

1.5.1.27 Trade between England and Ireland increased during the 16th century as England produced larger quantities of coal, a resource which was scarce in Ireland. This growth in trade led to the establishment and expansion of ports such as Mayport on the Solway Firth to the north of the Mona marine archaeology study area.

1.5.1.28 During the 18th century there was also increased military activity from France, who planned a series of, ultimately unsuccessful, invasions of Ireland and Wales in 1759, 1796 and 1797. This led to a substantial increase of traffic in the Irish Sea, not just from the French but also in the form of British ships to stave off the threat of invasion and protect shipping and trade interests in the area.

1.5.1.29 From the 18th century onwards, records were kept of ship losses, with records becoming more detailed from the 19th century. Rapid industrialisation in the 18th and 19th centuries revolutionised shipbuilding, introducing technological innovation that precipitated fundamental changes in maritime technology. By the end of the 19th century with the advent of the steam engine, the introduction of iron hulls and the development of the screw propeller had wrought major transformations on ships and shipping (Lambert, 2001). Although steam and steel came to dominate shipping during the 19th century, there remained a strong local core of maritime activity around much of the coast of the UK which retained the more traditional, often wooden vessel types. The potential for the discovery of unknown maritime archaeology from the post medieval and modern periods within the Mona marine archaeology study area is high.

Modern military remains

1.5.1.30 The maritime archaeological record of the 20th century until the present day is dominated by remains associated with the two World Wars. Warships, submarines and U-boats along with cargo vessels, personnel transport vessels and aircraft, comprise the losses during this period.

1.5.1.31 The first World War saw the advent of the use of submarines in European waters, following their widespread usage in the American Civil War. Shipping activity around Britain was targeted by enemy submarines and a great number of vessels were lost this way.

1.5.1.32 During both World Wars submarine activity was extensive in the Irish Sea. There are a total of seven U-boat wrecks from the Second World War located in the Irish Sea. There are a further two Allied losses designated under the Protection of Military Remains Act 1986 present within the Irish Sea, HMS H5 and SS Rutherglen were both lost in a collision with each other off Anglesey. Closest to the Mona marine archaeology study area, the HMS H5 was lost off Anglesey after being rammed by a

British cargo ship the SS Rutherglen during U-boat manoeuvres. The submarine was mistaken for a U-boat, and all hands were lost.

1.5.1.33 Advances in maritime technology during the second World War meant an increase in naval offenses, this means that there was a substantial increase in recorded losses from this period, and therefore the potential for the discovery of unknown maritime archaeology from both World Wars is considered to be good.

1.5.2 Historic seascape characterisation

1.5.2.1 In 2009 English Heritage (now Historic England) commissioned an Historic Seascape Characterisation (HSC). An HSC follows the same principles as Historic Landscape Characterisation, and is designed to complement marine and coastal planning, this is with particular regard to the statutory responsibilities of Historic England.

1.5.2.2 The assessment of HSC furthers the principles of the European Landscape Convention by characterising 'seascape' as a subset of 'landscape' which is defined as 'an area, as perceived by people, whose character is the result of the action and interaction of natural and / or human factors' (Council of Europe, 2000: Article 1). HSC assessment is the identification and interpretation of the historic dimension of the present day coastal and marine environment (Natural England, 2012).

1.5.2.3 The Irish Sea HSC covers coastline and territorial waters of the northwest region of England, with the adjacent UK Controlled Waters. The boundaries are defined by the national border with Wales in the south, the border between UK and Isle of Man to the west, and the national border with Scotland to the north. Therefore, HSC is available for the north and west extents of the Mona marine archaeology study area only, however, it can be reasonably assumed that the areas of the Mona Marine archaeology study area that are within Welsh territorial waters can be characterised similarly. The utilisation and exploitation of the east Irish Sea has been summarised in the marine archaeological baseline (section 1.5.1).

1.5.2.4 The HSC method characterises historic trends and process that have shaped the marine archaeological environment to provide information for the sustainable management of English marine and coastal environments. The marine environment is considered in four 'levels': the sea surface, the water column, the sea floor and the sub-sea floor. The results are available in GIS compatible downloads from the Archaeology Data Service which allows key characteristics within the Mona marine archaeology study area to be identified. These are presented in Table 1.8.

Table 1.8: HSC within the Mona Marine archaeology study area.

Present broad Character Types	Present Character Sub-Types
Cultural Topography	Coarse sediment plains, fine sediment plains
Industry	Energy – hydrocarbon pipelines, hydrocarbon fields (oil and gas), renewable energy installation (wind)
	Extractive – aggregate dredging
	Processing – spoil and waste dumping,
Fishing	Fishing grounds, potting, shellfish dredging, bottom trawling
Navigation	Navigation activity – navigation routes, maritime debris
	Navigation features - navigation channels;
	Navigation hazards – maritime debris, wreck hazards, drying hazards, shoals and flats
Communications	Telecommunications – submarine cables

1.5.2.5 Historical cultural processes which have shaped the character of the Mona marine archaeology study area are predominantly related to fishing and navigation activity indicating a high presence of maritime traffic in the area and therefore a high potential for maritime archaeology.

1.5.3 Navigation hazards

1.5.3.1 In 2009 Bournemouth University (commissioned by English Heritage, now Historic England) undertook the project Mapping Navigational Hazards as Areas of Maritime Archaeological Potential. Historical records of shipwreck data were analysed in combination with areas of seabed with where sediments are conducive to the preservation of archaeological material, frequency of hydrographic surveys and high-traffic marine environments, such as around ports and harbours. These combined factors were considered Areas of Maritime Archaeological Potential (AMAPs).

1.5.3.2 Liverpool Bay, Morecambe Bay and their approaches have been considered AMAPs due to historically high maritime traffic and an offshore sandy seabed. Therefore, there is a high potential for archaeological wreck sites within and close to the Mona marine archaeology study area.

1.5.4 Maritime recorded losses

1.5.4.1 There are 121 recorded losses attributed to coordinates within the Mona marine archaeology study area. These have been recorded within the NRHE and NMRW datasets.

1.5.4.2 Recorded losses represent maritime and aviation losses that are known to have occurred in the vicinity but to which no specific location can be attributed. Recorded losses are often grouped with reference to a geographic, hydrographic or other point of reference, making the positional data of these records unreliable. However, they do provide information on the historical marine traffic of the general region and therefore the archaeological potential. Recorded losses may be attributed to unknown anomalies identified by the geophysical survey or they may be positioned outside the Mona marine archaeology study area.

1.5.5 Aviation archaeology

1.5.5.1 No aviation remains were identified within the UKHO and other datasets for the Mona marine archaeology study area during the desktop study or from the assessment of geophysical data.

Aviation archaeology potential

1.5.5.2 Thousands of military and civilian aircraft casualties have occurred in UK waters since the advent of powered flight in the early 20th century. The bulk of these are casualties of World War II and most are concentrated off the south and southeast coasts of England. However, there is evidence for substantial numbers of aircraft casualties in the east Irish Sea (Wessex Archaeology, 2008).

1.5.5.3 Whilst the aviation archaeology record is potentially very large, the ephemeral nature of aircraft wrecks ensures that many sites remain unknown and unrecorded. In addition, although records of aircraft losses at sea are extensive, they are seldom tied to an accurate position, which further complicates any assessment of the likely presence of aircraft wreckage on any particular area of the seabed.

1.5.5.4 Since World War II, despite the volume of both military and civilian air traffic, there have been few aviation losses off the west coast of England and north Wales, in the vicinity of the Mona Offshore Wind Project. The potential for post-war aircraft remains to be discovered within the Mona marine archaeology study area for the transmission assets is therefore considered to be low. Civilian aircraft wrecks are not subject to protection under the terms of the Protection of Military Remains Act 1986.

Aviation recorded losses

1.5.5.5 There are 20 recorded losses of aircraft attributed to coordinates within the Mona marine archaeology study area. As with maritime recorded losses, no specific location can be associated with these records.

1.5.6 Overview of potential

1.5.6.1 An overview of the marine archaeological potential within the Mona marine archaeology study area is presented in Table 1.9.

Table 1.9: Overview of marine archaeological potential.

Receptor	Potential	Value
Submerged prehistoric archaeology	Low	Local/Regional/National
Paleoenvironmental evidence	Low	Local/Regional/National
Early prehistoric maritime evidence	Low	National
Bronze Age maritime evidence	Low	National
Iron Age and Roman maritime evidence	Low to Moderate	National
Early medieval and medieval maritime evidence	Moderate	Regional/National
Post medieval and modern maritime evidence	Good	Local/Regional/National
Modern military remains	Good	Local/Regional/National

1.5.7 Designated, known and recorded wrecks

1.5.7.1 No designated sites have been identified within the datasets for the Mona marine archaeology study area.

1.5.7.2 The desktop study has identified 30 entries within the datasets that may indicate the presence of material of anthropogenic origin within the Mona marine archaeology study area. Of these, 18 wreck or potential wreck sites that have positions verified by the UKHO have been identified along with one find of an anchor and 11 seabed anomalies. These are shown in Figure 1.3. The UKHO data contains a high number of obstructions which may be attributed to archaeological material on the seabed.

1.5.7.3 The majority of the wreck or potential wreck sites have little to no known information associated with them and are either recorded as unknown or unnamed wrecks. There are however, five wreck or potential wreck sites that are associated with known shipwreck casualties. None of these sites are designated.

1.5.7.4 Of the five known non designated wreck sites which have been identified within the data, two are the remains of modern ships and currently considered ‘live’ by the UKHO. The *Ardlough* was a cargo ship built in Germany in 1968 which sank in 1988 after taking on water in the Irish Sea. The *Ardlough* is recorded as being located on the south boundary of the Mona Array Area, however geophysical surveys were unable to confirm its location. The *Tijl Uilenspiegle* was a Belgian fishing trawler built in 1972 and sank in 1987 under mysterious circumstances. The location of the *Tijl Uilenspiegle* has been confirmed through the site-specific geophysical survey (Mona_0076), full details of which are presented in section 1.5.8.7.

1.5.7.5 The Albanian was an iron-hulled steam ship built in Liverpool in 1870 used for Mediterranean trade during the 1870s until it collided with the Nydia whilst on route from Liverpool to Genoa on the 18 November 1877. The collision off of Great Orme resulted in the loss of both vessels and the Nydia, built 1863 in Quebec, is now also a wreck site within the Mona marine archaeology study area. The Nydia is now almost entirely buried by sand and it is believed that some damage has been caused though trawling. The Albanian was the subject of salvage operations in 1992 and is now reported to lie in three parts and to be very broken up. Both of these wrecks are located within the Mona Offshore Cable Corridor, the geophysical surveys conducted in April – October 2022 will help to establish the extent of the surviving archaeological remains at these locations.

1.5.7.6 The final non designated wreck site identified within the data is that of the *Linda Blanche,* a WWI British cargo ship that was sunk by the German submarine U-21 on 30 January 1915 while on voyage from Manchester to Belfast. There were no reported casualties. The UKHO record for the Linda Blanche (UKHO 7940) is located outside of the Mona Array Area and therefore was not covered by the geophysical survey, it remains possible that the wreck is situated at the position shown in Figure 1.3.

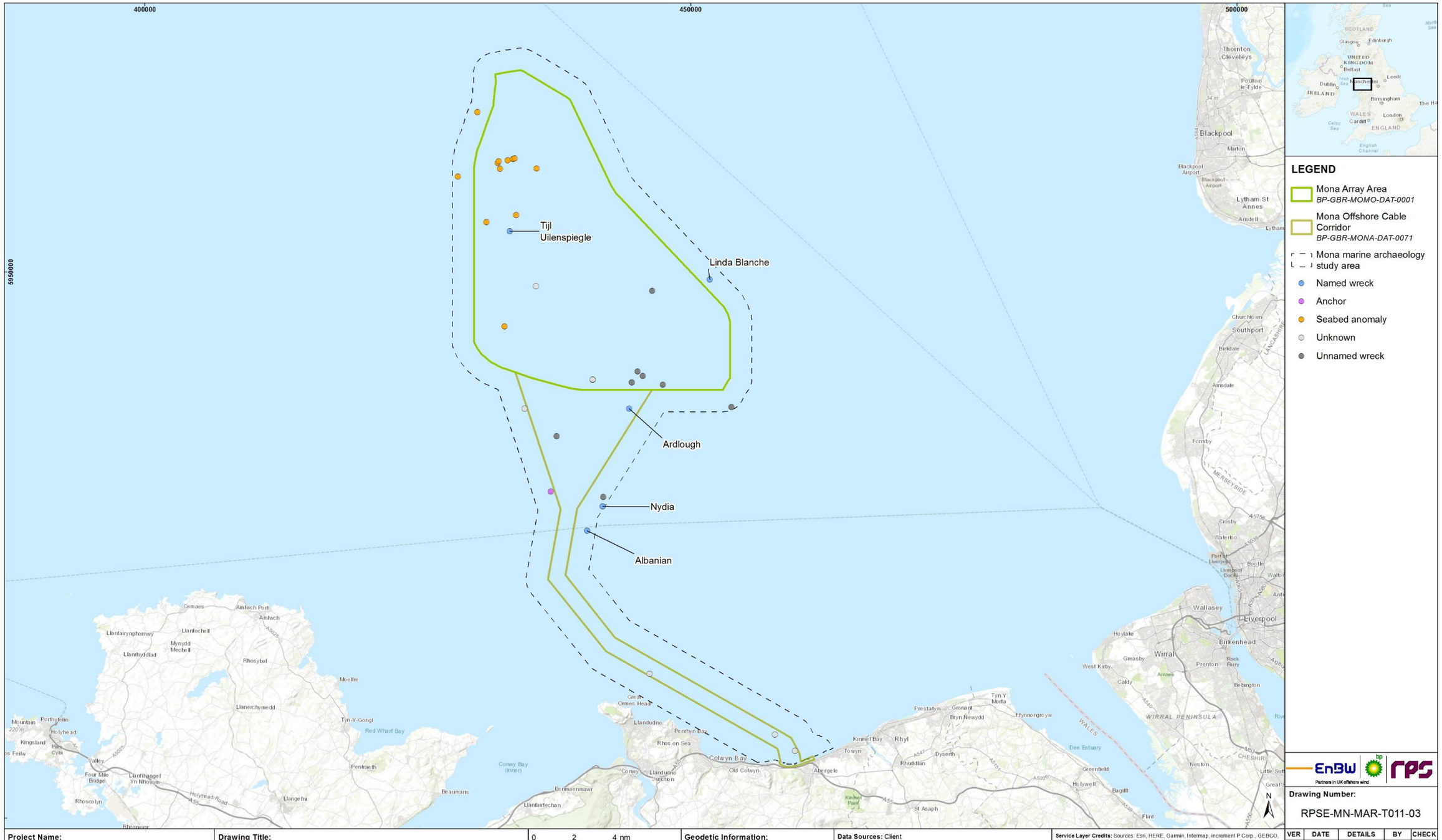

Figure 1.3: Maritime archaeology identified within the desktop data.

1.5.8 Geophysical seabed features assessment results

1.5.8.1 Geophysical data was collected for the Mona Array Area only, therefore the following sections relate only to archaeological receptors identified within the Mona Array Area. Future geophysical surveys are proposed for the Mona Offshore Cable Corridor.

1.5.8.2 49 anomalies of potential archaeological interest were identified within the Mona Array Area. Of these, five are considered to be high potential anomalies, nine are of medium potential and 35 have been classed as low potential anomalies. The distribution of these can be seen in Figure 1.4.

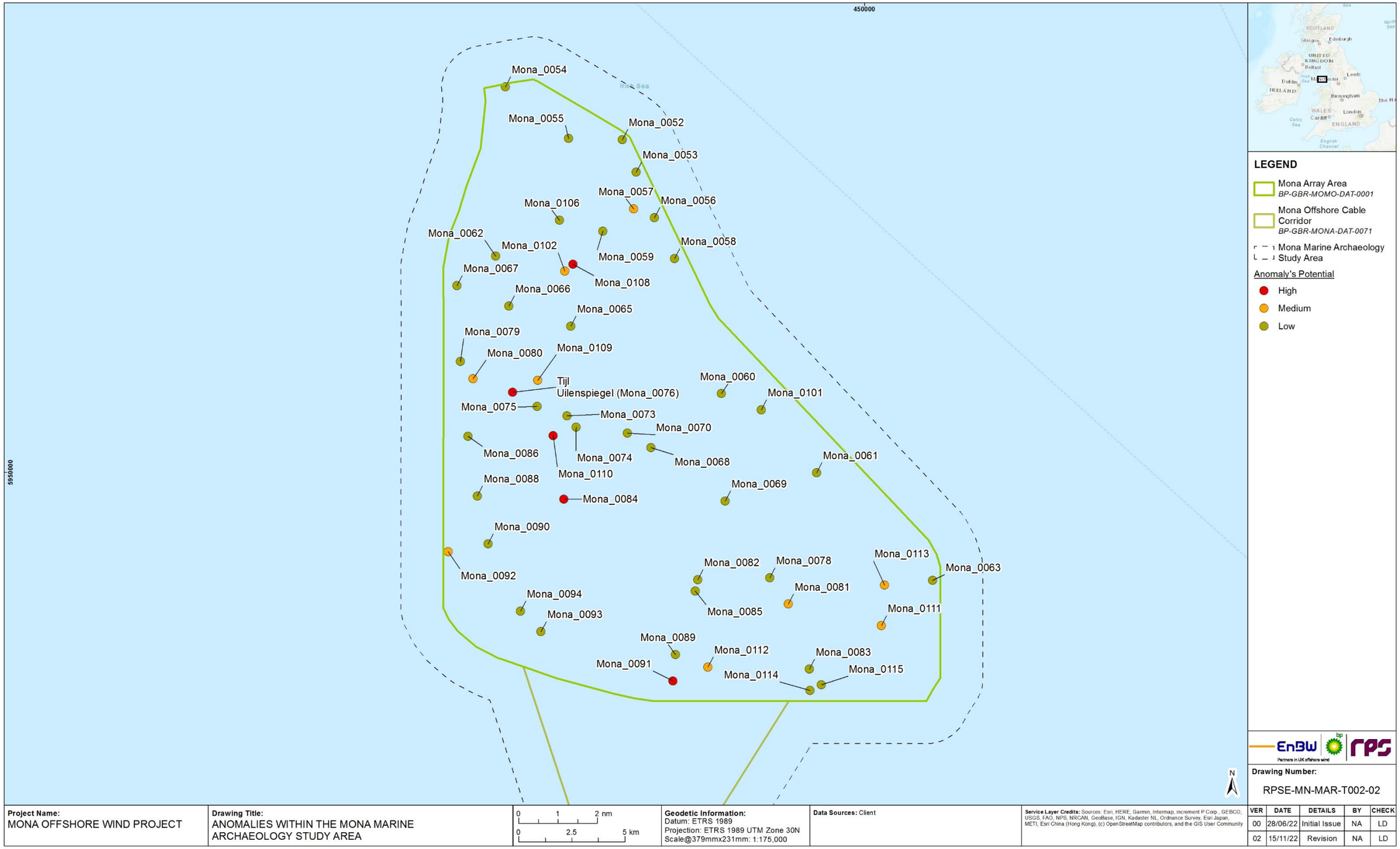

Figure 1.4: Geophysical anomalies within the Mona marine archaeology study area.

Low potential anomalies

1.5.8.3 The 35 low potential anomalies predominantly represent likely geological features, modern debris such as chain, cable or rope and linear features. None of these are considered to represent material of archaeological potential and are therefore not considered further within this report.

Medium potential anomalies

1.5.8.4 The nine medium potential anomalies are presented below in Table 1.10 and the distribution is shown in Figure 1.5. Images of the medium potential anomalies identified within the survey data are shown in Figure 1.6 and Figure 1.7.

1.5.8.5 Anomalies that could represent either geological or archaeological features have been classed as medium potential anomalies and these range from potential debris to potential wreck.

Table 1.10: Medium potential anomalies.

ID	Category	Description
Mona_0057	Anchor	Mona_0057 (Figure 1.6) lies to the north of the Mona Array Area. The anomaly covers an area 18.1m x 22.1m with a measurable height of 1.1m. The anomaly is incoherent in the SSS sonar data but has been interpreted as a potential anchor with associated debris. It is a boulder like contact with disturbance around it, there are curvilinear features indicative of chain or cable around the area. Extending from it there is a very feint seabed scar potentially indicating something dragging towards that point. This may be indicative of an anchor, or it could be snagged fishing gear, etc.
Mona_0080	Unidentified debris	Mona_0080(Figure 1.6) lies to the west of Mona Array Area, approximately midway north and south, and 1.4km from the west boundary. The anomaly measures 9.1m x 2.7m with a measurable height of 2.3m. The anomaly is similar in form to a boulder; however, the size is not consistent with others identified in the dataset.
Mona_0081	Potential debris	Mona_0081 (Figure 1.6) lies to the southeast of the Mona Array Area. The anomaly measures 11.5m x 2.2m, with a measurable height of 0.6m, and is characterised by irregular shadow. Any potential features are obscured by shadow, and there is potential the anomaly represents a geological feature. However, the form is unusual, and prominent.
Mona_0092	Potential wreck	Mona_0092 (Figure 1.6) lies to the southwest of the Mona Array Area. The anomaly measures 8.8m x 1.3m and with a measurable height of 0.5m. The form is indicative of anthropogenic debris, with irregular shadow towards the north end. The form may indicate the remains of a small, wrecked vessel.
Mona_0102	Potential debris	Mona_0102 (Figure 1.6) lies to the north, and centre, of the Mona Array Area. The anomaly is a round, prominent, feature measuring 4.9m across, with a measurable height of 1.4m. Scour, and potential smaller features, are visible around the anomaly. Whilst prominent, and unusual, in the surrounding area, there remains the possibility the anomaly is a large boulder. The position of the anomaly corresponds with a seabed anomaly previously identified within the NMRW data.
Mona_0109	Mound	Mona_0109 (Figure 1.6) lies to the east of the Mona Array Area. The anomaly is a prominent lozenge shaped mound measuring 16.6m x 5.4m with a measurable height of 1.4m. Scour extends to the east. Mounds can represent the buried remains of anthropogenic material including wrecks, and as such have the potential to be of archaeological significance. Whilst not dissimilar to other features within the dataset the majority are clearly related to other geological features through location and orientation.
Mona_0111	Potential debris	Mona_0111 (Figure 1.7) lies in the southeast corner of the Mona Array Area. The anomaly is an irregular mound measuring 12.4m x 9.6m with a measurable height of 0.7m. Scour is evident to the southeast and the north. The form, and size, is not consistent with other geological features in the area and the anomaly may indicate anthropogenic material.
Mona_0112	Mound	Mona_0112(Figure 1.7) lies in the centre of the south section of t the Mona Array Area. The anomaly is a lozenge shaped mound measuring 9.9m x 4.7m with a measurable height of 0.4m. Slight scour extends to the east.
Mona_0113	Potential wreck	Mona_0113(Figure 1.7) lies in the southeast corner of the Mona Array Area. The anomaly is a prominent mound measuring 59.1m x 27.3m. The surface of the mound is irregular with a prominent protrusion to the southeast with potential outlying features to the southwest and northwest. Whilst potentially a geological feature, the surface form may indicate anthropogenic material.

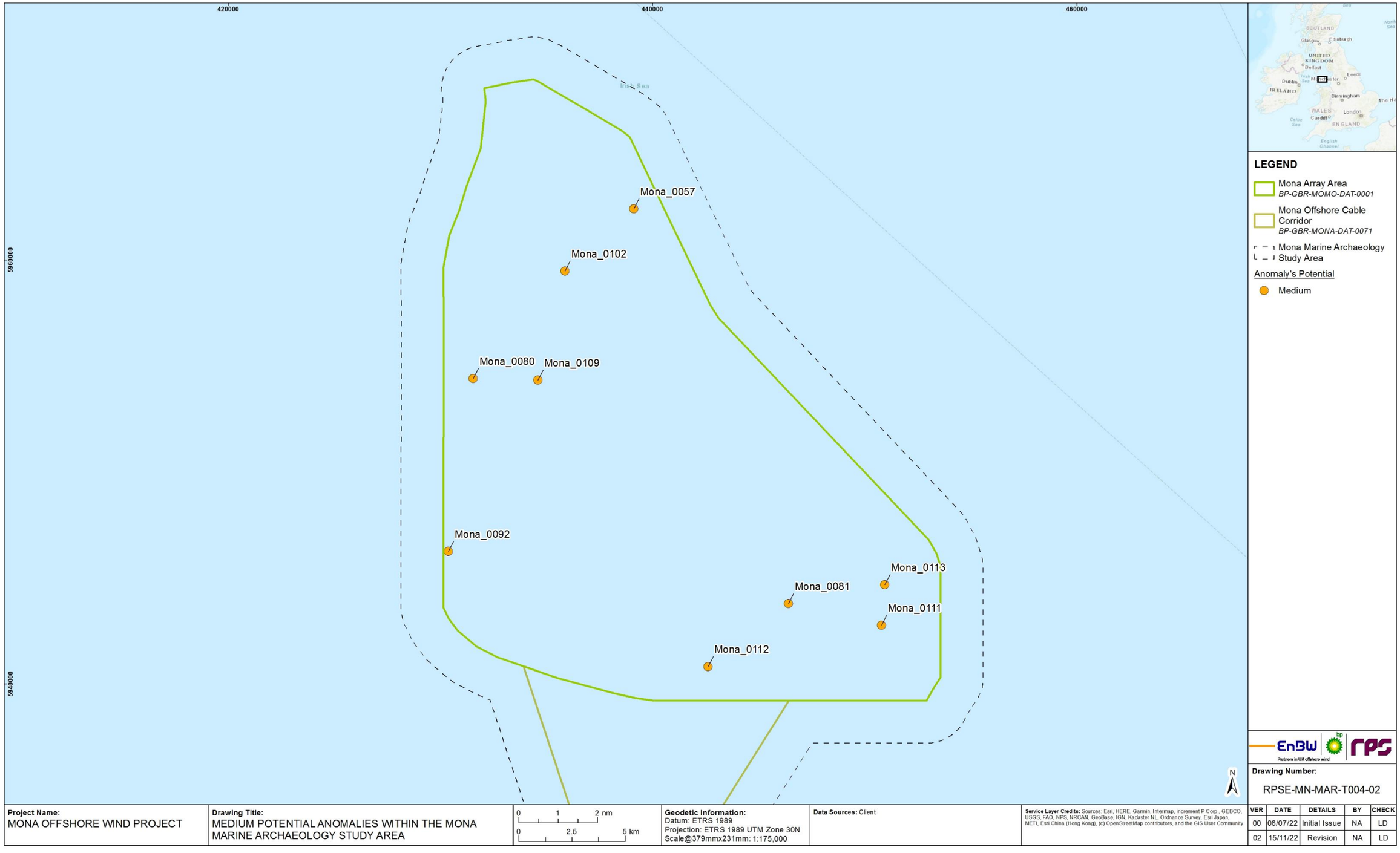

Figure 1.5: Distribution of medium potential anomalies within the Mona marine archaeology study area.

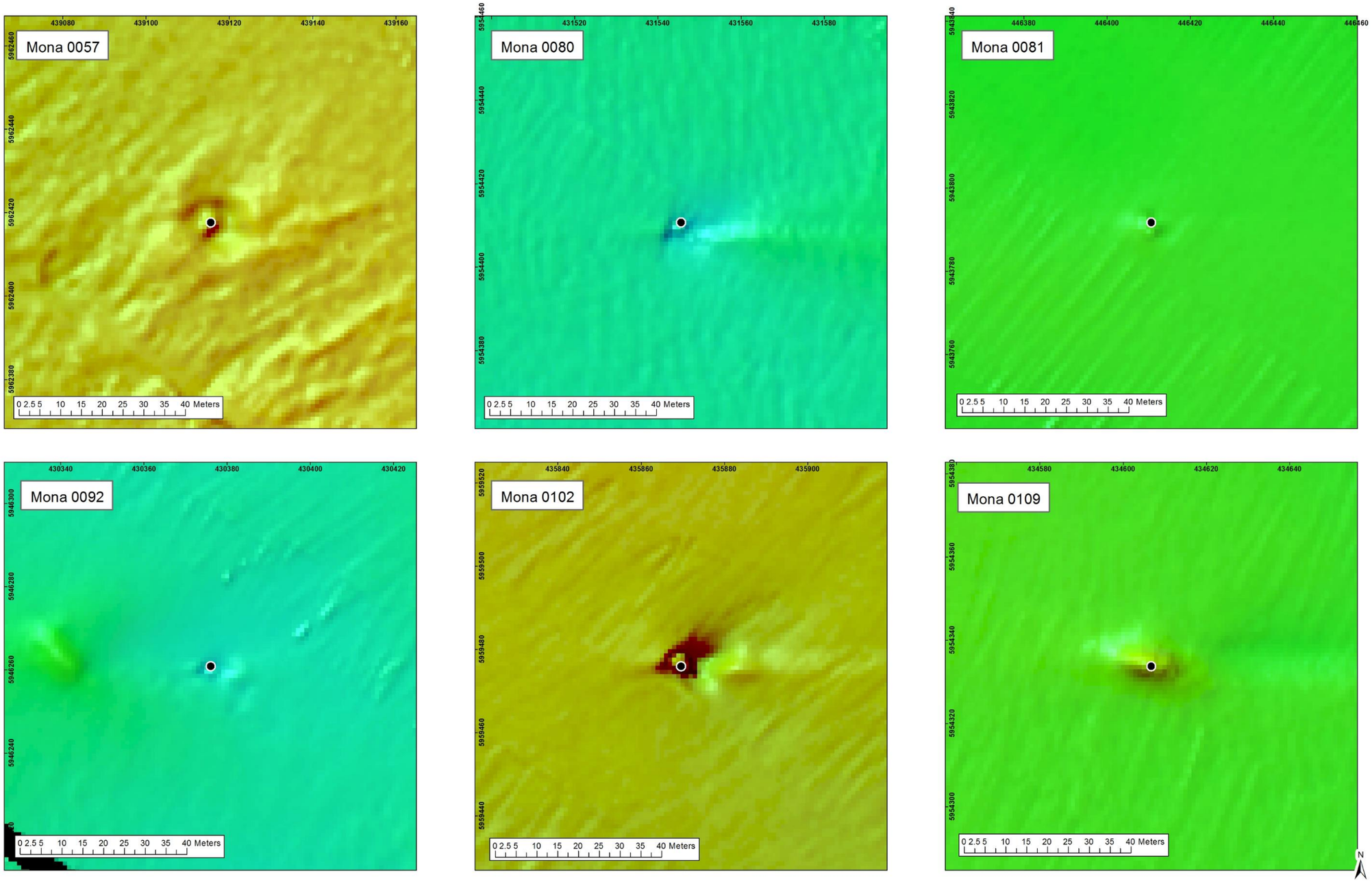

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Figure 1.6: Medium potential anomalies within the Mona marine archaeology study area.

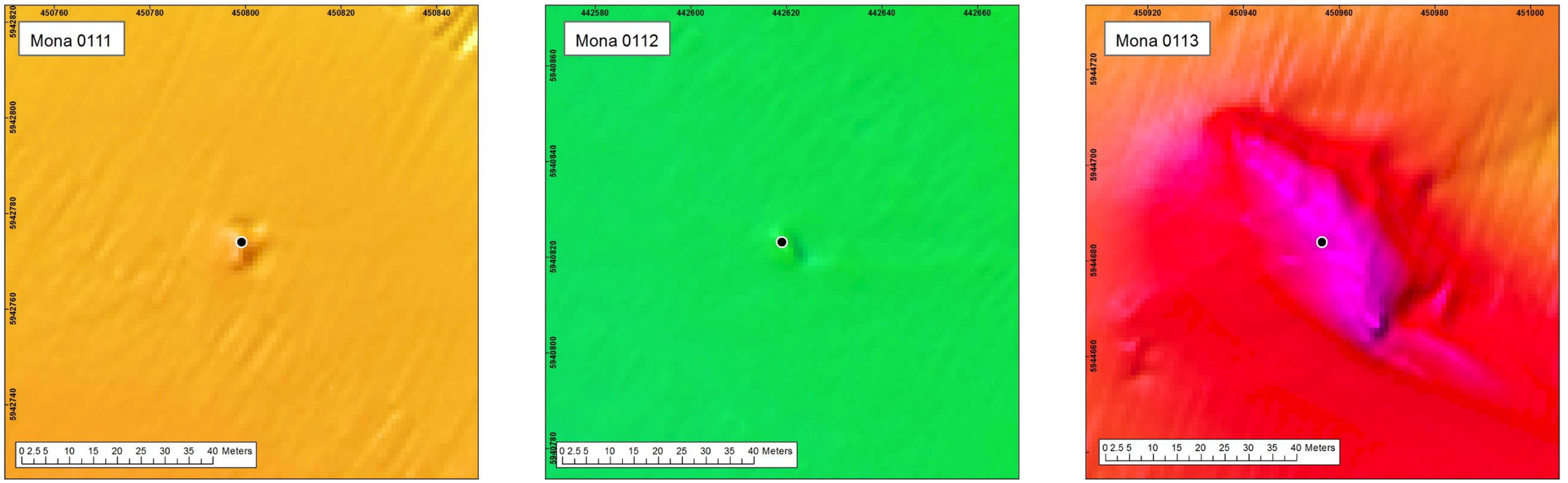

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Figure 1.7: Medium potential anomalies within the Mona marine archaeology study area.

High potential anomalies

1.5.8.6 Five high potential anomalies were identified within the Mona Array Area, three of which have also been recorded within the UKHO as discussed in section 1.5.7. The distribution of these is presented in Figure 1.8. Images of the high potential anomalies identified within the survey data are shown in Figure 1.9 and Figure 1.10.

1.5.8.7 Mona_0076 (Figure 1.9) was identified in both the SSS and MBES data and is located in the central east section of the Mona Array Area, approximately 3.3km south of the west boundary. Measuring 29.7m x 7.6m with a height of 7m the anomaly has been interpreted as a wreck and coincides with the recorded location of UKHO record 7452, the *Tijl Uilenspiegel*, a late 20th century Belgian fishing trawler that was lost in 1989 and subsequently identified in 2000. The *Tijl Uilenspiegel* now lies on its port side with some associated debris, namely the vessel's trawl gear.

1.5.8.8 Mona_0084 (Figure 1.9) was identified in both the SSS and MBES data and is located in the southwest extent of the Mona Array Area. Prominently visible in the survey data Mona_0084 measures 15.8m x 5.4m with a height of 2.8m and is interpreted as a wreck that coincides with UKHO record 8162, NMRW record 518452 and NRHE record 909485. Diver investigations in 1991 recorded the wreck as the remains of a small lightship with a double ended hull. The survey data appears to show evidence of collapse of one end of the lightship. It is likely that this wreck dates from the post medieval or modern period.

1.5.8.9 Mona_0091 (Figure 1.9) was identified in both the SSS and MBES data and is located in the south extent of the Mona Array Area and is interpreted as a wreck corresponding to the UKHO record 7969, NMRW record 240670 and NRHE record 909482 of an unidentified steam ship. The wreck measures 37.1m x 5.1m and has a height of 5.8m and shows evidence of degradation. The wreck site was dived in 2000 and reported to be intact, a small bell and pottery dating to 1906 were recovered, indicating that the date of loss must be post 1906 and potentially associated with World War I.

1.5.8.10 Mona_0108 (Figure 1.10) was identified within the MBES data but not the SSS data and is located in the centre of the north of the Mona Array Area and has been interpreted as an area of anthropogenic debris. No UKHO, NRHE, or NMRW records are associated with its position. The area of debris may represent a wreck site and consists of three distinct features; the most prominent feature is an area of irregular debris measuring 29.6m x 23.4m. Approximately 60m to the southeast lies an isolated linear feature measuring 14.1m x 1.8m, and approximately 30m to the north lies an isolated piece of debris measuring 3.1m x 3.4m. There is a high potential for Mona_0108 to be of archaeological interest due to the size, form and distribution of the material.

1.5.8.11 Mona_0110 (Figure 1.10) was identified within the MBES data but not the SSS data and is located in the east extent of the Mona Array Area and has been interpreted as an area of anthropogenic debris. No UKHO, NRHE, or NMRW records are associated with its position, however NRHE records 102663 and 1027034 are located <300m south of this position and are recorded as seabed obstructions. Mona_0110 may represent a wreck site and covers an area 34.8m x 9.7m, with a measurable height of 1.0m. To the northeast is a prominent linear feature measuring approximately 22m, with at least two mounds lying alongside to the southwest. To the northwest is a further mound. The overall form, and distribution of features is consistent with that of a wrecked vessel.

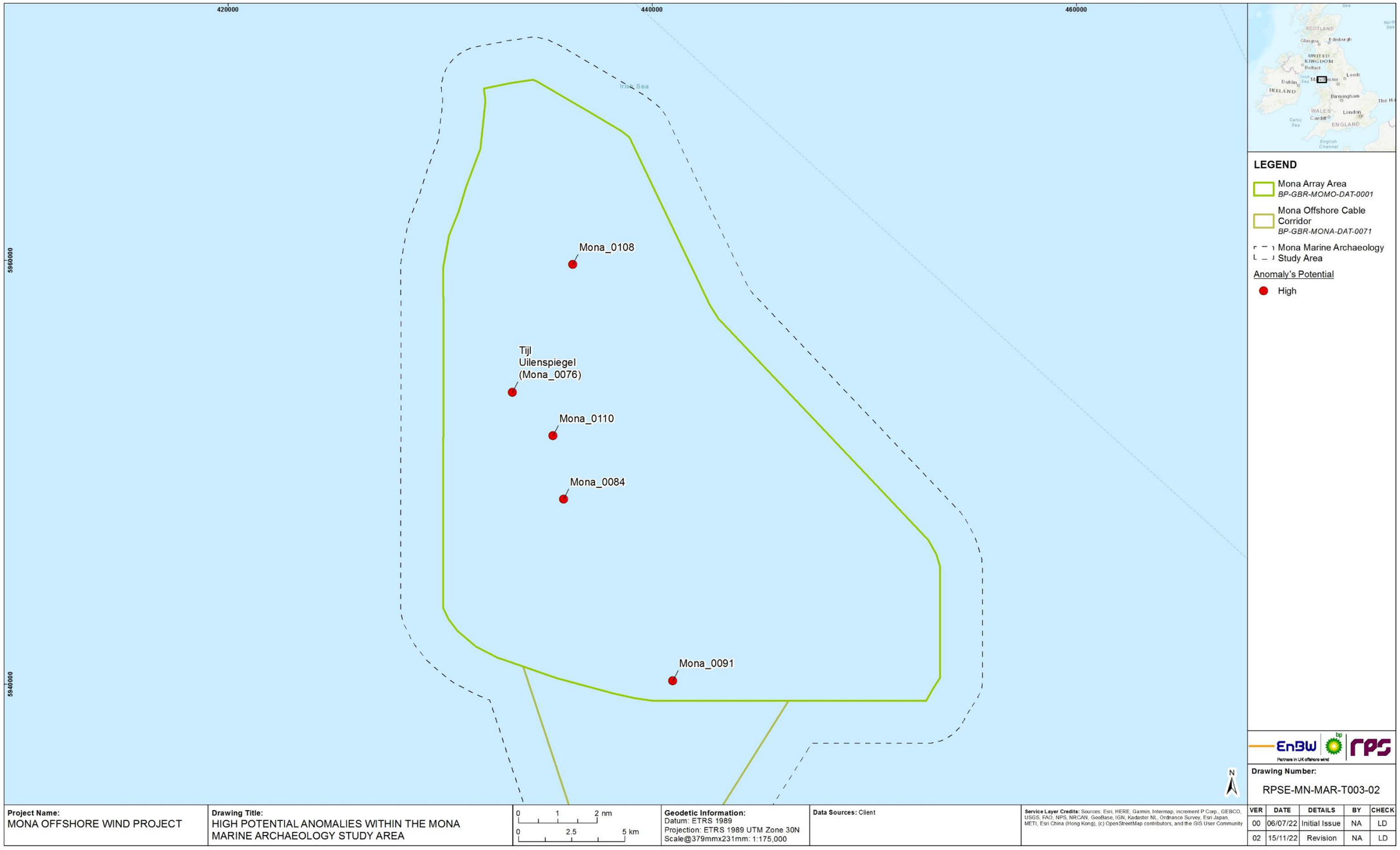
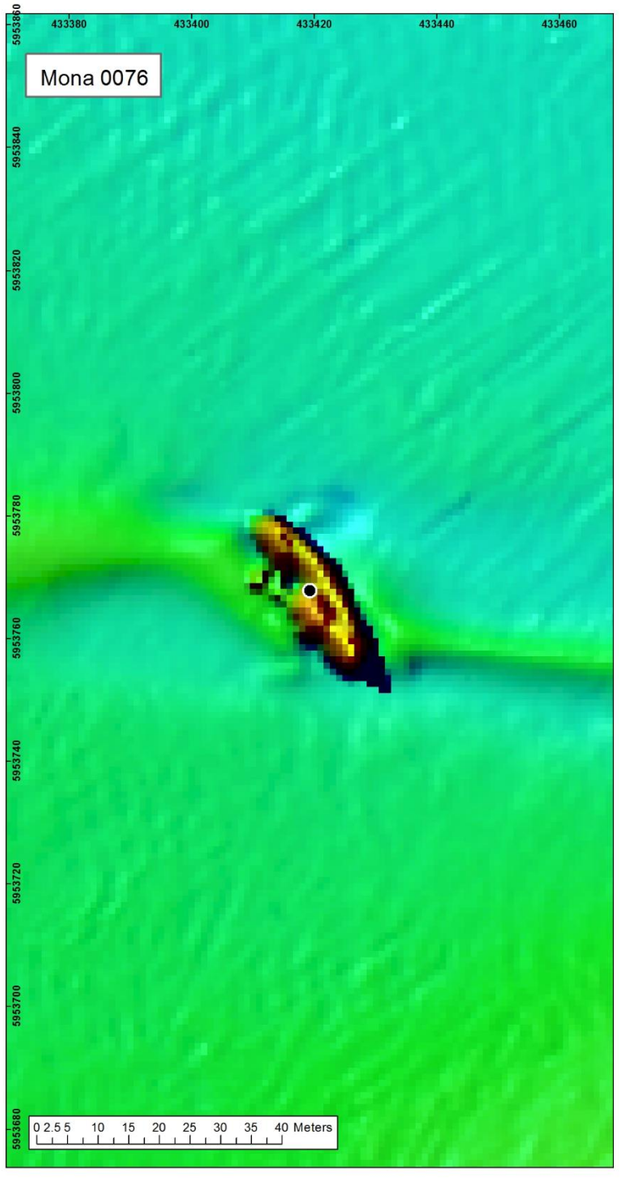
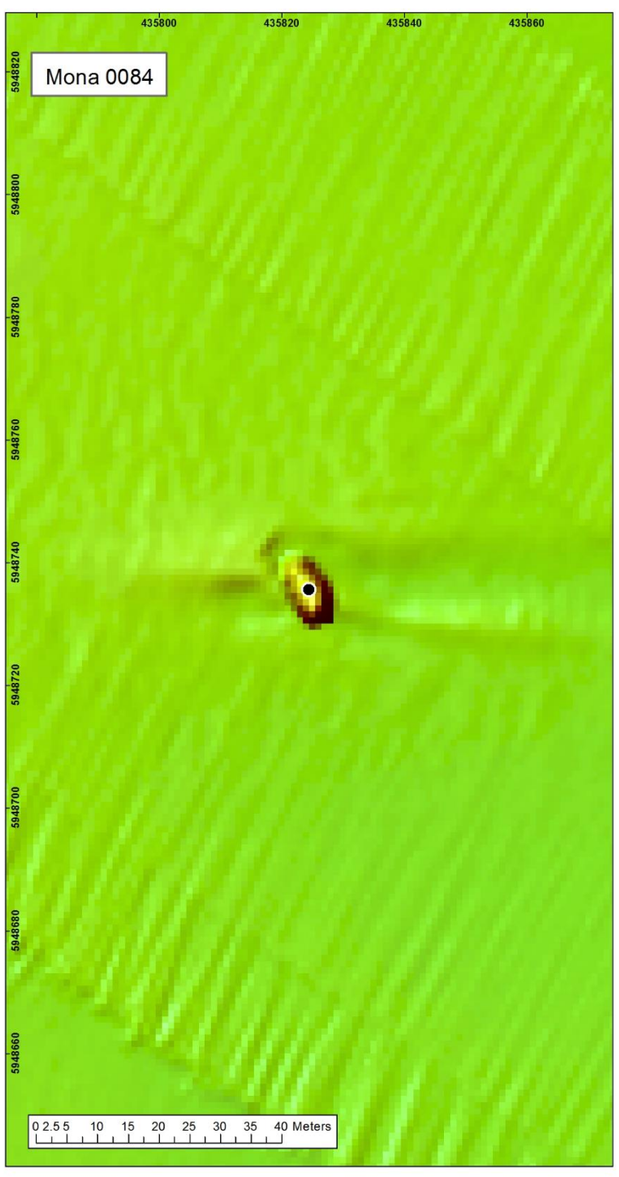
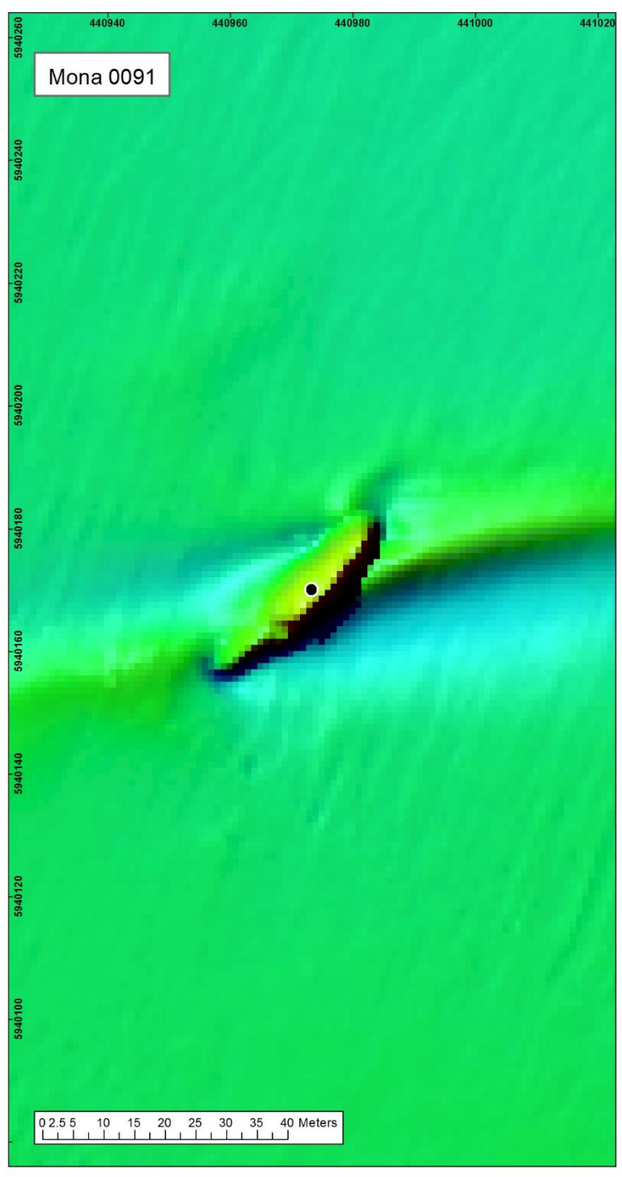


Figure 1.8: Distribution of high potential anomalies within the Mona marine archaeology study area.







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- Archeological Anomaly

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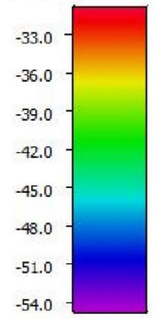

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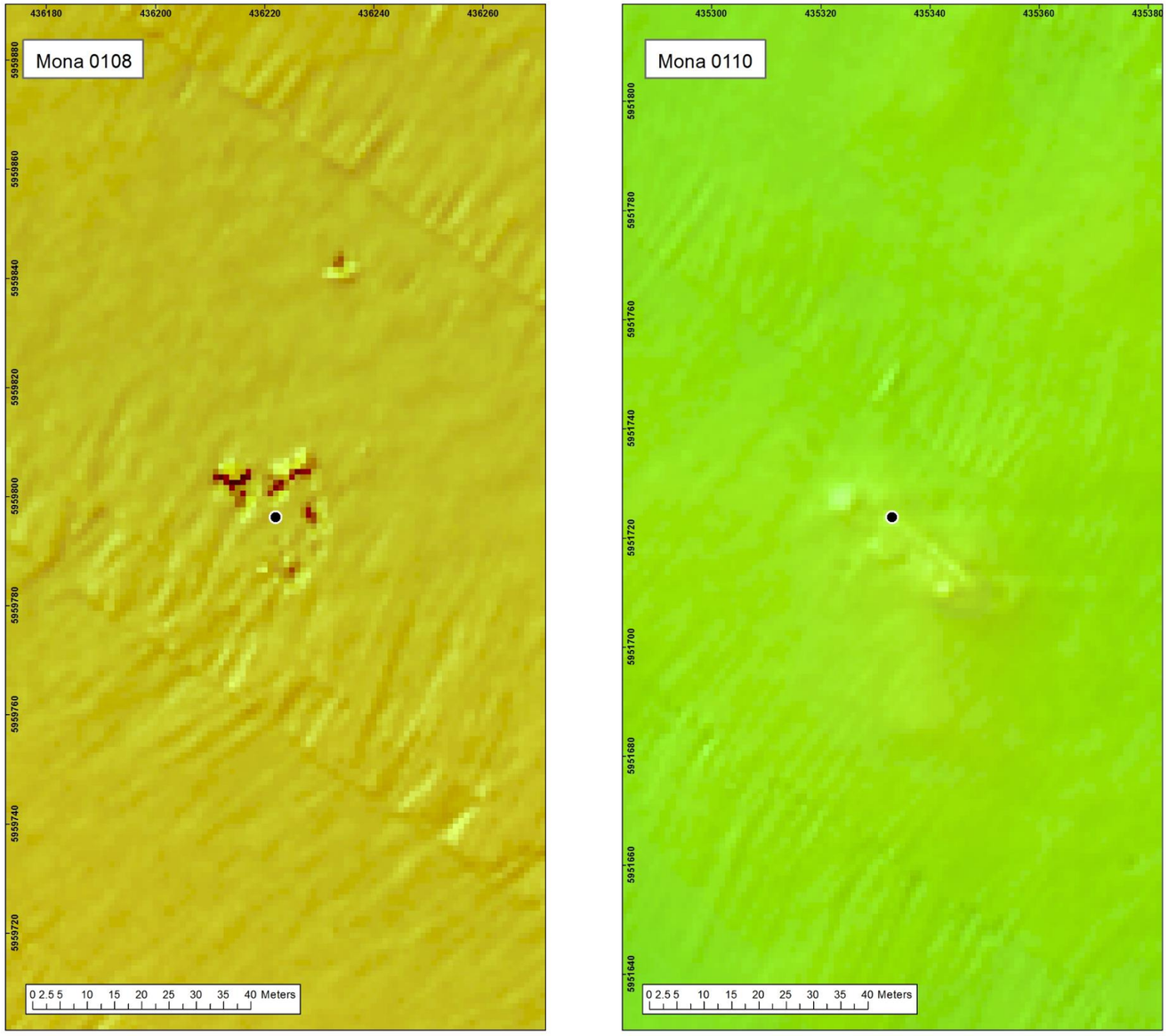
Figure 1.9: High potential anomalies within the Mona marine archaeology study area.



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- Archeological Anomaly

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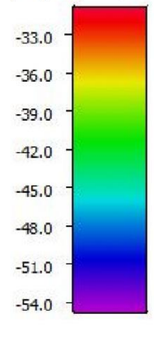

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Figure 1.10: High potential anomalies within the Mona marine archaeology study area.

1.6 Summary

1.6.1 Submerged prehistoric archaeology

1.6.1.1 The potential for the survival of submerged prehistoric archaeology within the Mona marine archaeology study area is predominantly confined to the Upper Palaeolithic and Mesolithic periods. Geophysical survey data has identified deposits that may indicate that the south and southeast area of the Mona marine archaeology study area was a terrestrial environment during these periods. However, the environment in this area is unlikely to have been favourable for human occupation, making the potential for the survival of archaeological material low. It is anticipated that the presence of peat deposits will increase closer to shore in the Mona Offshore Cable Corridor and this may represent a higher potential for the survival of archaeological material. The current geophysical surveys and studies such as Brooks *et al*., 2011 support the theory that parts of the Mona Offshore Cable Corridor would have been part of a terrestrial environment until c. 6000 BP and therefore suitable for human activity. The proposed pre-construction geotechnical surveys will help to further characterise the nature of the prehistoric environment in the Mona marine archaeology study area.

1.6.2 Maritime and aviation archaeology

1.6.2.1 Geophysical surveys have identified five high potential anomalies and nine medium potential anomalies within the Mona Array Area. Of the five high potential anomalies, two cannot be correlated with records held by either the UKHO, NMRW or NRHE. Only one identified wreck, the *Tijl Uilenspiegel*, can be positively identified at this time.

1.6.2.2 Geophysical data is not available for the Mona Offshore Cable Corridor at this time. The desktop study has identified the potential for several archaeological receptors to be present within the Mona Offshore Cable Corridor. Potential for archaeological remains dating to the post medieval, modern periods and for remains that are associated with the World Wars to survive in this area are particularly high. The forthcoming geophysical survey data will confirm the extent of maritime and aviation archaeological material that survives within the Mona Offshore Cable Corridor.

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Appendix A: Gazetteer of maritime archaeology identified within the desktop data

UKHO	NRHE	NMRW	X	Y	Name	Description
7922			459543.3616	5906155.065	Unknown	Wreck
8279			457687.3235	5907652.734	Unknown	Wreck
8175			446220.7432	5913207.212	Unknown	Wreck
8347	906836	271774	440489.1722	5926317.466	Albanian	The Albanian was an iron-hulled steamship built by T Royden & Sons, Liverpool, in 1870. Technical and configuration specifications are given as 1417gt, 919nt; 291ft length x 31ft depth x 22ft depth; screw propulsion powered by an inverted compound engine
6852	271604		441918.122	5928554.656	Nydia	The Nydia was a wooden barque built by Valin at Quebec in 1863. Technical and configuration specifications are given as 834nt, 163ft length x 33ft 8in breadth x 22ft 3in depth; partially fastened with iron bolts; sheathed in felt and yellow metal.
	906866		441917.4868	5928555.648	Unknown	The remains of a British sailing vessel
		240916	441993.5099	5929408.647	Unnamed wreck	Post Medieval
6789			437172.1552	5929919.026	Find	Anchor
		506869	437700.6266	5934976.894	Unnamed wreck	Post Medieval
	909480	272253	434781.5946	5937486.664	Unknown	The remains of a vessel
7004			444342.1	5937501	Ardlough	The Ardlough was a cargo ship built in Germany in 1968 which sank in 1988 after taking on water in the Irish Sea.
7940	909397	271270	451724	5949341	Linda Blanche	A British cargo ship in 1914. The vessel was sunk by the German submarine U-21 on 30 January 1915 while on voyage from Manchester to Belfast. There were no reported casualties.
			453724.3	5937636	Unnamed wreck	Wreck
		506879	447431.4	5939710	Unnamed wreck	Wreck
7356	909481		444575.6	5939896	Unknown	Obstruction / probable buried wreck
		506868	444575	5939897	Unnamed wreck	Wreck
7332	909482	240670	440992	5940149	Unknown	Steam ship/remains of a vessel
		506867	445611.4	5940503	Unnamed wreck	Wreck
		506866	445119.7	5940911	Unnamed wreck	Wreck
		525129	432950.6	5945040	Seabed anomaly	Findspot
		506877	446462.9	5948288	Unnamed wreck	Wreck

UKHO	NRHE	NMRW	X	Y	Name	Description
7630	909485	518452	435799.7	5948722	Unknown	Probable remains of a lightship
7563			433422.7	5953756	Tijl Uilenspiegle	The Tijl Uilenspiegle was a Belgian fishing trawler. Built in 1972 the Tijl Uilenspiegle sank in 1987 under mysterious circumstances.
		525276	431274.5	5954586	Seabed anomaly	Findspot
		525270	433998.1	5955236	Seabed anomaly	Findspot
		525259	428656.9	5958769	Seabed anomaly	Findspot
		525258	432511.7	5959463	Seabed anomaly	Findspot
		518451	435876.1	5959489	Seabed anomaly	Wreck
		525252	432318.3	5959991	Seabed anomaly	Findspot
		525257	432399.1	5960145	Seabed anomaly	Find scatter
		525254	433248.9	5960227	Seabed anomaly	Findspot
		525255	433716.8	5960372	Seabed anomaly	Findspot
		525249	433856.1	5960418	Seabed anomaly	Find scatter
		525134	430454.9	5964644	Seabed anomaly	Findspot
		525134	430454.9	5964644	Seabed anomaly	Findspot

Appendix B: Gazetteer of potential anomalies within the Mona Array Area

ID	Potential	Description	Name	UKHO	NRHE	NMRW	L	W	H	X	Y
Mona_0076	High	Wreck	Tijl Uilenspiegel	7452			29.7	7.6	7	433419.2	5953767.8
Mona_0084	High	Wreck	Lightship	8162	909485	518452	15.8	5.3	2.8	435824.4	5948735.6
Mona_0091	High	Wreck		7969	909482	240670	37.1	5.1	5.8	440973.4	5940170
Mona_0108	High	Potential wreck					93.1	45.7		436254.1	5959800.1
Mona_0110	High	Potential wreck					34.8	9.7	1	435333.1	5951723.8
Mona_0057	Medium	Anchor					18.1	22.1	1.1	439115.4	5962417.7
Mona_0080	Medium	Unidentified debris					9.1	2.8	2.3	431545.5	5954410.7
Mona_0081	Medium	Potential debris					11.5	2.2	0.6	446410.7	5943791.7
Mona_0092	Medium	Potential wreck					8.8	1.3	0.5	430376	5946260.9
Mona_0102	Medium	Potential debris					4.9	3.1	1.4	435869.6	5959476
Mona_0109	Medium	Mound					16.5	5.4	1.4	434606.8	5954333.8
Mona_0111	Medium	Potential debris					12.4	9.6	0.7	450799.2	5942774
Mona_0112	Medium	Mound					9.9	4.7	0.4	442619.1	5940823.2
Mona_0113	Medium	Potential wreck					59.1	27.3		450956.5	5944683.9
Mona_0052	Low	Potential debris					2.3	0.2	0.6	438590.2	5965679.4
Mona_0053	Low	Likely geological					3.8	4.1	0.6	439243.3	5964150.5
Mona_0054	Low	Likely geological					2.7	1.6	1.6	433065.9	5968174.1
Mona_0055	Low	Likely geological					7.1	0.8	2	436054.9	5965736.7
Mona_0056	Low	Chain, cable, or rope					89	0.4	0.1	440102.2	5962003.5
Mona_0058	Low	Potential debris					5.7	2.8	1.2	441044.3	5960071.5
Mona_0059	Low	Likely geological					3.5	1.5	1.4	437665	5961357.8
Mona_0060	Low	Fishing gear					18.6	2	0.2	443262.3	5953708.4
Mona_0061	Low	Potential debris					10.2	5	0.4	447742.3	5949982.7
Mona_0062	Low	Likely geological					29.6	3.5	1.9	432607.7	5960196.9
Mona_0063	Low	Potential debris					5.3	1	0.6	453223.1	5944907
Mona_0065	Low	Linear feature					22.8	0.1	0.1	436153.6	5956883.3
Mona_0066	Low	Linear feature					4.1	0.8	0.1	433238.3	5957837.2
Mona_0067	Low	Linear feature					19.9	0.8	0.2	430787.7	5958799.3
Mona_0068	Low	Unidentified debris					5.5	1.5	0.3	439943.1	5951162.2
Mona_0069	Low	Linear feature					14.3	0.8	0.3	443432.5	5948646.5
Mona_0070	Low	Unidentified debris					2.6	1.4	1.4	438825.4	5951842.4

ID	Potential	Description	Name	UKHO	NRHE	NMRW	L	W	H	X	Y
Mona_0073	Low	Potential debris					3.4	0.8	0.3	435984.8	5952664.9
Mona_0074	Low	Potential debris					2.2	1.3	0.4	436408.4	5952122.7
Mona_0075	Low	Likely geological					3.1	0.9	0.3	434563.7	5953111.3
Mona_0078	Low	Linear feature					19.5	0.1	0.3	445536	5945025.6
Mona_0079	Low	Fishing gear					20	0.1	0.1	430954.3	5955226
Mona_0082	Low	Linear feature					12.6	0.3	0.4	442140	5944942.9
Mona_0083	Low	Potential debris					5.7	0.4	0.5	447401.2	5940723.4
Mona_0085	Low	Likely geological					23	6.3	1.7	442029.2	5944403.6
Mona_0086	Low	Potential debris					2.6	0.6	0.4	431309.4	5951695.3
Mona_0088	Low	Likely geological					3.9	1.1	0.3	431749.4	5948889.5
Mona_0089	Low	Likely geological					13.4	0.6	0.4	441088.7	5941414.9
Mona_0090	Low	Potential debris					0.6	0.7	0.5	432251.3	5946628.3
Mona_0093	Low	Linear feature					10.3	0.4	0.1	434750.3	5942491.9
Mona_0094	Low	Potential debris					2.8	0.6	0.1	433784.3	5943463.7
Mona_0101	Low	Linear feature					23.9	0.8	0.1	445136.8	5952944.8
Mona_0106	Low	Potential debris					3.3	0.8	0.4	435616.7	5961888.1
Mona_0114	Low	Likely geological					60.7	18.5		447444.3	5939716.4
Mona_0115	Low	Likely geological					8	3.7		447964.5	5939981.3