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MONA OFFSHORE WIND PROJECT

Environmental Statement

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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.
Glaciofluvial	Erosion or deposition caused by flowing meltwater, from melting glaciers, ice sheets and ice caps.
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.
Moraines	Material left behind by a moving glacier.
Nadir	The lowest or most unsuccessful point.
Outwash plain	Sediment deposits due to meltwater outwash at the terminus of a glacier.
Palaeoenvironmental	An environment of a past geological age.
Periglacial	Ice edge environments.
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
AMAPs	Areas of Maritime Archaeological Potential
BC	Before Christ
BGS	British Geological Survey
BLF	Bardsey Loom Formation
BP	Before Present
CBF	Cardigan Bay Formation
CIfA	Chartered Institute for Archaeologists
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
FBF	Caernarfon Bay Formation
HE	Historic England
HSC	Historic Seascape Characterisation

Acronym	Description
LAT	Lowest Astronomical Tide
MCA	Maritime and Coastguard Agency
MBES	Multi-beam Echo Sounder
MLWS	Mean Low Water Springs
MNH	Manx National Heritage
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
PWA	The Protection of Wrecks Act
RoW	Receiver of Wreck
SBP	Sub-bottom Profiler
SL	Sediment Layer
SSS	Side Scan Sonar
STG	St George's Channel Formation
UHRS	Ultra High Resolution Seismic
UKHO	United Kingdom Hydrographic Office
UNESCO	United Nations Educational, Scientific and Cultural Organisation's
UNCLOS	United Nations Convention on the Law of the Sea
USBL	Ultra Short Baseline
WIS-A	Western Irish Sea Formation A
WIS-B	Western Irish Sea Formation B

Units

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

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 Environmental Statement. 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 3, Chapter 4: Historic Environment of the Environmental Statement.

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 and Mona Offshore Cable Corridor 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 and the results of Stage 1 Geoarchaeological Assessment for deposits of geoarchaeological 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 ‘Welsh waters’ is the classed as the area of sea within the limits 12 nm of the Welsh coastline. This also includes any area of sea beyond 12 nm, that is within the Exclusive Economic Zone (EEZ) and the UK sector of the continental shelf (up to 200 nm). 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), 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).

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 12 nm 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 2, Chapter 9: Marine Archaeology of the Environmental Statement.

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 (CIfA), 2014)
  - Standard and Guidance for Historic Environment Desk Based Assessment (CIfA, 2014 (updated 2020))
  - COWRIE Historic Environment Guidance for the Offshore Renewable Energy Sector (Wessex Archaeology, 2007a)
  - Offshore Renewables protocol for Archaeological Discoveries (PAD) (The Crown Estate, 2014)
  - 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 (Wessex Archaeology for The Crown Estate, 2021)
  - Principles of Cultural Heritage Impact Assessment in the UK (IEMA, IHBC and CIfA, 2021)
  - Environmental Archaeology, A Guide to the Theory and Practice of Methods, from Sampling and Recovery to Post-excavation (second edition) (Historic England, 2011)
  - Marine Geophysical Data Acquisition, Processing and Interpretation – guidance notes (Historic England, 2013)
  - Guidance for Assessment of Cumulative Impacts on the Historic Environment from Offshore Renewable Energy (Oxford Archaeology, 2008)
  - Deposit Modelling and Archaeology – Guidance for Mapping Buried Deposits (Historic England, 2020).

1.3 Consultation

1.3.1.1 A summary of the key issues raised during consultation activities undertaken to date specific to marine archaeology is presented in Table 1.1.

Table 1.1: Summary of key consultation topics raised during consultation activities undertaken for the Mona Offshore Wind Project relevant to marine archaeology.

Date	Consultee and type of response	Issues raised	Response to issue raised and/or where considered in this technical report
May 2023	British Oceanographic Data Centre (BODC)	Geophysical anomaly Mona_0113 confirmed as an old wooden sailing ship. A H102	UKHO data monitored to include UKHO ID when available.

Date	Consultee and type of response	Issues raised	Response to issue raised and/or where considered in this technical report
		report has been made to the United Kingdom Hydrographic office (UKHO) so an official UKHO ID number may be forthcoming.	Interpretation of anomaly updated in section 1.6.8.
May 2023	Historic England (HE)	Two low potential geophysical anomalies appear to be in the English marine planning area. HE request clarification is provided if the anomalies require further investigation and whether any mitigation strategy is appropriate.	Due to refinement of project boundaries, these two low potential geophysical anomalies are no longer within the Mona Array Area. Consideration of low potential anomalies included in the Outline Written Scheme of Investigation. Formal response and engagement handled through Archaeology and Heritage Engagement Forum. Low potential anomalies are presented within section 1.6.8 and in Appendix B.
May 2023	Historic England (HE)	The wreck of *Linda Blanche* is located in the English North West Marine Plan area and was given an archaeological exclusion zone, but not included in the geophysical survey area.	Due to the refinement of the Mona Offshore Wind Project boundaries, the wreck of *Linda Blanche* is located more than 100 m from the Mona marine archaeology study area and is therefore not included in this assessment further.
May 2023	Isle of Man Government	The Isle of Man has acquired some shipwreck data and is being integrated into Manx National Heritage (MNH) data system. MNH expects the Environmental Impact Assessment (EIA) to exercise due diligence in this respect.	Data from the MNH Shipwreck Index was reviewed but there were no records within the Mona marine archaeology study area.
Nov 2023	Manx National Heritage	In relation to the PEIR we have no other comments to raise from a cultural heritage perspective.	Response noted.

1.4 Methodology

1.4.1 Mona marine archaeology study area

1.4.1.1 The Mona marine archaeology study area consists of the Mona Array Area and the Mona Offshore Cable Corridor up to MLWS with an additional 2 km buffer. This is shown in Figure 1.1. This was used as the search area for obtaining records from relevant archive databases. This 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.

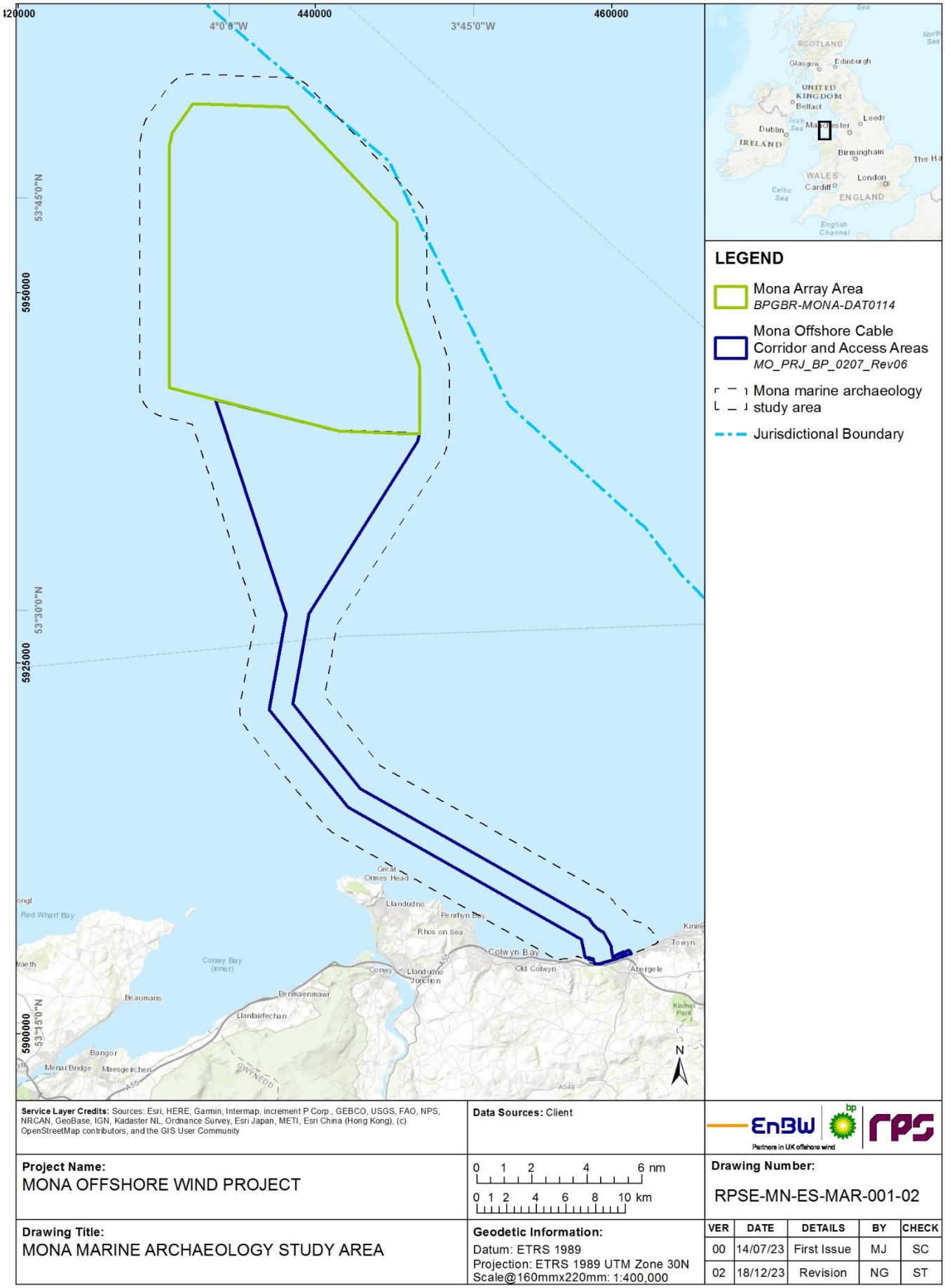

Figure 1.1: Mona marine archaeology study area.

1.4.2 Desktop study

1.4.2.1 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
- Historic Seascape Character (HSC): characterisation of the historic and present physical, environmental and human made changes and activities that have formed the seascape as it is today.

Data sources

1.4.2.2 A number of sources were consulted in order to inform the desktop study of the marine archaeology technical report and are provided in Table 1.2.

Table 1.2: Summary of key desktop sources.

Title	Source	Year	Author
Submerged Landscapes Data	EMODnet Geology	2023	British Geological Survey
UKHO Wreck and Obstructions Data	UKHO	2023	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
Historic Seascape Characterisation: The Irish Sea (English Sector)	Archaeology Data Service	2011	Historic England

Data structure

1.4.2.3 In order to compile a marine archaeological baseline for the purposes of this marine archaeology technical report, the sources relating to the maritime and aviation archaeology of the Mona marine archaeology study area were compiled into gazetteers.

1.4.2.4 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.

1.4.2.5 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.

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

- Ultra High Resolution Seismic (UHRS) data acquired with a line spacing of 250 m with cross lines every 500 m, and a vertical resolution of 1 m collected for the Mona Array Area
- Sub-bottom Profiler (SBP) data collected for the Mona Array Area
- Innomar Sub-bottom Profiler (SBP) data collected by Gardline and Pinger SBP data collected by Titan for the Mona Offshore Cable Corridor
- Shallow vibrocores from within the Mona Offshore Cable Corridor
- Boreholes from within the Mona Array Area
- Shallow Cone Penetration Test 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, the data from which has been utilised for the submerged prehistoric archaeology assessment in section 1.5. 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.
- COARS (2023). Mona and Morgan Offshore Wind Farm Stage 1 Geoarchaeological Assessment.
- Interpretation reports of the Mona Offshore Cable Corridor:
  - Gardline (2022a). Morgan and Mona OWF Mona Export Cable Routes. Ref: 11781.2 (Final)4. This covers the whole Offshore Cable Corridor and fan.
  - Gardline (2022b). Mona OWF Bodelwyddan Route 01. Ref: 11781.4. This covers the west strip of the Offshore Cable Corridor and west fan area.
  - Gardline (2022c). Mona OWF Bodelwyddan Route 02. Ref: 11781.5. This covers the central strip of the Offshore Cable Corridor and central fan area.
  - Gardline (2022d). Mona OWF Bodelwyddan Route 03. Ref: 11781.6. This covers the east strip of the Offshore Cable Corridor and crosses the central fan area.
  - Gardline (2022e). Mona OWF Bodelwyddan Route 04. Ref: 11781.7. This covers the east strip of the Offshore Cable Corridor and the eastern fan area.

1.4.2.7 Previous development led studies have also been incorporated into the assessment. Geoarchaeological review cores collected within the Walney extension offshore wind farm which lies c. 25 km to the northeast of the site (MSDS Marine, 2019), and archaeological assessments associated with the Rhiannon Offshore Wind Farm PEIR, which incorporated part of the current Mona marine archaeology study area (Wessex

Archaeology, 2012; Wessex Archaeology, 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 (Fitch *et al*., 2011) covered the south and east parts of the Mona marine archaeology study area.

1.4.3 Site-specific surveys

1.4.3.1 Survey data were collected across the pre-defined Mona Array Area of 500 km^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 SBP.

1.4.3.2 Geophysical survey of the Mona Offshore Cable Corridor was undertaken in three lots. Data were collected by Gardline between 01 April 2022 and 10 July 2022, by Titan between 07 June 2022 and 15 August 2022 and by Xocean between 25 April 2022 and 19 September 2022. The data consisted of near-full coverage by SSS, MBES, SBP, and magnetometer.

1.4.3.3 Geotechnical site investigations were conducted in 2022 by Furgo Marine Limited and Gardline within the Mona Offshore Wind Red Line Boundary. This was in the form of vibrocore and borehole sampling.

Technical specifications

1.4.3.4 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).

1.4.3.5 For the Mona Array Area, line spacing was approximately 250 m 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 1.3.

1.4.3.6 For the Mona Offshore Cable Corridor, line spacing was 250 m for the main lines and 500 m for the cross lines within the fan section. For the remainder of the Mona Offshore Cable Corridor, line spacing was 200 m. These spacings achieved 100% coverage for the MBES data, 90-95% SSS coverage between the fan section and -15 m Lowest Astronomical Tide (LAT), and approximately 80% coverage from -15 m LAT to 0 LAT. The equipment specification is shown in Table 1.4.

Table 1.3: Mobilised survey equipment for the Mona Array Area.

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

Table 1.4: Mobilised survey equipment for the Mona Offshore Cable Corridor.

Contractor	Vessel	Sidescan Sonar	Mag.	UHRS	SBP	MBES	USBL
Gardline	*Ocean Resolution*	Edgetech 4200 300/600 kHz	Geometrics G-882 10 Hz	N/A	Innomar SES-2000 Medium Parametric SBP	Kongsberg EM2040D 200-500 kHz	Kongsberg Seapath 5+
Titan	*Titan Endeavour*	Edgetech 4200 FS 100/600 kHz	Geometrics G-882	N/A	GeoAcoustics Geopulse Pinger	Reson T51-R	Sonardyne Mini Ranger 2
XOcean	XO-04, XO-05, XO-06, XO-11	N/A	N/A	N/A	N/A	Norbit Winghead B51s	N/A

1.4.3.7 The data were collected to a specification appropriate to achieve the following interpretation requirements for the Mona Array Area:

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

1.4.3.8 The data were collected to a specification appropriate to achieve the following interpretation requirements for the Mona Offshore Cable Corridor:

- Sidescan Sonar: ensonification of anomalies > 0.5 m
- Multibeam Bathymetry: ensonification of anomalies > 1.0 m
- Magnetometer (TVG): 5 nT threshold for anomaly picking
- Sub-bottom Profiler (SBP): penetration of up to 10 m was achieved
- Pinger (SBP): penetration of up to 10 m was achieved
- All data were collected and referenced relative to ETRS89 UTM Zone 30N.

1.4.3.9 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).

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

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

Data quality

1.4.3.12 The data collected to inform the assessment for the Mona Array Area 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.

1.4.3.13 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.

1.4.3.14 The topography and geology of the Mona Array Area 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.

1.4.3.15 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.

1.4.3.16 The data collected across the Mona Offshore Cable Corridor are of good quality overall, and in the case of MBES provided 100% coverage. SBP data were collected to a pre-determined line plan, largely providing suitable coverage and penetration for the interpretation of the palaeoenvironment. The Magnetometer data were collected to pre-determined line plan suitable for the identification of ferrous material with a peak-to-peak amplitude of 5 nT, with the minimum detection size increasing with distance from the tracklines.

1.4.3.17 The data is considered of an appropriate specification, coverage and quality, to undertake a robust archaeological assessment to inform the EIA process, noting that additional data collection and interpretation will be required prior to construction.

1.4.3.18 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 1.5.

Table 1.5: Data deliverables.

Sensor	Deliverables
Sidescan Sonar	Navigation corrected, unprocessed high and low frequency lines (.xtf) Georeferenced mosaic at 2 m resolution (.tif) Seabed features (.csv)
Multibeam Bathymetry	Navigation corrected, unprocessed points (.pts) Georeferenced mosaic at 2 m 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)

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

Processing

1.4.3.20 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.

1.4.3.21 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.

1.4.3.22 Whilst this report focuses on those anomalies identified within the boundaries of the Mona Offshore Wind Project, the purpose of the assessment is to characterise the historic environment, and therefore all of the data collected was assessed even that which extends beyond the limits of the Mona Offshore Wind Project.

Sidescan sonar

1.4.3.23 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.

1.4.3.24 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 1.6 below.

1.4.3.25 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

1.4.3.26 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.

1.4.3.27 Navigation corrected, but unprocessed, MBES data were provided 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.

1.4.3.28 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 1.6 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 1.6: 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

1.4.3.29 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.

1.4.3.30 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.

1.4.3.31 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.

1.5 Marine archaeological assessment: submerged prehistoric archaeology

1.5.1 Submerged prehistoric archaeology potential

1.5.1.1 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.

1.5.1.2 Geological periods referred to in this section are defined by the date ranges presented in Table 1.7. Dates are referred to as Before Present (BP).

Table 1.7: 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)

1.5.1.1 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.

1.5.1.2 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. The Stage 1 geoarchaeological assessment observed a complex range of depositional environments in Unit V deposits, supporting the interpretation of the presence of a possible glacial lake (COARS, 2023). 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 Offshore Wind Project 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)

1.5.1.3 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 is located within the Mona Offshore Wind Project 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.

1.5.1.4 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 and therefore capable of supporting human habitation. The Stage 1 geoarchaeological assessment of Unit IV (confined to the north half of the Mona Array Area) indicates it comprises seven sub-units, all of which are interpreted to represent the retreat of the Irish Sea Ice Stream. The conclusion of the geoarchaeological assessment of the depositional environment of Unit IV is a distal glacifluvial system crossing an outwash plain, with sub-units representing glacifluvial channeling (COARS, 2023). The date around which the final submergence of the area took place is also not conclusive, with some studies (Brooks *et al*., 2011; Figure 1.2) indicating submergence of the Mona Array Area c. 13,000 BP and others arguing for c. 6000 to 7000 BP (Shennan and Horton, 2002).

1.5.1.5 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.

1.5.1.6 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 and glaciofluvial channels.

1.5.1.7 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.

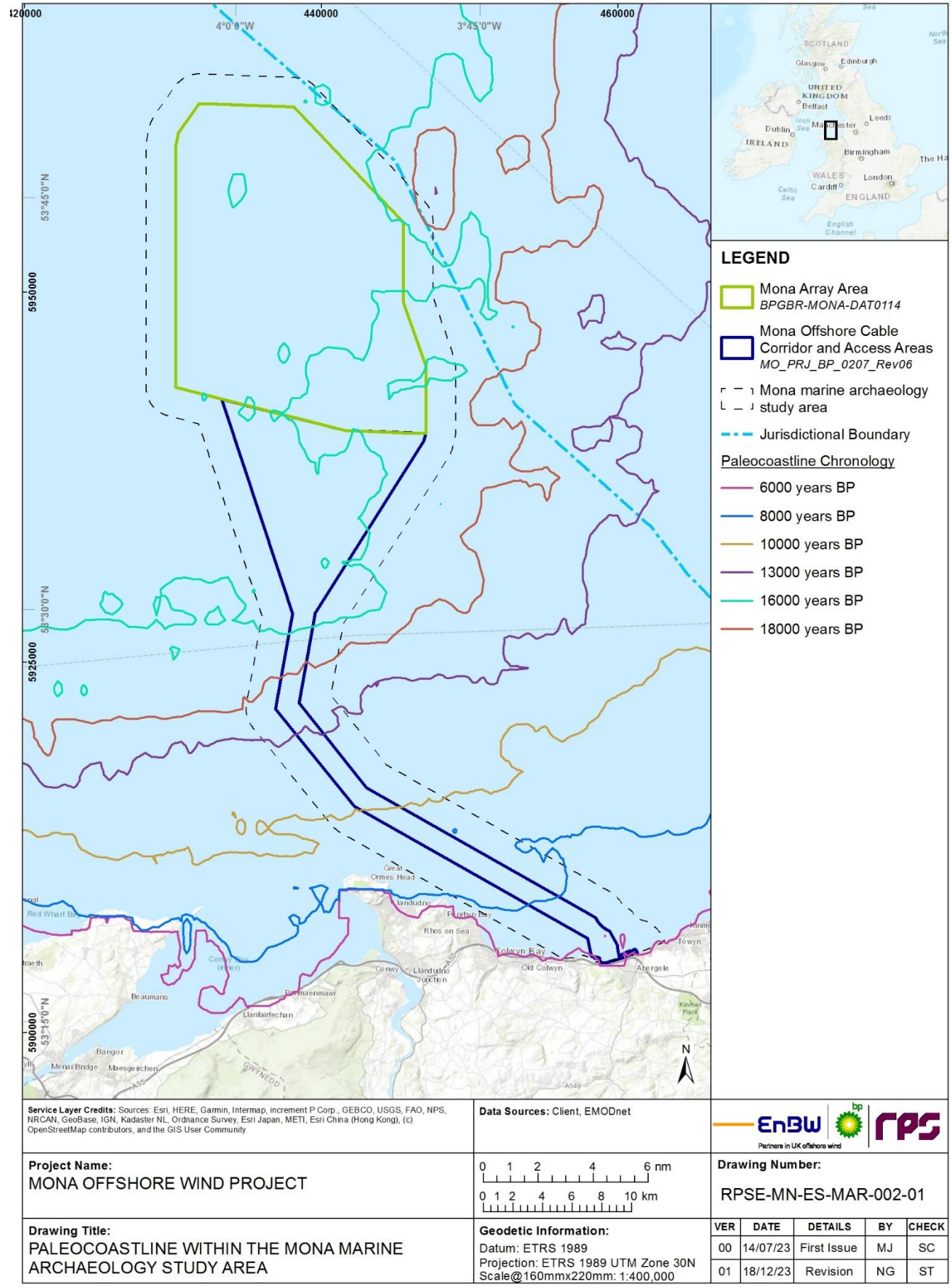

Figure 1.2: Paleocoastlines within the Mona marine archaeology study area (EMODnet Geology, 2019).

Mesolithic (10,000 – 6000 BP)

1.5.1.8 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.

1.5.1.9 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.

1.5.1.10 The Sediment Layer (SL) 1 and SL2 members of the Holocene Surface Sands Formation have been correlated to Unit I (Table 1.8 and Table 1.9) 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. 30 km 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

1.5.1.11 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 and Geotechnical 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.

1.5.2 Geology and seabed topography

1.5.2.1 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. It has been informed by a characterisation of the results of the project specific geophysical surveys, as described in section 1.4.3, and by relevant documentary sources.

1.5.2.2 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 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.

1.5.2.3 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).

1.5.2.4 The bedrock geology varies along the Mona Offshore Cable Corridor. In the fan area and the north to central portions of the Mona Offshore Cable Corridor, the bedrock consists of Triassic mudstones and hailite of the Mercia Mudstone Group as well as sandstone of the Ormskirk Formation of the Sherwood Group. The central part of the Mona Offshore Cable Corridor also contains sandstone of the St Bees Formation of the Sherwood Group. The southeast part of the Mona Offshore Cable Corridor contains undifferentiated lower Permian rocks such as sandstone, breccia, conglomerate and mudstone and gypsum-stone. The nearshore portion of the Mona Offshore Cable Corridor consists of limestones and sandstones of the Carboniferous Limestone supergroup. Faulting is common within the bedrock and multiple faults have been identified across the Mona Offshore Cable Corridor.

1.5.2.5 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). An esker structure was found within the Mona Offshore Cable Corridor. Features such as these could represent relict periglacial conditions during periods when the seabed was potentially exposed, and it is these areas that could have been exploited by early hominins.

Quaternary sequence

1.5.2.6 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).

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

1.5.2.8 Holocene material varies greatly in thickness across the site, ranging from absent in places to 14 m thick in the southeast of the Mona Array Area and the thickness increases to 20 to 30 m thick within the south part of the Mona Offshore Cable Corridor but there are bedrock outcrops in the nearshore area. The average thickness of these

deposits across the site is c. 05 m, through the Holocene sands are absent in many places, and thickest in the southeast od the Mona Offshore Wind Project (Wood, 2022). The absence of Holocene sands may be due to activities in the area such as fishing, trawling and aggregate dredging, this is corroborated by the HSC data presented in the section 1.6.2

1.5.2.9 The Quaternary sequence within the Mona Array Area is shown in Table 1.8 and for the Mona Offshore Cable Corridor in Table 1.9. Full details of the deposits can be found in Wood (2022). The units encountered in the evolving ground model were subject to a Stage 1 geoarchaeological assessment. The results of that assessment are presented in section 1.5.3 below.

Table 1.8: Quaternary sequence of the Mona Offshore Array Area.

Unit	Lithology	Correlated Formation	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	

Table 1.9: Quaternary sequence of the Mona Offshore Cable Corridor.

Unit		Lithology	Correlated Formation	Correlated Member	Age	Depositional Environment
A		Sands	Surface Sands	Sediment Layer 1 (SL1)	Holocene	Marine
B		Variable infill	Unknown	Unknown	Holocene	Channels indicate fluvial deposition within a potentially terrestrial wider environment.
C (Array Unit I)	Upper	Medium dense to dense sand with gravel	Surface Sands	Sediment Layer 2 (SL2)	Holocene	Intertidal to Marine

Unit		Lithology	Correlated Formation	Correlated Member	Age	Depositional Environment
	Mid	Dense to very dense sand				
	Lower	Dense to very dense silty sand with gravel				
D (Array Unit IV)		Low to high strength clay or sandy clay	Western Irish Sea A (WIS-A)	Western Irish Sea A	Devensian	Glacial to glaciomarine and glacial retreat
E (Array Unit V)	Vb	Low to high strength clay	Cardigan Bay Upper Glacial Lakes	Till	Devensian	Sub glacial to glacial
	Vib	High to very high strength clay	Cardigan Bay Lower Glacial Lakes			
	VIIb	Predominantly sand	Cardigan Bay Upper Till			

1.5.3 Geoarchaeological assessment

1.5.3.1 In 2022, Fugro Marine Limited and Gardline were commissioned to undertake geotechnical site investigations within the Mona Offshore Wind Project, Morgan Offshore Wind Project Generation Assets and Morgan and Morecambe Offshore Wind Farms Transmission Assets.

1.5.3.2 The coring targeted seabed and sub-seabed features that had been identified through the geophysical survey campaigns. A complete marine geoarchaeological investigation should consist of four constituent stages, following the guidance provided by Wessex Archaeology for COWRIE (2011). Stage 1 evaluation was completed in 2023 by Coastal and Offshore Archaeological Research Services (COARS). Stage 1 evaluation consists of a geoarchaeological review of core logs comprising a desk-based assessment of geotechnical core logs and recommendations as to which cores should be subject to visual inspection and recording by a geoarchaeologist.

1.5.3.3 Shallow vibrocores were sampled within the Mona Offshore Cable Corridor. None of these vibrocore samples were identified as having any geoarchaeological potential.

Deep boreholes were taken from within Mona Array Area. Based on the core descriptions, available photographs and the evolving ground model interpretation, these cores were assessed in relation to their geoarchaeological potential.

1.5.3.4 A series of proglacial, possibly lacustrine/fluvial deposits, have been identified within several of the Units identified within the ground model. These offer the potential to be dated, and therefore improve the chronology of the timing of Devensian glacial advance and retreat. Stage 2 geotechnical analysis will also provide information on the presence of a submerged palaeolandscape, within the region, as well as provide palaeoenvironmental information. This will help improve the classification of these features and provide additional refinement to the evolving ground models.

1.5.3.5 The boreholes held no evidence to suggest human occupation of the area and therefore any potential for the survival of prehistoric archaeological material. However,

a series of sub-glacial and pro-glacial landscape features and deposits were identified. These have the potential to provide evidence that will lead to a better understanding of the late Devensian dynamics of the Irish Sea Ice Stream, including the timing of ice retreat within the east Irish Sea region.

1.5.3.6 Following the Stage 1 geoarchaeological assessment, five boreholes have been recommended for Stage 2 geoarchaeological recording. The results of which will continue to be disseminated post-application to inform the knowledge base.

1.6 Marine archaeological assessment: maritime and aviation archaeology

1.6.1 Maritime archaeological potential

1.6.1.1 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.

1.6.1.2 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 1.10. 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.

1.6.1.3 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).

1.6.1.4 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 Before Christ (BC), or anno domini (AD).

1.6.1.5 The chronological periods and their corresponding date ranges that are considered within the report are provided in Table 1.10.

Table 1.10: 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

Period	Date Range
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)

1.6.1.6 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).

1.6.1.7 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; Dunkley, 2016), however no evidence of Palaeolithic sea-faring craft is currently known.

1.6.1.8 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; 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.

1.6.1.9 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

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

1.6.1.11 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.

1.6.1.12 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.

1.6.1.13 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

1.6.1.14 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).

1.6.1.15 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, which is currently located at the 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.

1.6.1.16 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).

1.6.1.17 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

1.6.1.18 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 to 9th century AD).

1.6.1.19 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 15 m long (Bruce-Mitford, 1952).

1.6.1.20 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 27 m 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 to 9th century AD clinker built vessel of about 14 m 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.

1.6.1.21 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.

1.6.1.22 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).

1.6.1.23 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

1.6.1.24 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. 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.

1.6.1.25 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).

1.6.1.26 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.

1.6.1.27 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.

1.6.1.28 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.

1.6.1.29 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

1.6.1.30 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.

1.6.1.31 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.

1.6.1.32 During both World Wars submarine activity was extensive in the Irish Sea. There are a total of seven U-boat wrecks from World War II (WWII) 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.

1.6.1.33 Advances in maritime technology during WWII 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 high.

1.6.2 Historic seascape character

1.6.2.1 In 2009 English Heritage (now Historic England) commissioned an Historic Seasscape Character project.. 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.

1.6.2.2 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). HSC assessment is the identification and interpretation of the historic dimension of the present day coastal and marine environment (Natural England, 2012).

1.6.2.3 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 very northwest 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 1.6.1).

1.6.2.4 The HSC method characterises historic trends and process that have shaped the marine archaeological environment to provide information for the sustainable management of 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 1.11.

Table 1.11: HSC within the Mona Marine archaeology study area.

Character area	Character type within the Mona marine archaeology study area	Date
Conflated	Wreck hazard	Unknown
	Shellfish dredging	Modern (AD1900 to Present)
	Fine sediment plains	Unknown
	Submarine telecommunications cable	Modern (AD1900 to Present)
	Coarse sediment plains	Unknown
Sea Surface	Submarine telecommunications cable	Modern (AD1900 to Present)
	Submarine telecommunications cable	Modern (AD1900 to Present)
	Shellfish dredging	Modern (AD1900 to Present)
	Fine sediment plains	Unknown
	Coarse sediment plains	Unknown
	Wreck hazard	Unknown
Water Column	Submarine telecommunications cable	Modern (AD1900 to Present)
	Submarine telecommunications cable	Modern (AD1900 to Present)
	Shellfish dredging	Modern (AD1900 to Present)
	Fine sediment plains	Unknown
	Coarse sediment plains	Unknown
	Wreck hazard	Unknown
Sea Floor	Submarine telecommunications cable	Modern (AD1900 to Present)
	Submarine telecommunications cable	Modern (AD1900 to Present)
	Shellfish dredging	Modern (AD1900 to Present)
	Fine sediment plains	Unknown
	Coarse sediment plains	Unknown
	Wreck hazard	Unknown
Sub-Sea Floor	Submarine telecommunications cable	Modern (AD1900 to Present)
	Submarine telecommunications cable	Modern (AD1900 to Present)
	Shellfish dredging	Modern (AD1900 to Present)
	Fine sediment plains	Unknown
	Coarse sediment plains	Unknown
	Wreck hazard	Unknown

1.6.2.5 The sub-character types can be broken down into the following categories:

- Modern installations and activities such as submarine cables

- Shellfish dredging in the modern period
- Navigation routes, both modern and post medieval
- Wrecks and maritime debris of unknown date
- Seabed types and characteristics of coarse sediment plains.

1.6.2.6 Due to the limited data available for the study area, these representations cannot be considered the totality of the HSC for the Mona marine archaeology study area. However, they do suggest the potential for evidence of modern industry and development, fishing activity and marine archaeology.

1.6.3 Navigation hazards

1.6.3.1 In 2009 Bournemouth University (commissioned by English Heritage, now Historic England) undertook the project Mapping Navigational Hazards as Areas of Maritime Archaeological Potential (Bournemouth University, 2009). 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).

1.6.3.2 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.

1.6.4 Maritime recorded losses

1.6.4.1 There are 101 recorded losses attributed to coordinates within the Mona marine archaeology study area. These have been recorded within the NMRW datasets and are listed in Appendix C.

1.6.4.2 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.

1.6.4.3 The overwhelming majority of recorded losses are Post Medieval and predominantly lost to weather. Of the vessels that were lost during the periods of both World Wars, only one, *Stanleigh* (NRHE ID 271180) was certainly sunk as a result of enemy action. Of the 101 recorded losses, only HMS *Thistle* (NRHE ID 271584) was in active military service at the time of sinking and would thus constitute a Protected Place under the auspices of the Protection of Military Remains Act 1986.

1.6.5 Aviation archaeology

1.6.5.1 No aviation remains can be positively identified within the UKHO, NMRW or NRHE datasets for the Mona marine archaeology study area during the desktop study or were identified from the assessment of geophysical data.

Aviation archaeology potential

1.6.5.2 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).

1.6.5.3 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. Therefore, the potential for aircraft dating to WWII to survive in the Mona marine archaeology study area is considered to be low.

1.6.5.4 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 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

1.6.5.5 There are eight 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.

1.6.5.6 No recorded losses of aircraft are associated with enemy action but instead appear to represent equipment failures. All eight recorded losses were military aircraft, but only one, the De Havilland Vampire (NRHE ID 515680), occurred outside of the timeframe of World War II. It was assigned to assigned to 202 AFS (Advanced Flying School) and crashed in the sea in 1953.

1.6.6 Overview of potential

1.6.6.1 An overview of the marine archaeological potential within the Mona marine archaeology study area is presented in Table 1.12.

Table 1.12: 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

Receptor	Potential	Value
Modern military remains	Good	Local/Regional/National
Aviation archaeology	Low	Local/Regional/National

1.6.7 Designated, known and recorded wrecks

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

1.6.7.2 The desktop study has identified 36 entries within the datasets that may indicate the presence of material of anthropogenic origin within the Mona marine archaeology study area. Of these, there are three positively identified non designated wreck sites that are listed as 'live' by the UKHO, four possibly identified 'live' non designated wreck sites and six unknown sites believed to be of anthropogenic origin that are also considered 'live'.

1.6.7.3 There are 23 other entries within the NMRW and NRHE datasets that do not correspond with UKHO records and have little to no known information associated with them and are either recorded as unknown, unnamed wrecks or seabed anomalies. These notably include the possible position of the wrecks *Glory* and *Hecla* and a record of a porthole find. These are included in the desktop gazetteer presented in Appendix A for completeness as they may represent archaeological material.

1.6.7.4 The *Ardlough* (UKHO 8239) was a cargo ship built in Germany in 1968 which sank in 1988 after taking on water in the Irish Sea. In addition to the UKHO record, the *Ardlough* is recorded as NMRW number 544553. The *Ardlough* is recorded as being located on the south boundary of the Mona Array Area and has been confirmed through the site-specific geophysical survey (Mona_0009), full details of which are presented in section 1.6.8.7. 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 1.6.8.2.

1.6.7.5 The *Susie Mo II* (UKHO 91489) was a fishing vessel that sank in 2015. The location corresponding with the *Susie Mo II* has been identified through the site-specific geophysical survey (Mona_0068), though it appears that wreck material may no longer be at that location. Full details of the anomaly and the potential correspondence with the record for *Susie Mo II* are presented in section 1.6.8.15.

1.6.7.6 The *Sea Gull* was a British steam ship that was torpedoed by submarine U-103 on route from Le Havre to Liverpool and sank on 16 March 1918. The potential wreck of the Sea Gull was identified within the geophysical data (Mona_0045), full details of which are presented in section 1.6.8.

1.6.7.7 The possible remains of the *Vine* (UKHO 8238*),* a British transport barge lost in 1877, are recorded as 'live' by the UKHO and listed as located within the Mona Offshore Cable Corridor. The position of this wreck has not been verified through the geophysical survey, but there remains a possibility for archaeological material to survive at the location shown in Figure 1.3.

1.6.7.8 The *Albanian* (UKHO 8124) was an iron-hulled steam ship built in Liverpool in 1870 used for Mediterranean trade during the 1870s until it collided with the *Nydia* (UKHO 8140) 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 also listed as 'live' within the Mona marine archaeology study area. The

Nydia is described as being 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. Although both of these are listed as 'live' within the Mona Offshore Cable Corridor, they have not been verified through the geophysical survey although it is possible that remains survive at the locations but have been buried. The recorded positions are shown in Figure 1.3.

1.6.7.9 Four of the unknown UKHO records have also been corroborated by the geophysical survey and these are discussed further in section 1.6.8. The UKHO data also contains a high number of fisherman's fasteners, obstructions and fouls which may be attributed to archaeological material on the seabed.

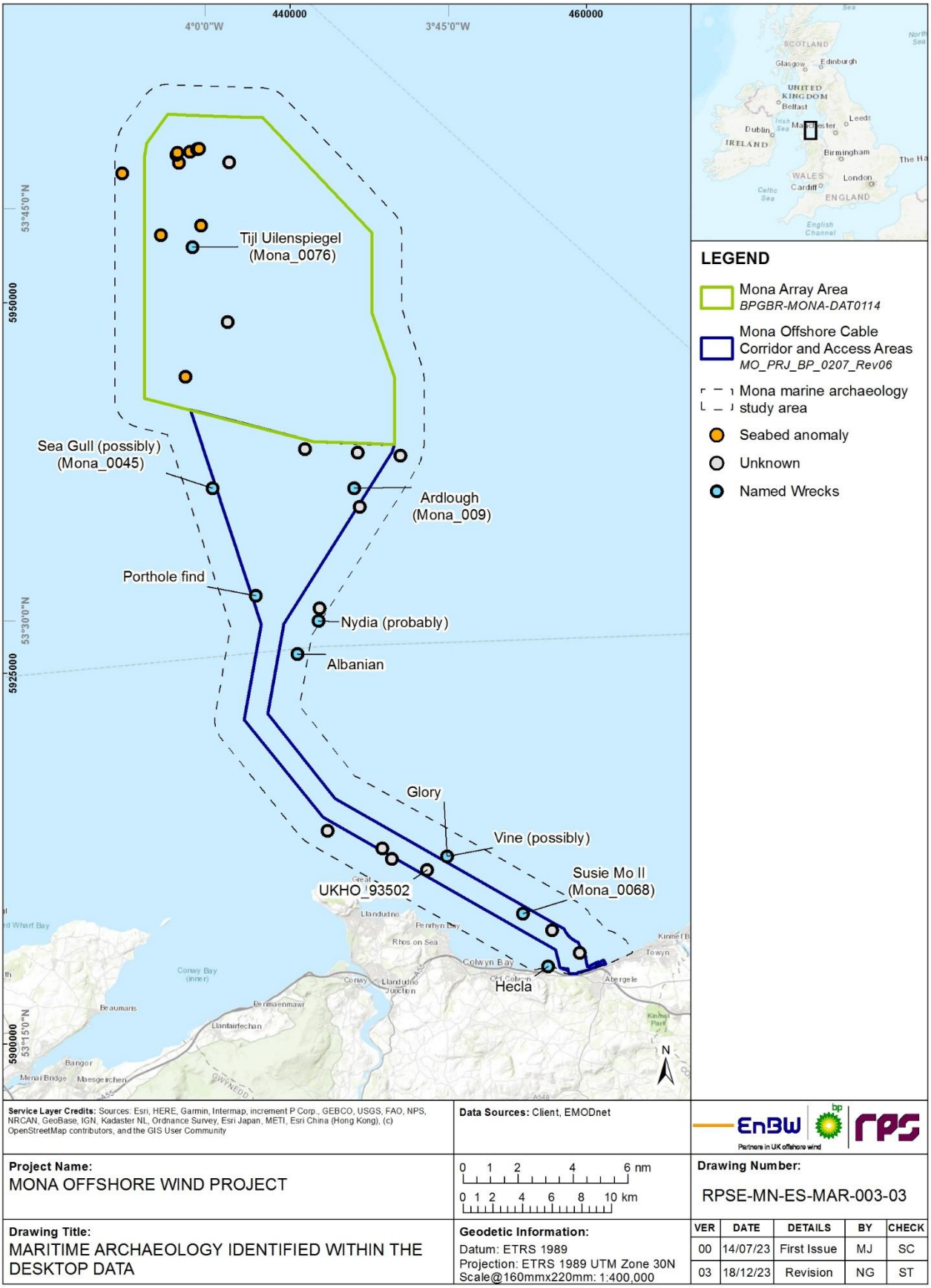

Figure 1.3: Maritime archaeology identified within the desktop data.

1.6.8 Geophysical seabed features assessment results

1.6.8.1 Geophysical data were collected across the Mona Array Area and Mona Offshore Cable Corridor. A total of 107 anomalies of potential archaeological interest were identified through the geophysical surveys. Of these, 17 are considered to be high potential anomalies, 16 are of medium potential and 74 have been classed as low potential anomalies. These are presented in Figure 1.4 and Figure 1.5.

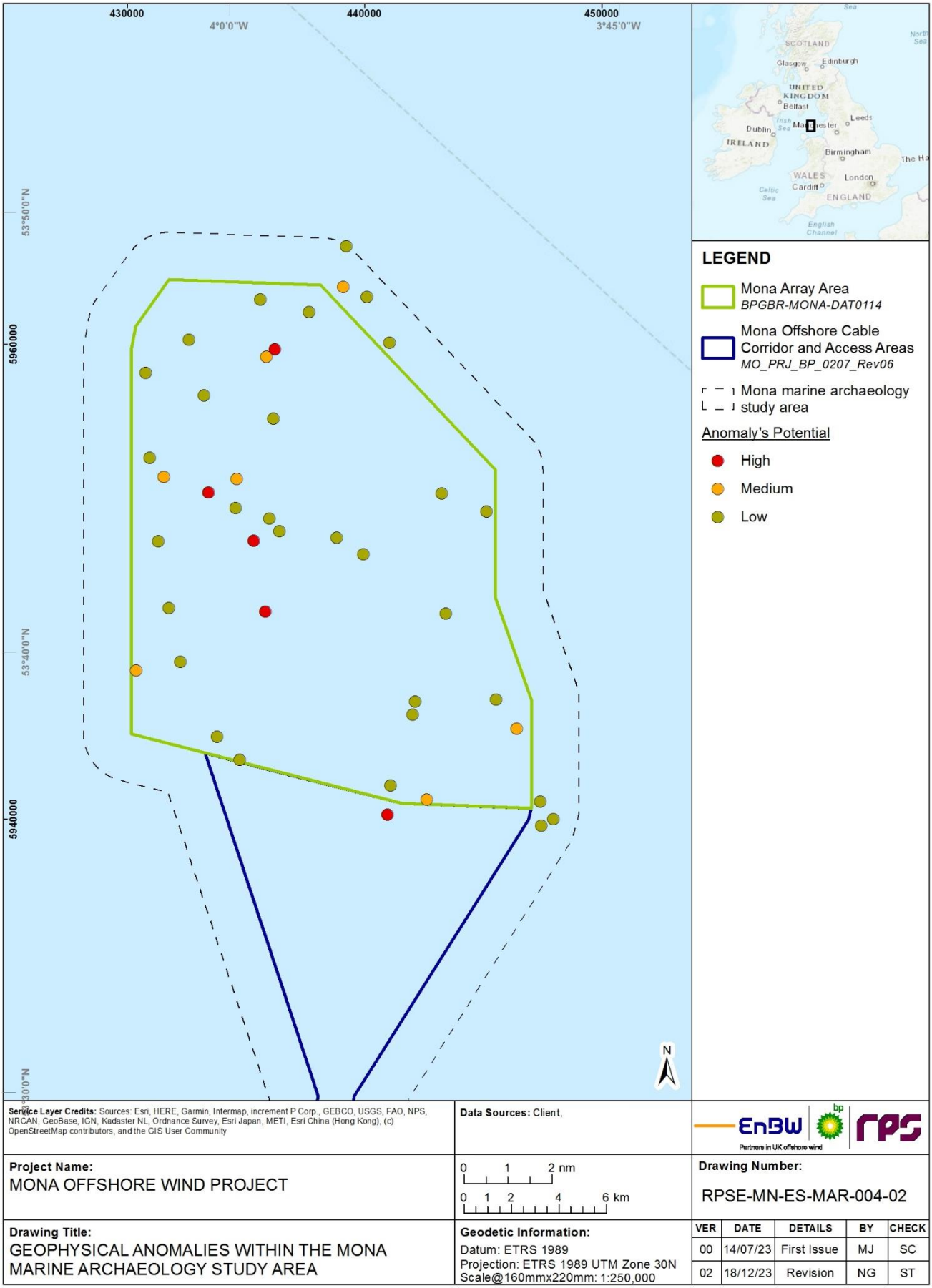

Figure 1.4: Geophysical anomalies within the Mona marine archaeology study area (Mona Array Area).

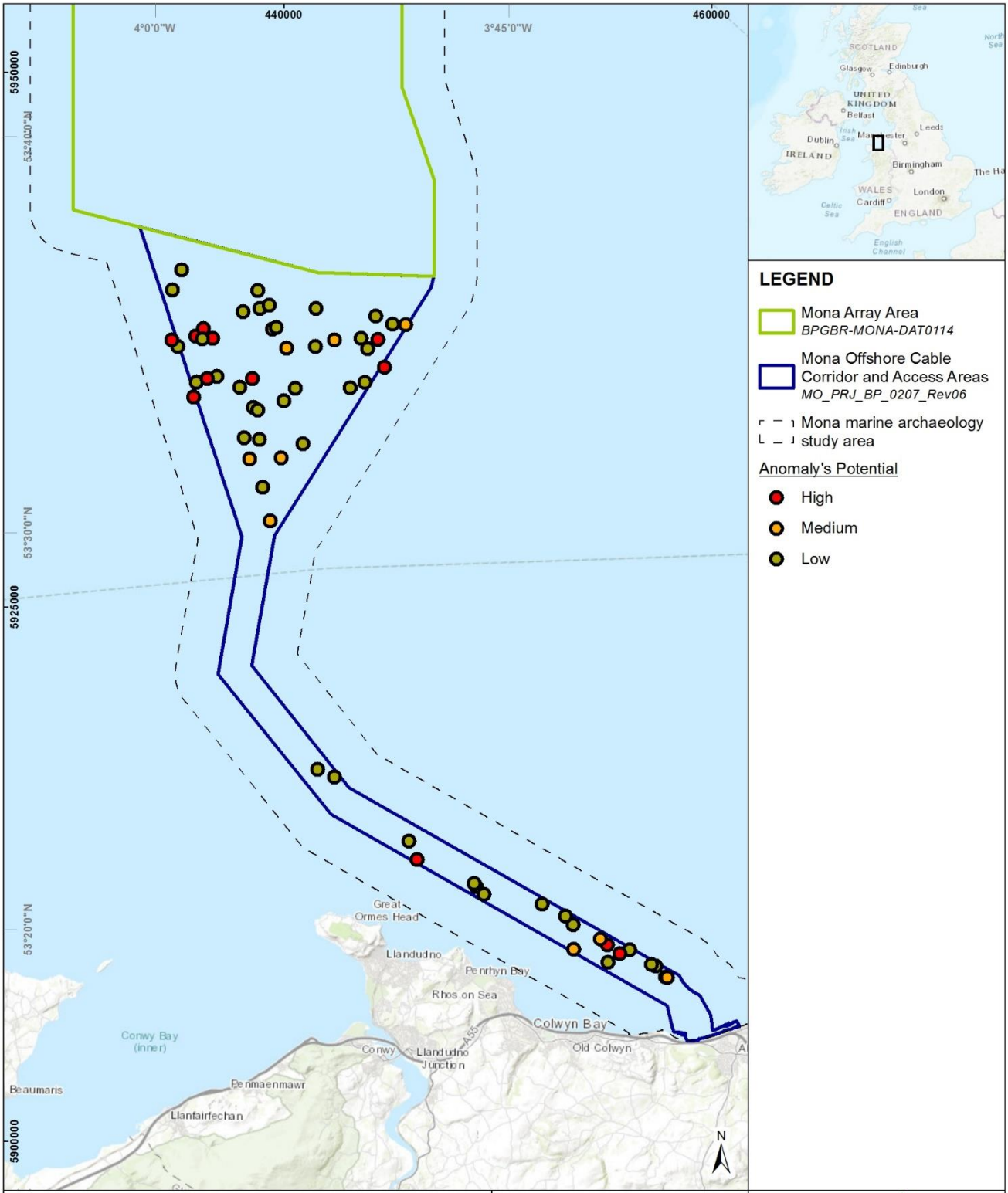

Figure 1.5: Geophysical anomalies within the Mona marine archaeology study area (Mona Offshore Cable Corridor).

Low potential anomalies

1.6.8.1 The 74 low potential anomalies are likely to predominantly represent 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

1.6.8.2 The 16 medium potential anomalies are presented below in Table 1.13 and the distribution is shown in Figure 1.6 and Figure 1.7. Images of the medium potential anomalies identified within the survey data are shown in Figure 1.8 to Figure 1.14.

1.6.8.3 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 1.13: Medium potential anomalies.

ID	Category	Description
Mona_0057	Anchor	Mona_0057 (Figure 1.8) lies to the north of the Mona Array Area. The anomaly covers an area 18.1 m x 22.1 m with a measurable height of 1.1 m. 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_0092	Potential wreck	Mona_0092 (Figure 1.8) lies to the southwest of the Mona Array Area. The anomaly measures 8.8 m x 1.3 m and with a measurable height of 0.5 m. 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_0080	Unidentified debris	Mona_0080 (Figure 1.9) lies to the west of Mona Array Area, approximately midway north and south, and 1.4 km from the west boundary. The anomaly measures 9.1 m x 2.7 m with a measurable height of 2.3 m. The anomaly is similar in form to a boulder; however, the size is not consistent with others identified in the dataset.
Mona_0102	Potential debris	Mona_0102 (Figure 1.9) lies to the north, and centre, of the Mona Array Area. The anomaly is a round, prominent, feature measuring 4.9 m 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_0081	Potential debris	Mona_0081 (Figure 1.10) lies to the southeast of the Mona Array Area. The anomaly measures 11.5 m x 2.2 m, with a measurable height of 0.6 m, 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_0109	Mound	Mona_0109 (Figure 1.10) lies to the east of the Mona Array Area. The anomaly is a prominent lozenge shaped mound measuring 16.6 m x 5.4 m 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

ID	Category	Description
		not dissimilar to other features within the dataset the majority are clearly related to other geological features through location and orientation.
Mona_0112	Mound	Mona_0112 (Figure 1.11) lies in the centre of the south section of t the Mona Array Area. The anomaly is a lozenge shaped mound measuring 9.9 m x 4.7 m with a measurable height of 0.4m. Slight scour extends to the east.
Mona_0018	Potential debris	Mona_0018 (Figure 1.13) lies towards the southern portion of the fan section of the Mona Offshore Cable Corridor.The anomaly is a cluster of smaller features, with the group measuring 16.7 m x 10.3 m with a measurable height of 1.0 m. The origin of the anomaly is unclear and could equally represent a small concentration of boulders, outcropping bedrock, or anthropogenic material.
Mona_0025	Mound	Mona_0025 (Figure 1.13) lies in the north-eastern portion of the fan section of the Mona Offshore Cable Corridor. The anomaly measures 8.0 m x 7.7 m with a measurable height of 1.0 m. The origin of the anomaly may be geological, but the size may indicate anthropogenic debris.
Mona_0033	Mound	Mona_0033 (Figure 1.13) lies in the western portion of the fan section of the Mona Offshore Cable Corridor.The anomaly measures 28.1 m x 13.5 m and has a measurable height of 1.3 m. There is an associated magnetic anomaly of 29 nT. The mound itself does not represent material of anthropogenic origin, when associated with a magnetic anomaly it may indicate the presence of buried debris.
Mona_0038	Debris	Mona_0038 (Figure 1.13) lies in the southern portion of the fan section of the Mona Offshore Cable Corridor. The anomaly is visible as three linear features oriented north-west to south-east, covering an area of 11.5 m x 11.0 m. There is an associated magnetic anomaly of 11 nT. The form of the anomaly and the association with a magnetic signature suggests anthropogenic debris.
Mona_0044	Potential debris	Mona_0044 (Figure 1.13) lies in the north-eastern portion of the fan section of the Mona Offshore Cable Corridor. The anomaly measures 10.7 m x 1.8 m with a measurable height of 0.9 m. Two smaller features in the vicinity (c. 30 m radius) may be potentially associated debris. The anomaly corresponds to UKHO record 7959, a (now dead) record of foul ground last updated in 1988 as a seabed hole with trawl scars.
Mona_0048	Potential debris	Mona_0048 (Figure 1.14) lies towards the centre of the fan section of the Mona Offshore Cable Corridor. The anomaly measures 12.7 m x 6.8 m with a measurable height of 0.5 m. There is an associated magnetic anomaly of 280 nT. The form of the anomaly in the SSS, combined with the large magnetic signature, suggests anthropogenic debris. The low height in the MBES data may indicate a level of burial.
Mona_0065	Potential debris	Mona_0065 (Figure 1.14) lies within the southern area of the Mona Offshore Cable Corridor. The anomaly is an overall area of discrete smaller features, measuring 18.6 m x 14.3 m with a measurable height of 0.2 m. It is unclear whether the anomaly is representative of anthropogenic more geologic material.
Mona_0066	Potential debris	Mona_0066 (Figure 1.14) lies within the southern area of the Mona Offshore Cable Corridor. The anomaly comprises an area of potential debris that measures 7.8 m x 4.2 m with a measurable height of 0.4 m. The presence of two linear components and the overall form of the anomaly is indicative of anthropogenic material.
Mona_0069	Potential wreck	Mona_0069 (Figure 1.14) lies within the southern area of the Mona Offshore Cable Corridor.The anomaly measures 47.6 m x 14.0 m, with a measurable height of 0.6 m. The mound is fairly uniform and possibly indicative of a largely buried anthropogenic features such as a wrecked

ID	Category	Description
		vessel. The mound, however, lies alongside a sand bank and could be related to other similar seabed features, though this location is uniquely anomalous.

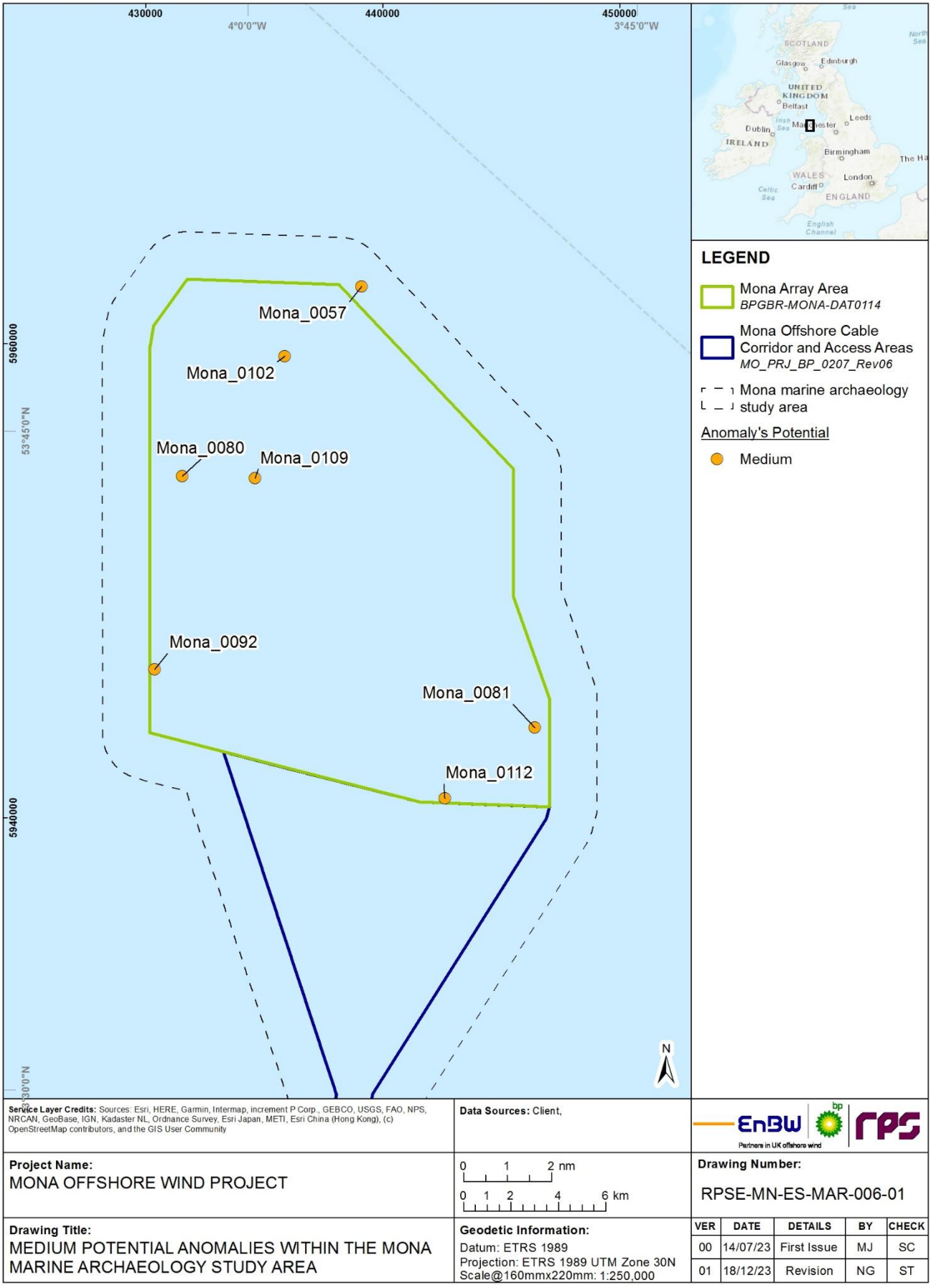

Figure 1.6: Distribution of medium potential anomalies within the Mona marine archaeology study area.

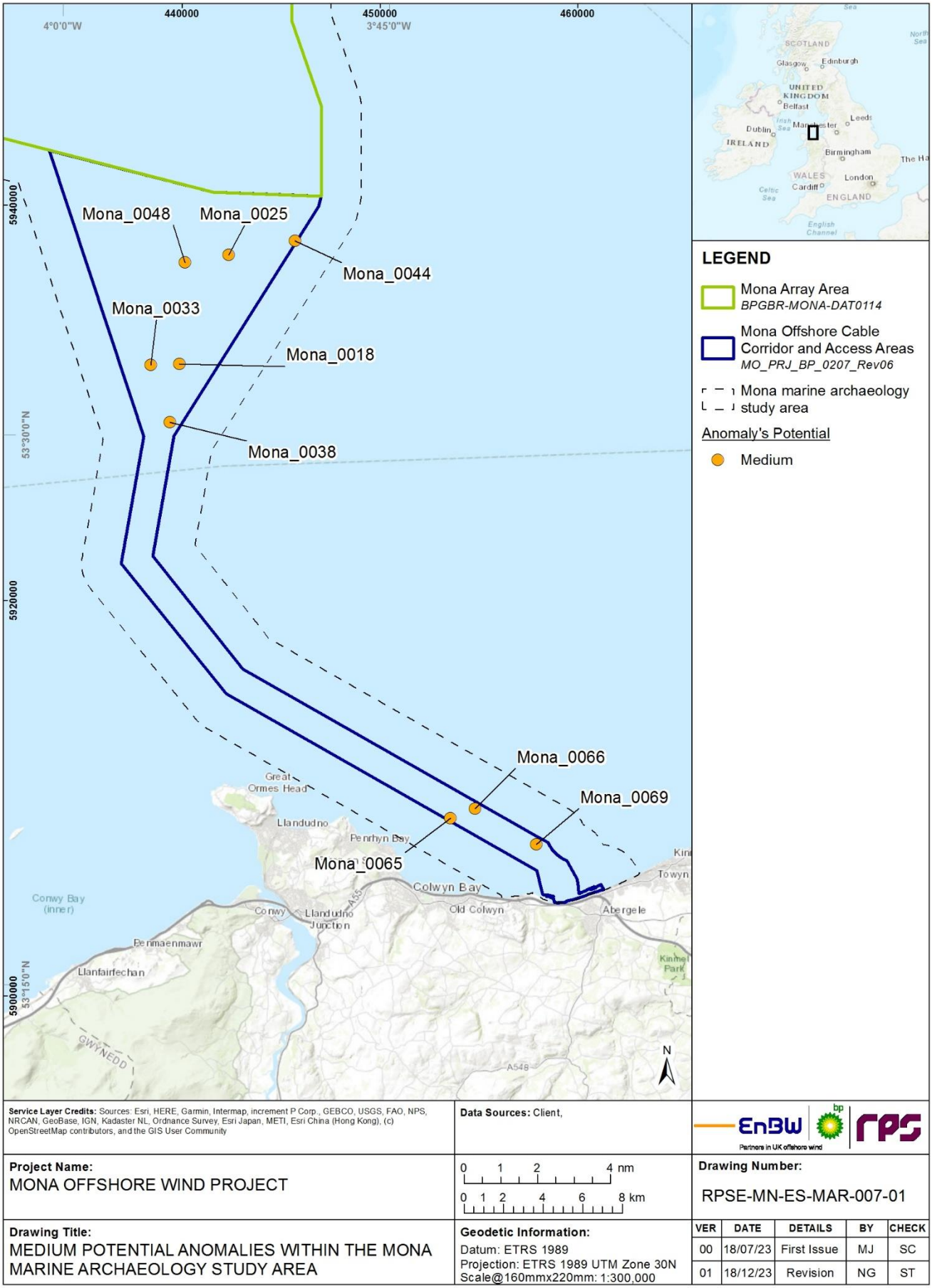

Figure 1.7: Distribution of medium potential anomalies within the Mona Offshore Cable Corridor.

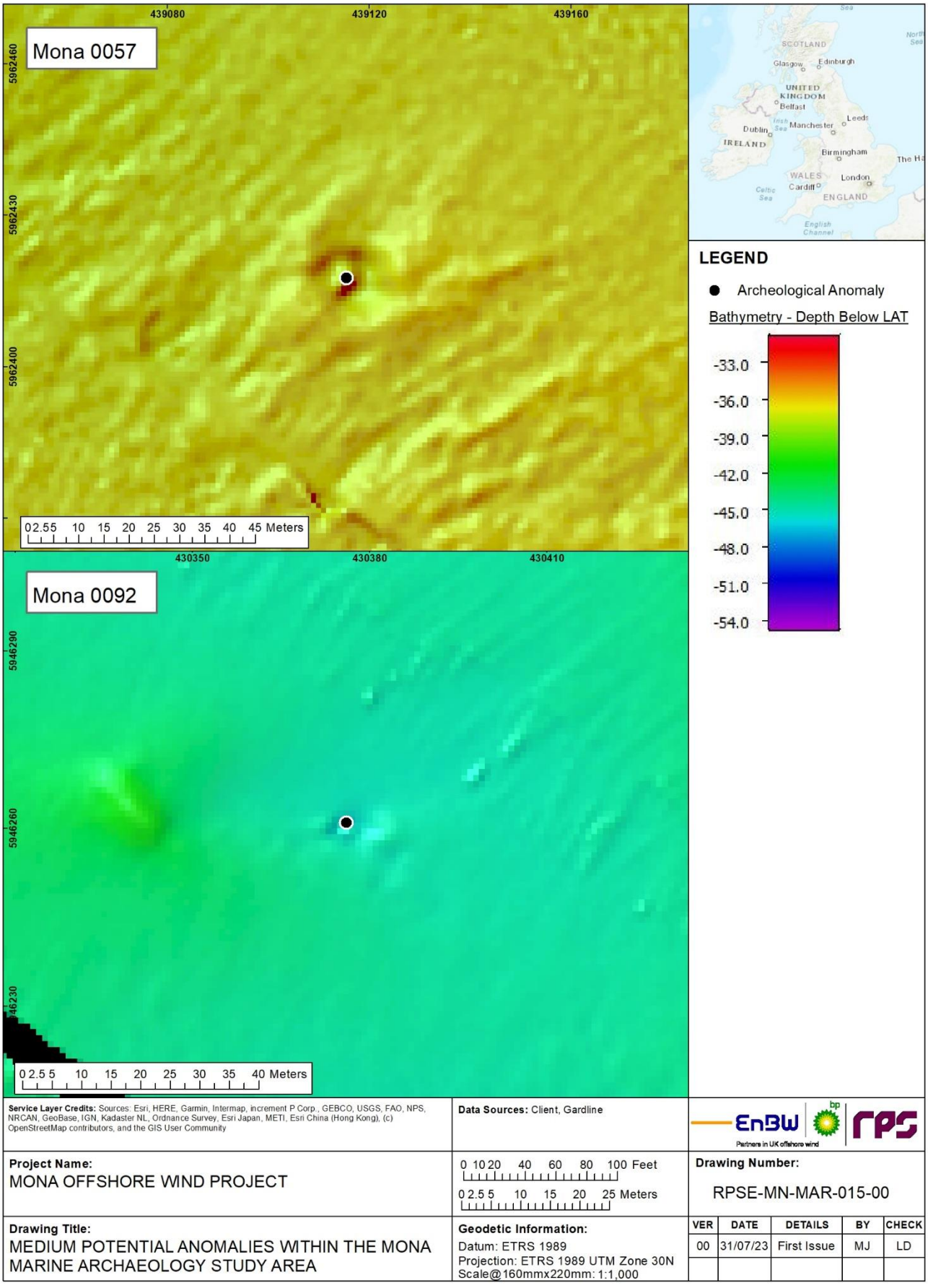

Figure 1.8: Medium potential anomalies within the Mona Array Area.

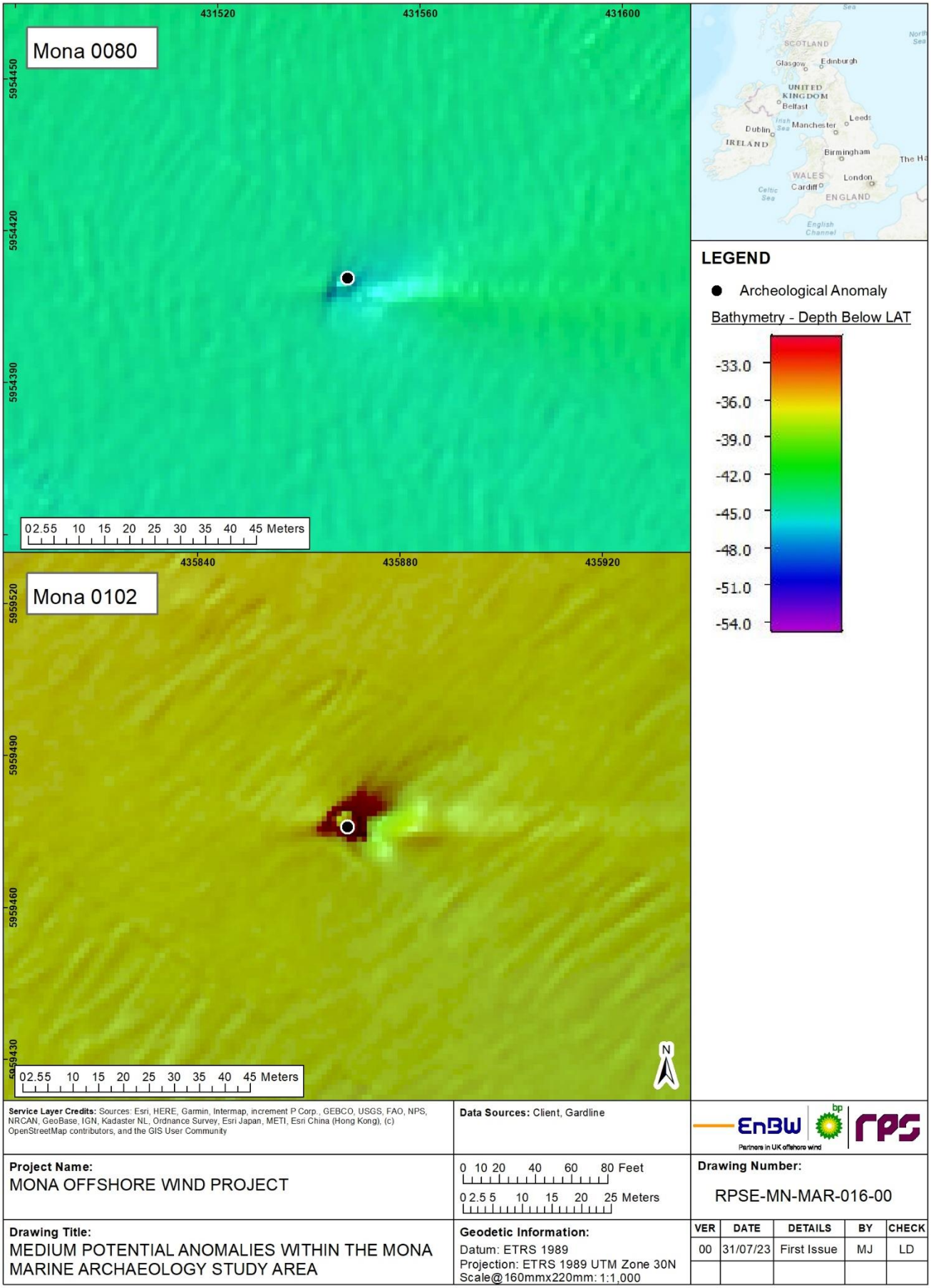

Figure 1.9: Medium potential anomalies within the Mona Array Area.

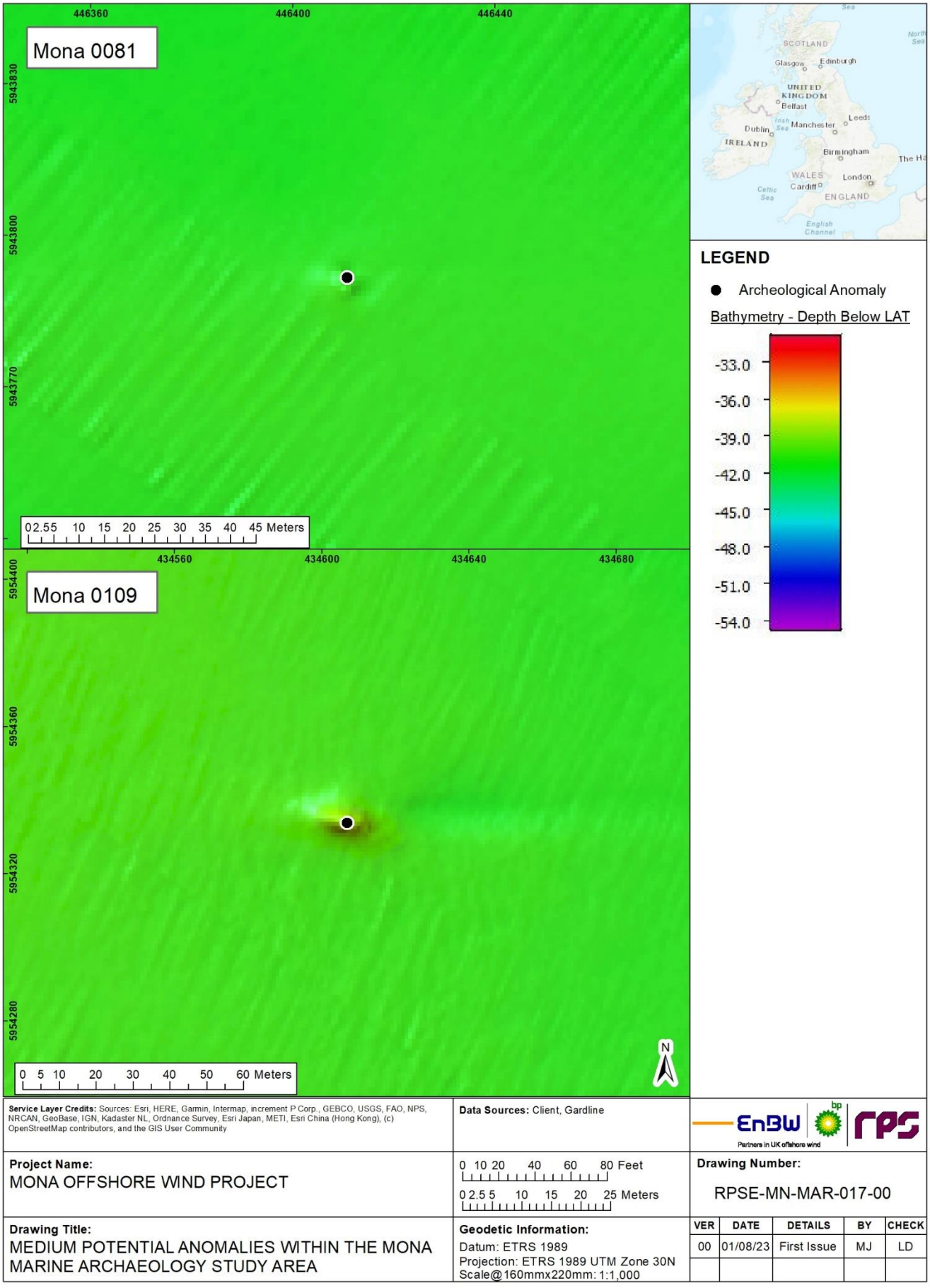

Figure 1.10: Medium potential anomalies within the Mona Array Area.

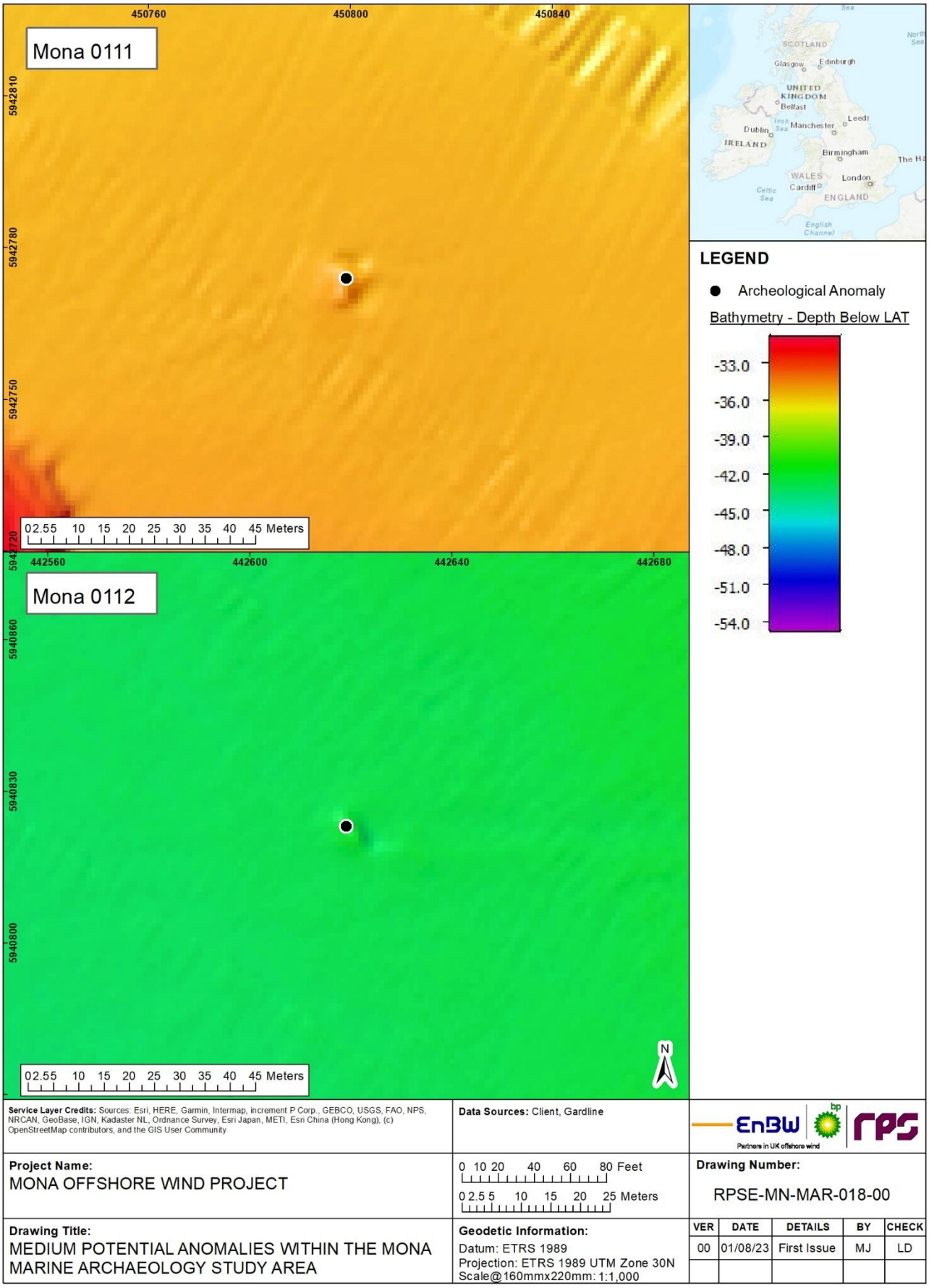

Figure 1.11: Medium potential anomalies within the Mona Array Area.

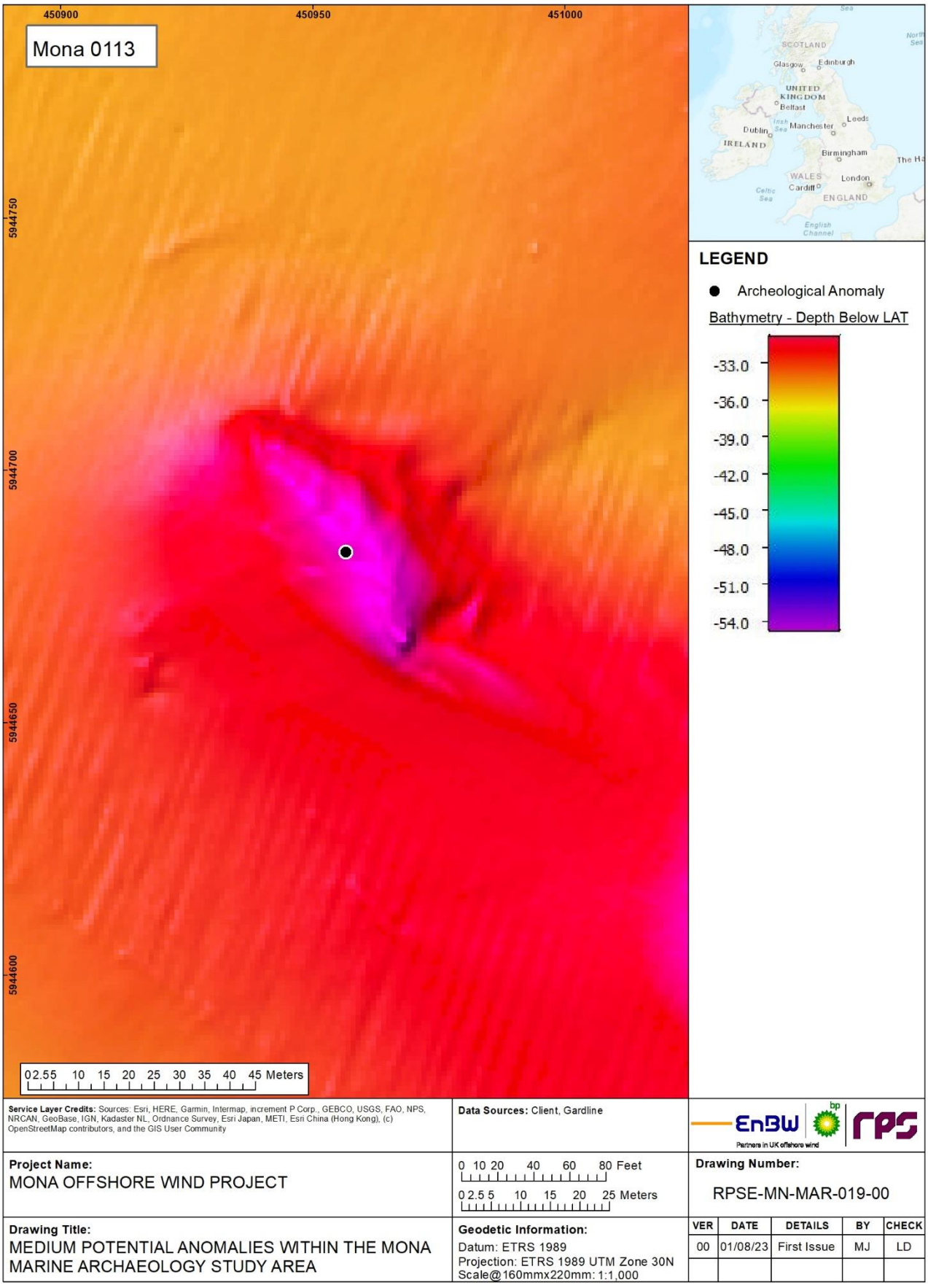

Figure 1.12: Medium potential anomalies within the Mona Array Area.

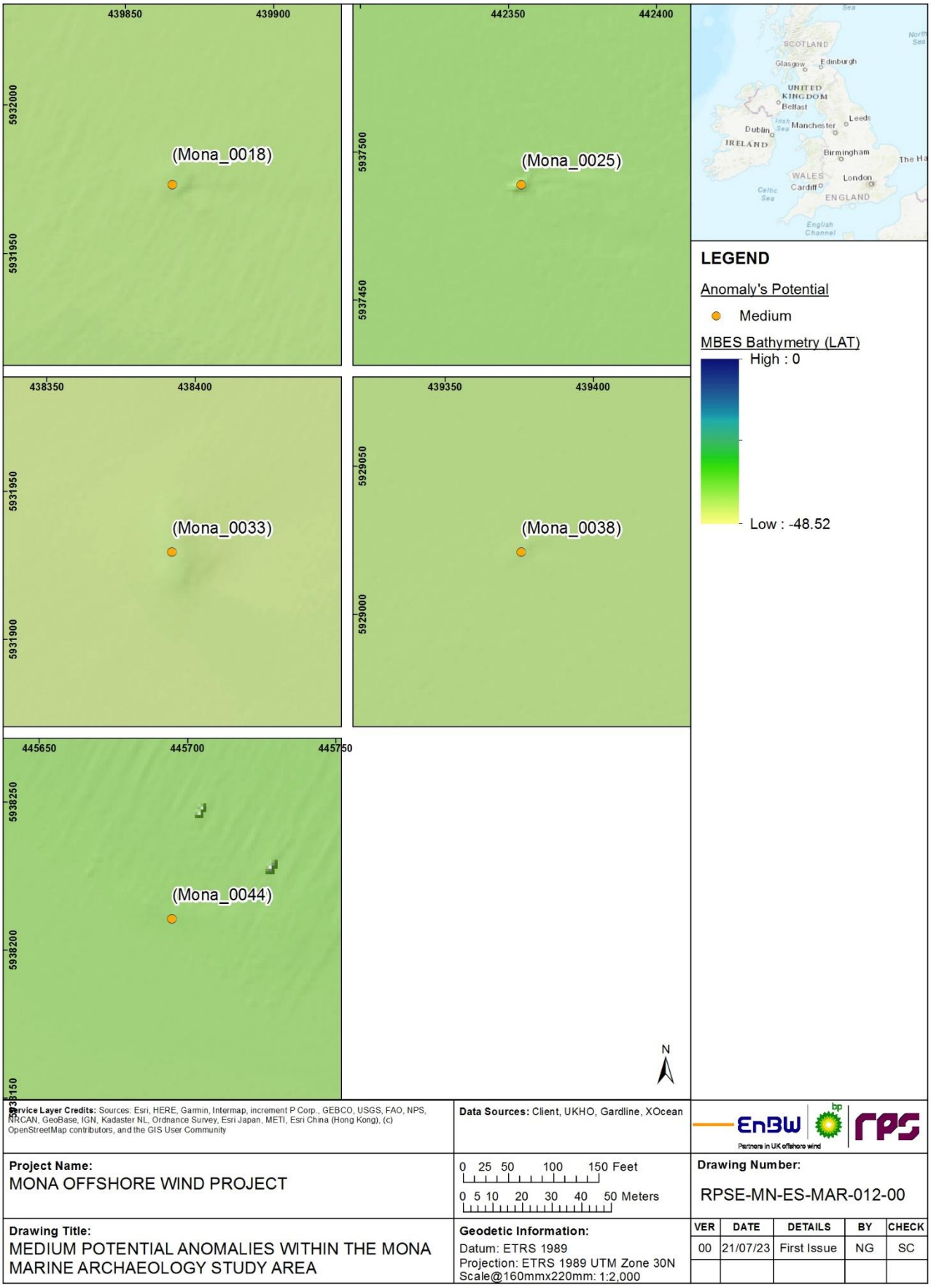

Figure 1.13: Medium potential anomalies within the Mona Offshore Cable Corridor.

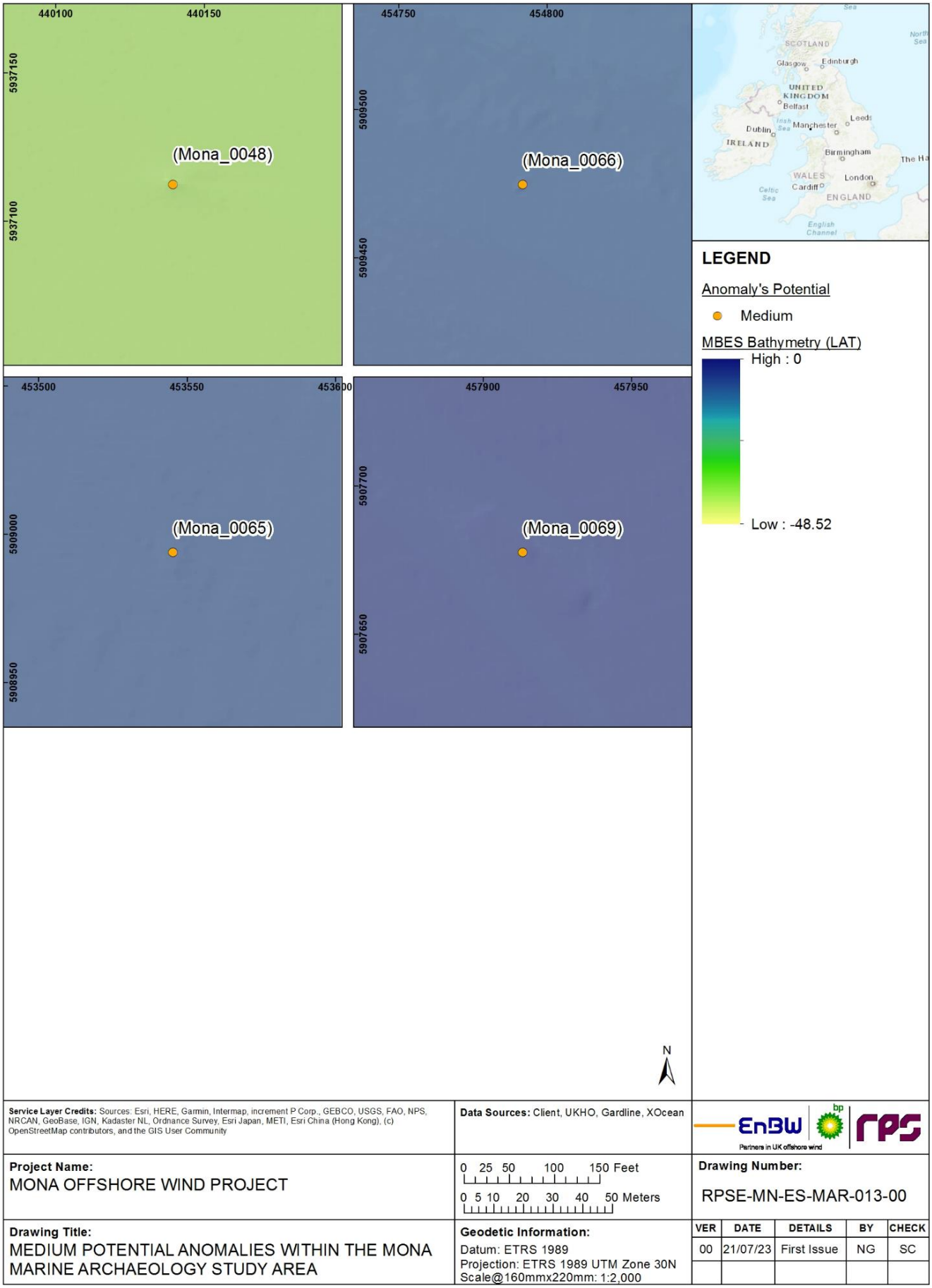

Figure 1.14: Medium potential anomalies within the Mona Offshore Cable Corridor.

High potential anomalies

1.6.8.1 A total of 17 high potential anomalies were identified: five from the Mona Array Area and nine from the Mona Offshore Cable Corridor. Of these, eight have also been recorded within the UKHO as discussed in section 1.6.7. The distribution of these is presented in Figure 1.15 and Figure 1.16. Images of the high potential anomalies identified within the survey data are shown in Figure 1.17 to Figure 1.21.

1.6.8.2 Mona_0076 (Figure 1.17) was identified in both the SSS and MBES data and is located in the central east section of the Mona Array Area, approximately 3.3 km south of the west boundary. Measuring 29.7 m x 7.6 m with a height of 7 m 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.

1.6.8.3 Mona_0084 (Figure 1.17) 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 15.8 m x 5.4 m with a height of 2.8 m 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.

1.6.8.4 Mona_0091 (Figure 1.17) 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 37.1 m x 5.1 m and has a height of 5.8 m 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.

1.6.8.5 Mona_0108 (Figure 1.18) 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 29.6 m x 23.4 m. Approximately 60 m to the southeast lies an isolated linear feature measuring 14.1 m x 1.8 m, and approximately 30 m to the north lies an isolated piece of debris measuring 3.1 m 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.

1.6.8.6 Mona_0110 (Figure 1.18) 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 <300 m south of this position and are recorded as seabed obstructions. Mona_0110 may represent a wreck site and covers an area 34.8 m x 9.7 m, with a measurable height of 1.0 m. To the northeast is a prominent linear feature measuring approximately 22 m, 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.

1.6.8.7 Mona_0009 (Figure 1.20) was identified in both the SSS and MBES data and has an associated magnetic anomaly of 3,437 nT. The anomaly measures 86.7 m x 31.6 m (at the widest point, including debris) with a measurable height of 13.3 m and lies in the northeast portion of the fan section of the Mona Offshore Cable Corridor. The anomaly directly corresponds with UKHO record 8239 (45 m southeast of NRHE 1004768), the *Ardlough*, an Antiguan and Barbudan carrier which sank on 26th September 1998 while enroute from Garston to Belfast. The wreck lies apparently upright and mostly coherent, except for notable collapse along the port side.

1.6.8.8 Mona_0016 (Figure 1.20) was identified in both the SSS and MBES data and has no associated magnetic anomaly and does not directly correspond with any UKHO, NRHE or NMRW records. The anomaly lies 120 m outside of the west boundary of the fan section of the Mona Offshore Cable Corridor and appears as two prominent and irregular mounds, covering an area 18.5 m x 5.6 m. While the origin is not clear the form of the anomaly is indicative of anthropogenic debris; the size and distribution potentially represent the remains of a collapsed wreck vessel.

1.6.8.9 Mona_0030 (Figure 1.20) was identified in both the SSS and MBES data and has no associated magnetic anomaly and does not directly correspond with any UKHO, NRHE or NMRW records. The anomaly lies 120 m outside of the west boundary of the fan section of the Mona Offshore Cable Corridor and appears as two prominent and irregular mounds, covering an area 18.5 m x 5.6 m. While the origin is not clear the form of the anomaly is indicative of anthropogenic debris; the size and distribution potentially represent the remains of a collapsed wreck vessel.

1.6.8.10 Mona_0031 (Figure 1.20) was identified in both the SSS and MBES data and has no associated magnetic anomaly and does not directly correspond with any UKHO, NRHE or NMRW records. The anomaly lies 120 m outside of the west boundary of the fan section of the Mona Offshore Cable Corridor and appears as two prominent and irregular mounds, covering an area 18.5 m x 5.6 m. While the origin is not clear the form of the anomaly is indicative of anthropogenic debris; the size and distribution potentially represent the remains of a collapsed wreck vessel.

1.6.8.11 Mona_0037 (Figure 1.20) was identified in both the SSS and MBES data, has no associated magnetic anomaly, and the location does not directly correspond with any UKHO, NRHE or NMRW records. The anomaly lies in the northwest portion of the fan section of the Mona Offshore Cable Corridor and measures 8.8 m x 5.3 m, with a measurable height of 2.6 m. The anomaly appears as an irregular mound but at least three linear features are visible in the SSS data on the top of the mound. Pronounced scour extending to 3 m is visible to the north, west and south of the anomaly; a ridge of sediment accumulation of 37 m extends from the east edge of the anomaly. The form of the mound and association with linear features is indicative of anthropogenic material. The size of the mound may indicate the remains of a wrecked vessel.

1.6.8.12 Mona _0040 (Figure 1.20) was identified in both the SSS and MBES data, has an associated magnetic anomaly of 447 nT, and does not directly correspond with any UKHO, NRHE or NMRW records. The anomaly lies in the northwest portion of the fan section of the Mona Offshore Cable Corridor and appears as a lozenge-shaped mound measuring 8.3 m x 3.9 m with a measurable height of 2.4 m and surrounded by encircling scour. The size and form of the mound and its association with a magnetic anomaly indicate buried material of anthropogenic origin, possibly the remains of a wrecked vessel.

1.6.8.13 Mona_0049 (Figure 1.21) was identified in both the SSS and MBES data, has no associated magnetic anomaly and does not directly correspond with any UKHO, NRHE or NMRW records. The anomaly lies in the south area of the Mona Offshore Cable

Corridor and is visible as a largely circular but irregular mound, measuring 6.2 m x 3.1 m, and has a measurable height of 0.8 m. While the form of the anomaly is not dissimilar to a large geological feature, the size and uniqueness in the vicinity may indicate an anthropogenic origin. The survey contractor, Gardline, identified the anomaly as a potential wreck during their assessment of the data. However, the form and lack of an associated magnetic anomaly does not make this identification firm.

1.6.8.14 Mona_0067 (Figure 1.21) was identified in the SSS and MBES data but has no associated magnetic anomaly. The anomaly lies midway along the Mona Offshore Cable Corridor and measures 7.8 m x 7.1 m and has a measurable height of 1.6 m. The position corresponds with UKHO record 8144 and NMRW record 505956. The UKHO record the position of the feature as a small wreck, or piece of wreckage, originally located in 1986. The prominence of the anomaly in the area of seabed and its recording by the UKHO and NMRW indicate a potential anthropogenic origin.

1.6.8.15 Mona_0014 (Figure 1.21) was identified in both the SSS and MBES data and has an associated magnetic anomaly of 9,734 nT, but does not directly correspond to any UKHO, NRHE or NMRW records. The anomaly measures 15.8 m x 14.9 m with a measurable height of 0.5 m, lies in the northwest of the fan section of the Mona Offshore Cable Corridor. In form the anomaly appears as an irregular mound in the MBES data, not dissimilar from other seabed features in the area. However, the high magnitude of the associated magnetic anomaly suggests anthropogenic material of archaeological interest.

1.6.8.16 Mona_0068 (Figure 1.21) was identified in both the SSS and MBES datasets, though the anomaly is only partially visible in the SSS data and there is no associated magnetic anomaly. The location is in the northwest fan section of the Mona Offshore Cable Corridor and is visible in the MBES dataset as a prominent area of scour measuring 16.8 m x 10.2 m with a measurable depth of ca 0.5 m. There is no clear evidence of anthropogenic features within the scour. The location corresponds to the UKHO record 91489, the *Susie Mo II*, which sank in 2015. The UKHO record states that in 2019, the location was the site of a wreck measuring 7.8 m x 4.9 m, with a measurable height of 3.3 m. What is unusual about the record is that the intact wreck identified in the UKHO record in 2019 is no longer visible and there is no record of it having been lifted. It is not possible to determine, with certainty, that the wreck from UKHO 91489 was that of a small fishing vessel, or whether it relates to an older structure that has since collapsed. A high-potential rating has been assigned until full-coverage SSS data can be reviewed.

1.6.8.17 Mona_0045 (Figure 1.21) was identified in both the SSS and MBES data but at the extent of those datasets, so is only partially visible. It has no associated magnetic anomaly. The anomaly lies outside of the northwest border of the Mona Offshore Cable Corridor and measures at least 39.0 m x 11.2 m, but in the MBES the northwest quarter of the wreck is not visualised. The position directly corresponds with UKHO record 7946, NRHE record 909480 and NMRW record 272253, the *Sea Gull* (possibly). *Sea Gull* is a British steam ship that was torpedoed by Submarine U-103 and sank on 17 March 1918 while enroute from Le Havre to Liverpool. The full built dimensions of *Sea Gull* were 68.6 m x 10.1 m, so it is possible that should the anomaly be that of *Sea Gull* then another section of wreck lies outside the extents of the survey data.

1.6.8.18 Mona_0002 (Figure 1.21) was identified in the SSS dataset but is situated outside the extent of the MBES data and has no associated magnetic anomaly. The anomaly lies outside and to the northeast of the fan section of the Mona Offshore Cable Corridor, approximately 130 m east of the east boundary. Measuring 36.9 m x 24.2 m with a measurable height of 0.8 m, it has been interpreted as a potential wreck corresponding

with UKHO record 99231. The UKHO record is that of a degraded and buried wreck, of similar dimensions to those observed in the SSS data. No further details are given.

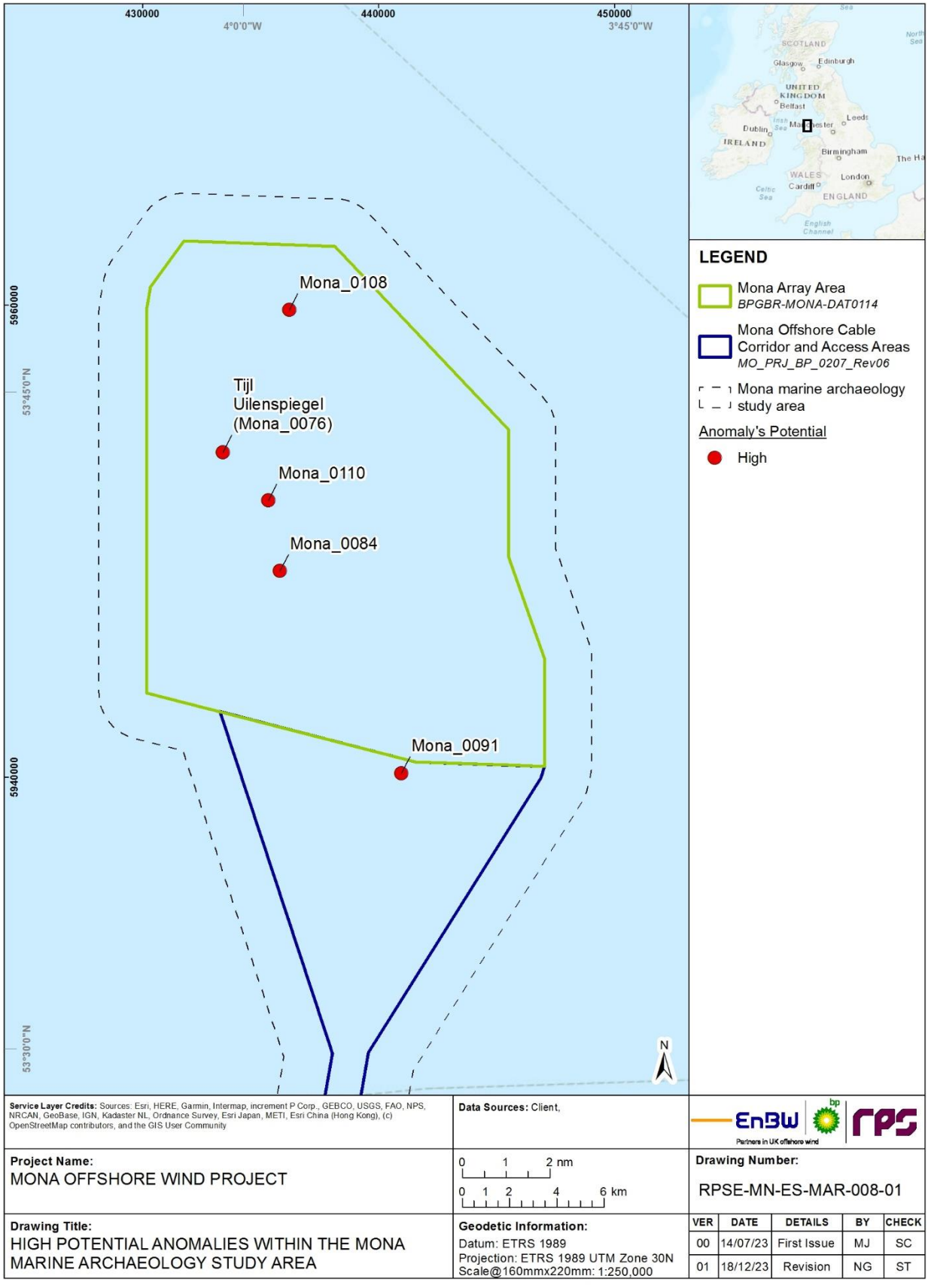

Figure 1.15: Distribution of high potential anomalies within the Mona Array Area.

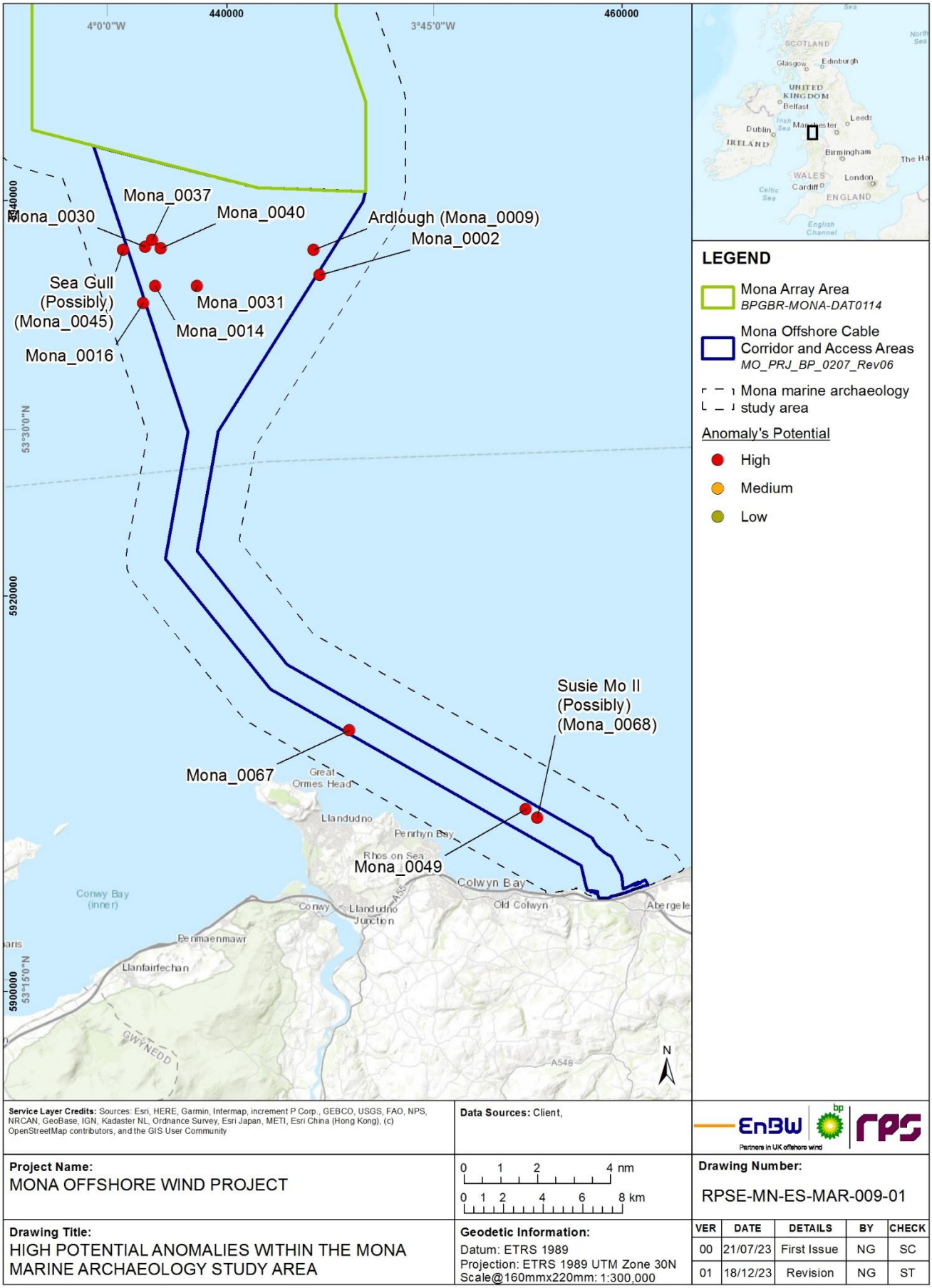

Figure 1.16: Distribution of high potential anomalies within the Mona Offshore Cable Corridor.

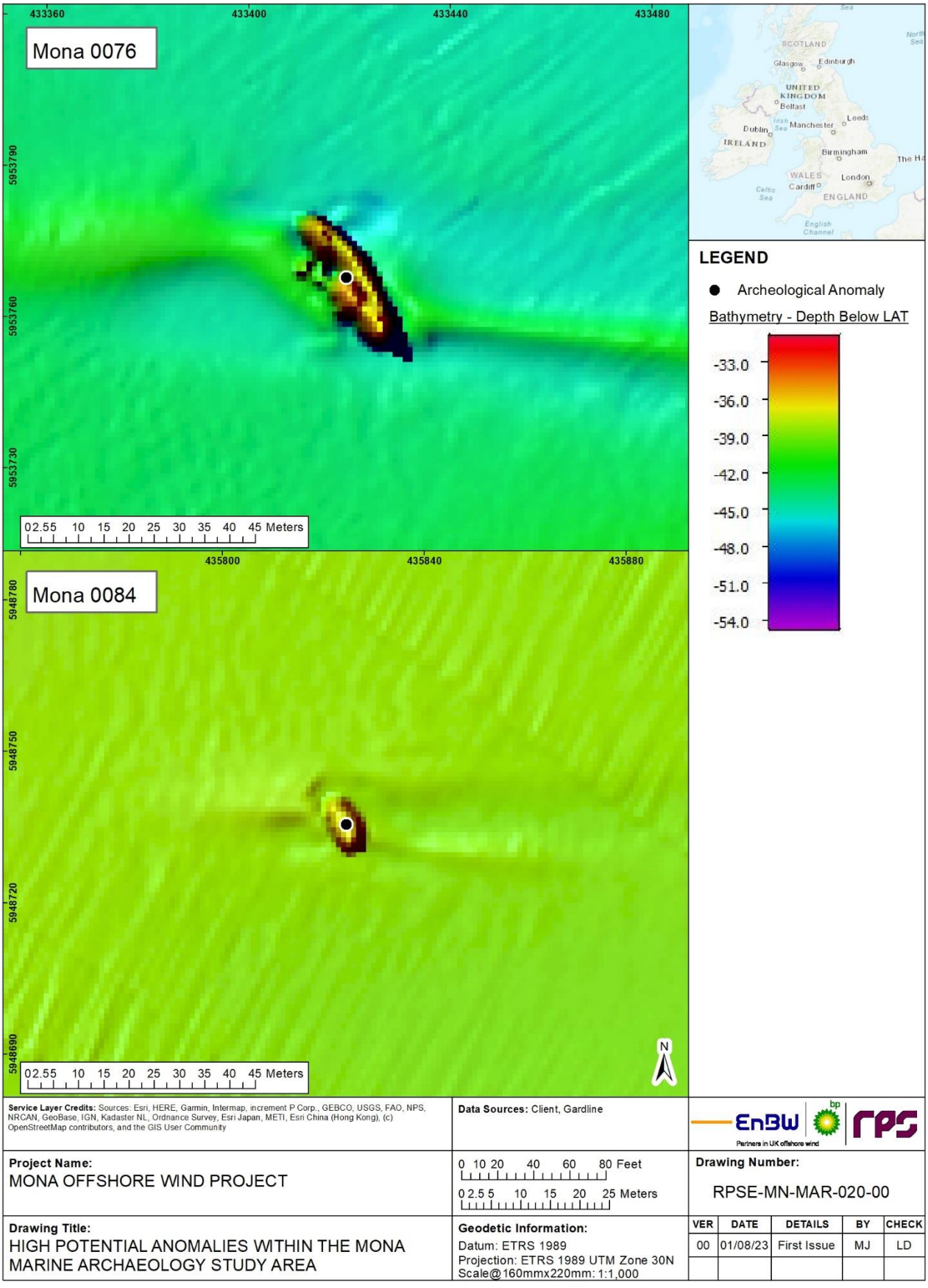

Figure 1.17: High potential anomalies within the Mona Array Area.

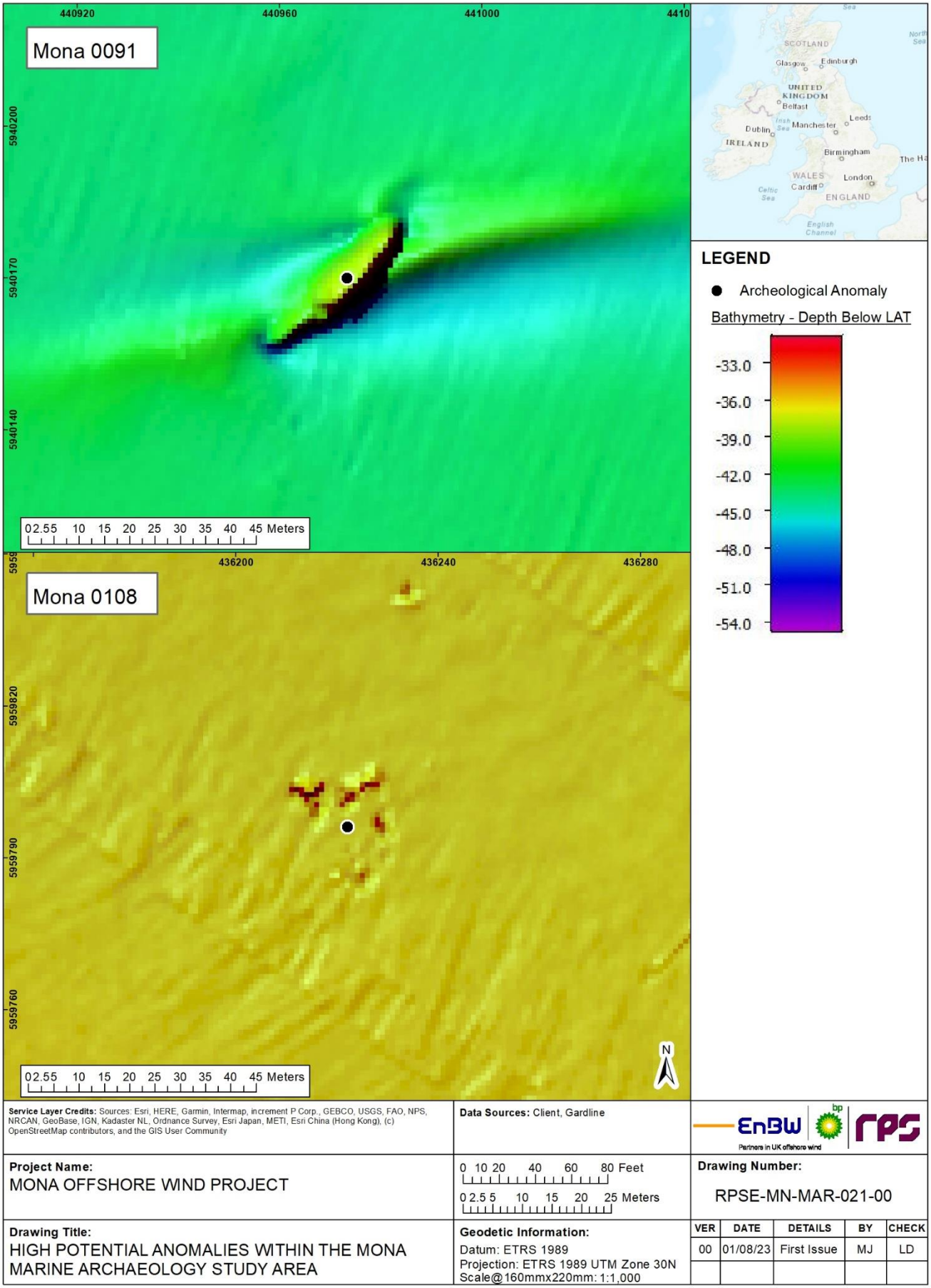

Figure 1.18: High potential anomalies within the Mona Array Area.

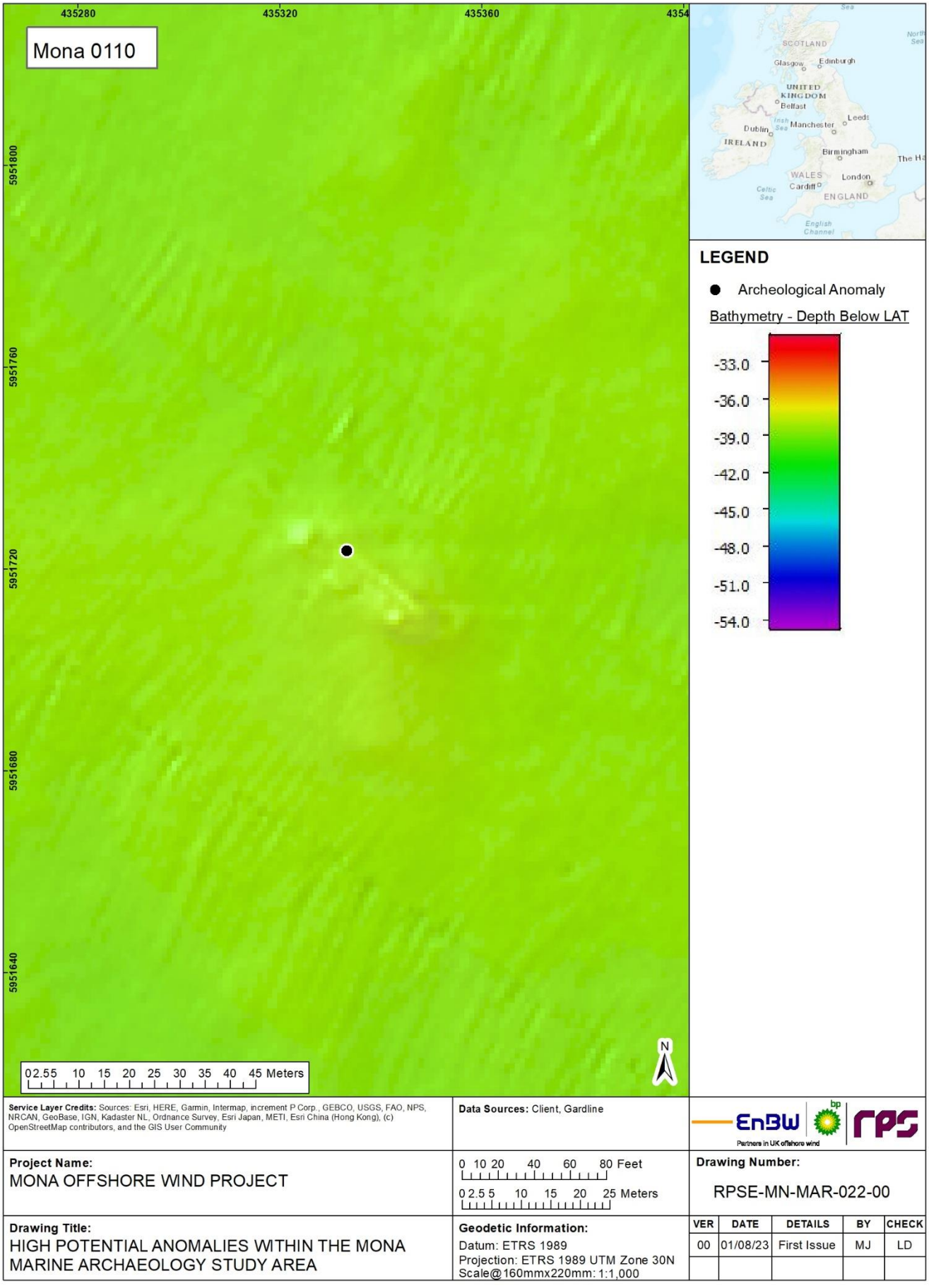

Figure 1.19: High potential anomalies within the Mona Array Area.

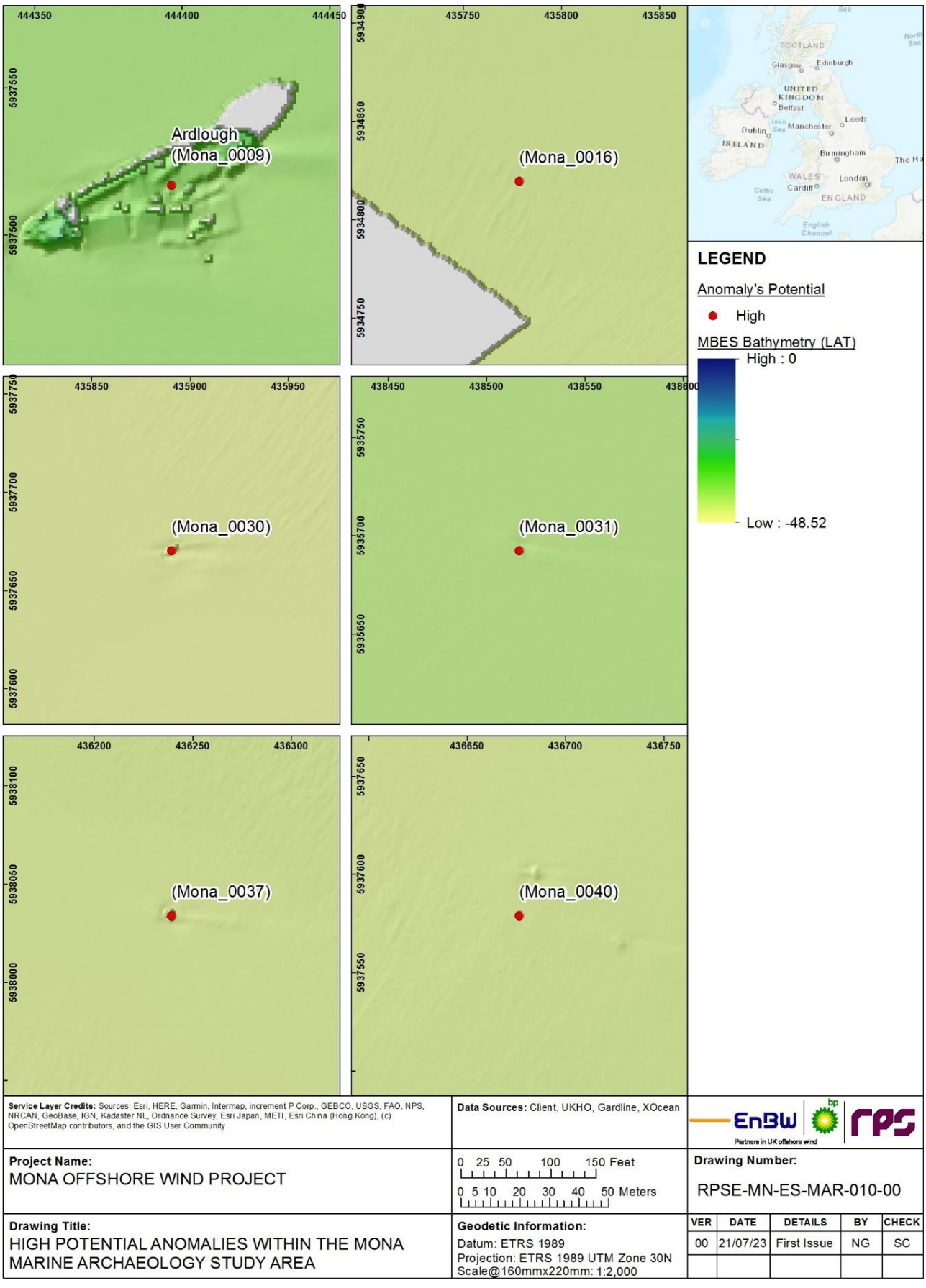

Figure 1.20: High potential anomalies within the Mona Offshore Cable Corridor.

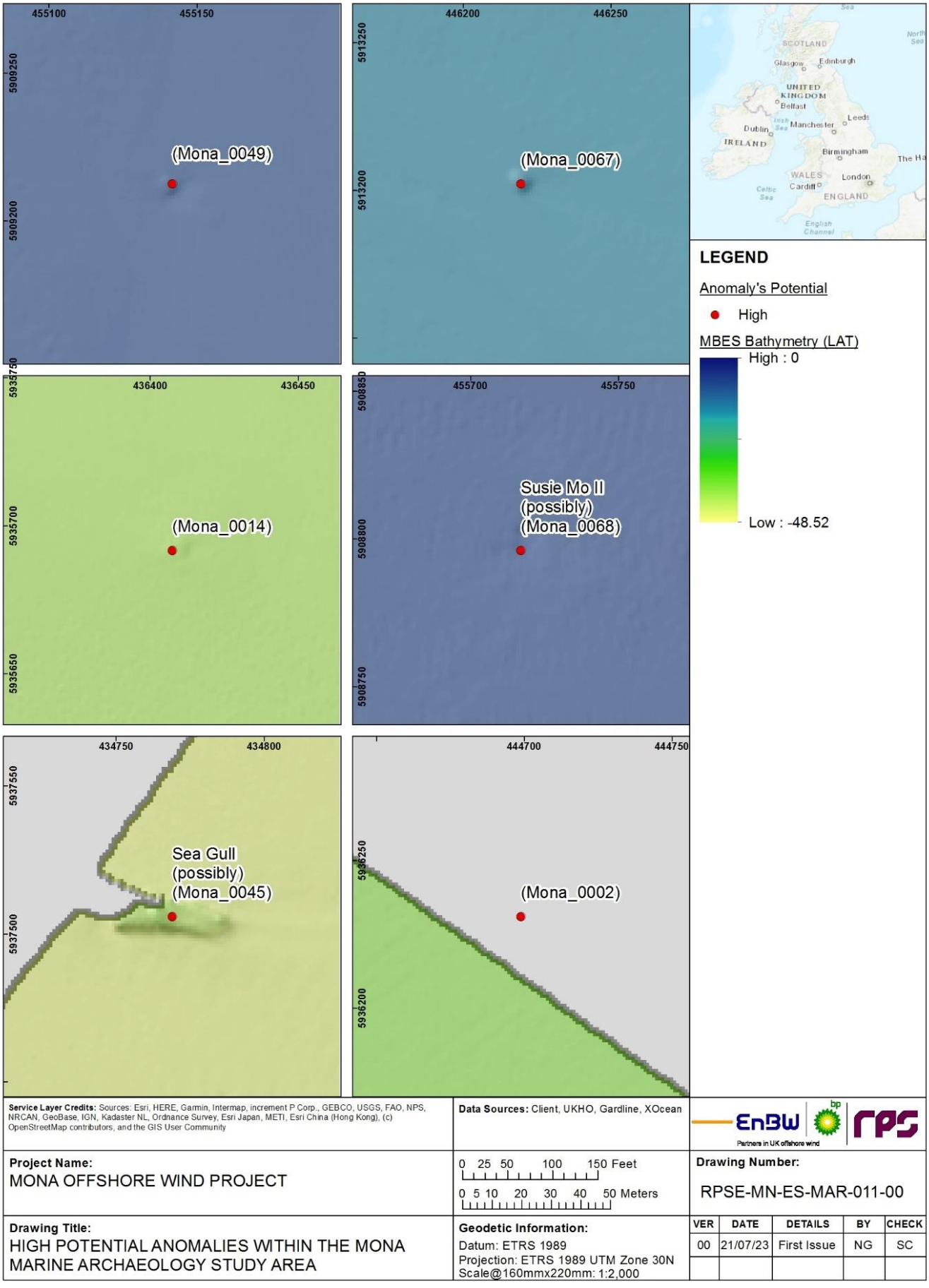

Figure 1.21: High potential anomalies within the Mona Offshore Cable Corridor.

1.7 Summary

1.7.1 Submerged prehistoric archaeology

1.7.1.1 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. Stage 1 geoarchaeological assessment concluded that there was no potential for the survival of prehistoric archaeological material within the 5 boreholes assessed. However, both the borehole data and geophysical surveys have 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. Therefore, Stage 2 geoarchaeological assessment is recommended to advance the understanding of the Devensian ice retreat in the East Irish Sea.

1.7.1.2 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.

1.7.2 Maritime and aviation archaeology

1.7.2.1 Geophysical surveys have identified 17 high potential anomalies and 16 medium potential anomalies within the Mona Offshore Wind Project. Of the 17 high potential anomalies, eight of the anomalies correspond with records in the desktop data including records of the *Tijl Uilenspiegel*, *Ardlough*, and *Sea Gull* and Mona_0068 may relate to the position of the *Susie Mo II*.

1.7.2.2 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 potential impacts to marine archaeology receptors are assessed in chapter 9: Marine archaeology of the ES.

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

UKHO	NRHE	NMRW	X	Y	Name	Description
8124	906839	271774	440489.1727	5926317.503	Albanian	The Albanian was an iron-hulled steamship built by T Royden & Sons, Liverpool, in 1870.
8239	1004768		444342.1595	5937500.782	Ardlough (Mona_009)	An Antiguan and Barbudan carrier which sank on 26 September 1998 while enroute from Garston to Belfast. The wreck lies apparently upright and mostly coherent, except for notable collapse along the port side.
		240100	450614.1589	5912635.901	Glory	The Glory was a wooden sailing vessel which was carrying roofing slates from Bangor to Liverpool under the command of J Garner. The vessel sank off Little Ormes Head in early October 1821, but the crew and passengers were saved. The Wreck lies with its keel orientated 000/180 degrees. The remains of the hull are pinned under the cargo of cut roofing slates. The site extends for some 20 m x 8 m and the mound has a height 2 m above the seabed. There is a debris trail extending some 35 m to the south.
		519089	457425.352	5905233.784	Hecla	Archaeological remains associated with the loss of this vessel are not confirmed as present at this location but may be in the vicinity. The Hecla was a sailing vessel, which became stranded off Llanddulas on 29 January 1882.
8140	906866	271604	441918.1436	5928554.619	Nydia (probably)	The Nydia was a wooden barque built by Valin at Quebec in 1863.
		240761	437693.968	5930253.237	Porthole find	This find, two portholes measuring 12 in, was recovered approximately 25 miles from Amlwch and reported to the Receiever of Wrecks.
7946	909480	272253	434782.0717	5937486.18	Sea Gull (possibly) (Mona_0045)	The Seagull was a steel hulled steamship built Mackie and Thomson at Glasgow in 1899. The ship was on passage from Le Harve to Liverpool under the command of master H D Barnard when it was torpedoed by U-103. The vessel sank 8 miles northeast of Point Lynas with the loss of 20 crewmembers.
		525255	433716.8084	5960372.482	Seabed anomaly	Described as a linear dark reflector with diffuse edges, measuring 4.2 m length x 0.7 m breadth x 0.5 m height. Identified during the archaeological review of geophysical data obtained by CERI, with the survey carried out by Marin Matteknik AB (MMT) between February and August 2010.

UKHO	NRHE	NMRW	X	Y	Name	Description
		525129	432950.6073	5945040.199	Seabed anomaly	A magnetic anomaly measuring 42 nT, within an area of noise. Identified during the archaeological review of geophysical data obtained by CERI, with the survey carried out by Marin Matteknik AB (MMT) between February and August 2010.
		525276	431274.4973	5954585.672	Seabed anomaly	Described as a small, isolated dark reflectors in an area of seabed devoid of any natural features. Identified during the archaeological review of geophysical data obtained by CERI, with the survey carried out by Marin Matteknik AB (MMT) between February and August 2010.
		525270	433998.0987	5955235.937	Seabed anomaly	Described as a small, isolated v-shaped anomaly, measuring 1.1 m length x 0.7 m breadth x 0.9 m height. Identified during the archaeological review of geophysical data obtained by CERI, with the survey carried out by Marin Matteknik AB (MMT) between February and August 2010.
		525259	428656.8506	5958769.394	Seabed anomaly	Described as a large magnetic anomaly (109 nT) but with no corresponding sidescan sonar trace to positively confirm a wreck site. Identified during the archaeological review of geophysical data obtained by CERI, with the survey carried out by Marin Matteknik AB (MMT) between February and August 2010.
		525258	432511.7297	5959462.601	Seabed anomaly	Described as a medium magnetic anomaly (23 nT) but with no corresponding sidescan sonar trace. Identified during the archaeological review of geophysical data obtained by CERI, with the survey carried out by Marin Matteknik AB (MMT) between February and August 2010.
		525252	432318.3091	5959990.826	Seabed anomaly	Described as an isolated linear dark reflector - measuring 0.6 m length x 0.3 m breadth. Identified during the archaeological review of geophysical data obtained by CERI, with the survey carried out by Marin Matteknik AB (MMT) between February and August 2010.
		525257	432399.1313	5960144.949	Seabed anomaly	Described as a large and distinct magnetic anomaly (140 nT) but with no corresponding sidescan sonar trace to confirm a wreck site. Identified during the archaeological review of geophysical data obtained by CERI, with the survey carried out by Marin Matteknik AB (MMT) between February and August 2010.

UKHO	NRHE	NMRW	X	Y	Name	Description
		525256	432399.1313	5960144.949	Seabed anomaly	Described as a medium magnetic anomaly (45 nT) but with no corresponding sidescan trace. Identified during the archaeological review of geophysical data obtained by CERI, with the survey carried out by Marin Matteknik AB (MMT) between February and August 2010.
		525254	433248.9001	5960226.907	Seabed anomaly	Described as a linear dark reflector, measuring 2.7 m length x 0.5 m height. Identified during the archaeological review of geophysical data obtained by CERI, with the survey carried out by Marin Matteknik AB (MMT) between February and August 2010.
		525250	433856.1488	5960418.44	Seabed anomaly	Described as a weak dark reflector with a bright shadow - measuring 1.1 m length x 0.6 m breadth x 1.3 m height. Identified during the archaeological review of geophysical data obtained by CERI, with the survey carried out by Marin Matteknik AB (MMT) between February and August 2010.
		525249	433856.1488	5960418.44	Seabed anomaly	Three dark reflectors within 80 m of each other - measuring 0.9 m length x 0.8 m breadth x 0.5 m height; 3.4 m length x 0.5 m breadth x 0.7 m height; and 1.6 m length x 0.5 m breadth x 0.9 m height. Identified during the archaeological review of geophysical data obtained by CERI, with the survey carried out by Marin Matteknik AB (MMT) between February and August 2010.
7452			433422.706	5953756.353	Tijl Uilenspiegel (Mona_0076)	The Tijl Uilenspiegle was a Belgian fishing trawler. Built in 1972 the Tijl Uilenspiegle sank in 1987 under mysterious circumstances.
	909482		440993.6069	5940155.679	Unknown	Remains of a vessel.
7969			440991.9988	5940148.841	Unknown (Mona_0091)	Entire Wreck.
		525257	432399.1313	5960144.949	Seabed anomaly	Described as a large and distinct magnetic anomaly (140 nT) but with no corresponding sidescan sonar trace to confirm a wreck site. Identified during the archaeological review of geophysical data obtained by CERI, with the survey carried out by Marin Matteknik AB (MMT) between February and August 2010.
8142			457687.3238	5907652.771	Unknown	Entire Wreck.
8143			459543.3616	5906155.065	Unknown	None reported.
8144			446220.7432	5913207.212	Unknown (Mona_0067)	Notable Debris.
8162	909485	518452	435799.6673	5948721.567	Unknown (Mona_0084)	Probable remains of a lightship.

UKHO	NRHE	NMRW	X	Y	Name	Description
8139		506955	446860.4436	5912489.845	Unknown	The remains comprise a mound of roofing slate, 25 m x 7 m long, under which lie the remains of the lower part of a wooden vessel. The wreck's wooden hull structure is exposed on the east side of the mound. The keel of the vessel is orientated 045/225 degrees. The wreck was located by a hydrographic survey company in September 1986.
		506956	446221.4104	5913210.275	Unknown	The wreck or wreckage lies orientated 045/235 degrees and has a length of 8 to 10 m. The site was located by a hydrographic survey company in October 1986 and examined by HMS Hectate and HMS Bulldog in June 1988.
		240917	442547.4032	5914370.7	Unknown	Unnamed wreck.
		240916	441993.5099	5929408.647	Unknown	A compass binnacle was reported to the Receiver of Wreck after being recovered from a wreck 10miles north of the Great Orme. Archaeological remains associated with the loss of this vessel are not confirmed as present at this location but may be in the vicinity.
	909406	506879	447431.4485	5939710.162	Unknown	Unnamed wreck.
	909481	506868	444575.0012	5939897.018	Unknown	A buried wreck which manifests as six hollows in the seabed with a magnetic signature. The wreck was located by HMS Bulldog in May 1988.
		518451	435876.0635	5959488.971	Unknown	A seabed obstruction (archaeological character unknown) with a height of 1.2 m.
8238			450614.7739	5912634.7	Vine (possibly)	Built of wood in 1788 in Norwich. Sprang a leak in SW force 9 winds whilst carrying 105 tons of roofing slates. Lost due to weather.
91489			455717.1	5908796.2	Susie Mo II (Mona_0068)	A fishing vessel that sank in 2015.
99231			444699	5936231	Unknown (Mona_002)	A degraded and buried wreck.

Appendix B: Gazetteer of potential anomalies within the Mona marine archaeology study area.

ID	Location	Potential	Description	Name	UKHO	NRHE	NMRW	L	W	H	X	Y
Mona_0002	Cable Corridor	High	Potential wreck		99231			36.9	24.2	0.8	444699.0	5936231.0
Mona_0009	Cable Corridor	High	Wreck	*Ardlough*	8239	1004768		86.7	31.6	13.3	444396.3	5937516.9
Mona_0014	Cable Corridor	High	Potential wreck					14.9	15.8	0.5	436407.3	5935691.7
Mona_0016	Cable Corridor	High	Potential wreck					18.5	5.6	0.6	435778.6	5934819.7
Mona_0030	Cable Corridor	High	Potential wreck					8.3	3.9	2.4	435890.5	5937670.3
Mona_0031	Cable Corridor	High	Potential wreck					11.8	3.8	0.5	438516.7	5935692.4
Mona_0037	Cable Corridor	High	Potential wreck					8.8	5.3	2.6	436239.1	5938033.9
Mona_0040	Cable Corridor	High	Wreck					125.0	30.0	1.6	436676.6	5937578.9
Mona_0045	Cable Corridor	High	Wreck	*Sea Gull* (possibly)	7946	909480	272253	38.6	11.2	1.7	434768.9	5937505.8
Mona_0049	Cable Corridor	High	Potential wreck					6.2	6.1	0.8	455141.6	5909212.6
Mona_0067	Cable Corridor	High	Potential wreck		8144		506956	7.8	7.1	1.6	446219.6	5913202.3
Mona_0068	Cable Corridor	High	Potential wreck	*Susie Mo II* (possibly)	91489			16.8	10.2	0.3	455717.1	5908796.2
Mona_0076	Array Area	High	Wreck	*Tijl Uilenspiegel*	7452			29.7	7.6	7	433419.2	5953767.8
Mona_0084	Array Area	High	Wreck		8162	909485	518452	15.8	5.3	2.8	435824.4	5948735.6
Mona_0091	Array Area	High	Wreck		7969	909482	240670	37.1	5.1	5.8	440973.4	5940170.0
Mona_0108	Array Area	High	Potential wreck					93.1	45.7		436254.1	5959800.1
Mona_0110	Array Area	High	Potential wreck					34.8	9.7	1.0	435333.1	5951723.8
Mona_0018	Cable Corridor	Medium	Potential debris					16.7	10.3	1.0	439865.8	5931973.2
Mona_0025	Cable Corridor	Medium	Potential debris					8.0	7.7	0.5	442354.5	5937489.0
Mona_0033	Cable Corridor	Medium	Potential debris					18.1	13.5	0.9	438392.3	5931929.6

ID	Location	Potential	Description	Name	UKHO	NRHE	NMRW	L	W	H	X	Y
Mona_0038	Cable Corridor	Medium	Potential debris					11.5	11.0	0.2	439386.8	5929010.4
Mona_0044	Cable Corridor	Medium	Debris		7959			10.7	1.8	0.9	445694.8	5938210.5
Mona_0048	Cable Corridor	Medium	Potential debris					10.1	4.7	0.6	440139.3	5937112.4
Mona_0057	Array Area	Medium	Anchor					18.1	22.1	1.1	439115.4	5962417.7
Mona_0065	Cable Corridor	Medium	Seabed disturbance					18.6	14.3	0.2	453545.1	5908994.0
Mona_0066	Cable Corridor	Medium	Potential debris					7.8	4.2	0.4	454791.8	5909474.8
Mona_0069	Cable Corridor	Medium	Mound					47.6	14.0	0.6	457913.3	5907677.7
Mona_0080	Array Area	Medium	Unidentified debris					9.1	2.8	2.3	431545.5	5954410.7
Mona_0081	Array Area	Medium	Potential debris					11.5	2.2	0.6	446410.7	5943791.7
Mona_0092	Array Area	Medium	Potential wreck					8.8	1.3	0.5	430376.0	5946260.9
Mona_0102	Array Area	Medium	Potential debris					4.9	3.1	1.4	435869.6	5959476
Mona_0109	Array Area	Medium	Mound					16.5	5.4	1.4	434606.8	5954333.8
Mona_0111	Array Area	Medium	Potential debris					12.4	9.6	0.7	450799.2	5942774
Mona_0112	Array Area	Medium	Mound					9.9	4.7	0.4	442619.1	5940823.2
Mona_0113	Array Area	Medium	Wooden sailing ship					59.1	27.3		450956.5	5944683.9
Mona_0001	Cable Corridor	Low	Potential debris					1.7	1.6	0.2	436179.6	5937551.6
Mona_0003	Cable Corridor	Low	Potential debris					2.6	1.7	0.8	443785.4	5935513.1
Mona_0004	Cable Corridor	Low	Potential debris					3.6	3.0	1.4	441465.6	5937188.9
Mona_0005	Cable Corridor	Low	Potential debris					6.5	0.3	0.7	438879.8	5938960.7
Mona_0006	Cable Corridor	Low	Potential debris					1.0	0.4	0.3	434784.6	5939824.2
Mona_0007	Cable Corridor	Low	Potential debris					5.8	2.8	0.3	434784.6	5939824.2
Mona_0008	Cable Corridor	Low	Potential debris					1.7	0.5	0.7	445083.4	5938239.0
Mona_0010	Cable Corridor	Low	Fishing gear					13.8	1.0	0.8	438147.4	5932919.2

ID	Location	Potential	Description	Name	UKHO	NRHE	NMRW	L	W	H	X	Y
Mona_0011	Cable Corridor	Low	Likely geological					3.1	1.1	0.3	443912.1	5937095.7
Mona_0012	Cable Corridor	Low	Likely geological					8.3	1.6	0.1	443602.7	5937566.8
Mona_0013	Cable Corridor	Low	Potential debris					1.5	1.4	0.4	438998.6	5930610.0
Mona_0015	Cable Corridor	Low	Potential debris					2.0	0.3	0.3	439304.2	5939111.3
Mona_0017	Cable Corridor	Low	Potential debris					2.8	0.8	0.3	438863.0	5932853.4
Mona_0019	Cable Corridor	Low	Likely geological					5.6	0.8	0.0	442353.8	5917060.8
Mona_0020	Cable Corridor	Low	Potential debris					3.7	2.3	0.1	441579.4	5917421.4
Mona_0021	Cable Corridor	Low	Potential debris					4.7	0.2	0.4	440885.4	5932651.2
Mona_0022	Cable Corridor	Low	Linear feature					11.3	0.1	0.0	436873.0	5935782.9
Mona_0023	Cable Corridor	Low	Potential debris					6.6	5.4	0.8	438590.7	5934354.7
Mona_0024	Cable Corridor	Low	Potential debris					35.3	5.4	0.0	438774.6	5934225.8
Mona_0026	Cable Corridor	Low	Likely geological					2.0	0.6	0.3	443103.1	5935263.6
Mona_0027	Cable Corridor	Low	Potential debris					4.2	0.8	0.2	439458.5	5938008.6
Mona_0028	Cable Corridor	Low	Potential debris					3.1	0.4	0.1	435213.9	5940774.6
Mona_0029	Cable Corridor	Low	Potential debris					1.3	0.7	0.7	438105.3	5938819.9
Mona_0032	Cable Corridor	Low	Potential debris					4.0	1.0	0.5	440014.2	5934652.6
Mona_0034	Cable Corridor	Low	Potential debris					3.2	2.7	0.8	441513.1	5938976.2
Mona_0035	Cable Corridor	Low	Likely geological					11.5	1.9	1.6	437952.8	5935278.5
Mona_0036	Cable Corridor	Low	Potential debris					3.0	1.0	0.5	435054.6	5937201.0
Mona_0041	Cable Corridor	Low	Likely geological					1.7	0.7	0.1	435938.5	5935538.8
Mona_0042	Cable Corridor	Low	Potential debris					2.6	2.9	0.2	435911.1	5935507.8
Mona_0043	Cable Corridor	Low	Likely geological					3.9	3.1	0.6	440542.6	5935222.3
Mona_0046	Cable Corridor	Low	Linear feature					5.9	0.2	0.2	439643.2	5938089.2

ID	Location	Potential	Description	Name	UKHO	NRHE	NMRW	L	W	H	X	Y
Mona_0051	Cable Corridor	Low	Chain, cable, or rope					17.6	0.4	0.1	453539.2	5910147.4
Mona_0052	Cable Corridor	Low	Fishing gear					15.2	0.1	0.2	448998.9	5911915.4
Mona_0052	Array Area	Low	Potential debris					2.3	0.2	0.6	438590.2	5965679.4
Mona_0053	Array Area	Low	Likely geological					3.8	4.1	0.6	439243.3	5964150.5
Mona_0053	Cable Corridor	Low	Potential debris					3.9	0.2	0.3	456183.4	5908968.1
Mona_0054	Array Area	Low	Likely geological					2.7	1.6	1.6	433065.9	5968174.1
Mona_0054	Cable Corridor	Low	Likely geological					2.2	1.6	0.2	452084.9	5911107.2
Mona_0055	Array Area	Low	Likely geological					7.1	0.8	2	436054.9	5965736.7
Mona_0055	Cable Corridor	Low	Potential debris					7.2	0.2	0.2	455154.5	5908377.3
Mona_0056	Array Area	Low	Chain, cable, or rope					89	0.4	0.1	440102.2	5962003.5
Mona_0056	Cable Corridor	Low	Potential debris					6.9	1.7	0.1	457859.7	5907707.1
Mona_0057	Cable Corridor	Low	Potential debris					1.4	1.7	0.3	448904.2	5912061.1
Mona_0058	Array Area	Low	Potential debris					5.7	2.8	1.2	441044.3	5960071.5
Mona_0058	Cable Corridor	Low	Chain, cable, or rope					32.5	0.3	0.1	457391.9	5908212.6
Mona_0059	Array Area	Low	Likely geological					3.5	1.5	1.4	437665	5961357.8
Mona_0059	Cable Corridor	Low	Chain, cable, or rope					64.6	0.3	0.0	457190.3	5908275.0
Mona_0060	Array Area	Low	Fishing gear					18.6	2	0.2	443262.3	5953708.4
Mona_0061	Array Area	Low	Potential debris					10.2	5	0.4	447742.3	5949982.7
Mona_0061	Cable Corridor	Low	Potential debris					8.7	0.8	0.1	449357.5	5911558.8
Mona_0062	Array Area	Low	Likely geological					29.6	3.5	1.9	432607.7	5960196.9
Mona_0062	Cable Corridor	Low	Potential debris					2.3	0.6	0.3	445860.2	5914056.1

ID	Location	Potential	Description	Name	UKHO	NRHE	NMRW	L	W	H	X	Y
Mona_0063	Array Area	Low	Potential debris					5.3	1	0.6	453223.1	5944907.0
Mona_0064	Cable Corridor	Low	Potential debris					4.5	1.9	0.1	453164.0	5910543.1
Mona_0065	Array Area	Low	Linear feature					22.8	0.1	0.1	436153.6	5956883.3
Mona_0066	Array Area	Low	Linear feature					4.1	0.8	0.1	433238.3	5957837.2
Mona_0067	Array Area	Low	Linear feature					19.9	0.8	0.2	430787.7	5958799.3
Mona_0068	Array Area	Low	Unidentified debris					5.5	1.5	0.3	439943.1	5951162.2
Mona_0069	Array Area	Low	Linear feature					14.3	0.8	0.3	443432.5	5948646.5
Mona_0070	Array Area	Low	Unidentified debris					2.6	1.4	1.4	438825.4	5951842.4
Mona_0073	Array Area	Low	Potential debris					3.4	0.8	0.3	435984.8	5952664.9
Mona_0074	Array Area	Low	Potential debris					2.2	1.3	0.4	436408.4	5952122.7
Mona_0075	Array Area	Low	Likely geological					3.1	0.9	0.3	434563.7	5953111.3
Mona_0078	Array Area	Low	Linear feature					19.5	0.1	0.3	445536	5945025.6
Mona_0079	Array Area	Low	Fishing gear					20	0.1	0.1	430954.3	5955226
Mona_0082	Array Area	Low	Linear feature					12.6	0.3	0.4	442140	5944942.9
Mona_0083	Array Area	Low	Potential debris					5.7	0.4	0.5	447401.2	5940723.4
Mona_0085	Array Area	Low	Likely geological					23	6.3	1.7	442029.2	5944403.6
Mona_0086	Array Area	Low	Potential debris					2.6	0.6	0.4	431309.4	5951695.3
Mona_0088	Array Area	Low	Likely geological					3.9	1.1	0.3	431749.4	5948889.5
Mona_0089	Array Area	Low	Likely geological					13.4	0.6	0.4	441088.7	5941414.9
Mona_0090	Array Area	Low	Potential debris					0.6	0.7	0.5	432251.3	5946628.3
Mona_0093	Array Area	Low	Linear feature					10.3	0.4	0.1	434750.3	5942491.9
Mona_0094	Array Area	Low	Potential debris					2.8	0.6	0.1	433784.3	5943463.7
Mona_0101	Array Area	Low	Linear feature					23.9	0.8	0.1	445136.8	5952944.8

ID	Location	Potential	Description	Name	UKHO	NRHE	NMRW	L	W	H	X	Y
Mona_0106	Array Area	Low	Potential debris					3.3	0.8	0.4	435616.7	5961888.1
Mona_0114	Array Area	Low	Likely geological					60.7	18.5		447444.3	5939716.4
Mona_0115	Array Area	Low	Likely geological					8	3.7		447964.5	5939981.3

Appendix C: Gazetteer of recorded losses within the Mona marine archaeology study area.

NMRW	Name	Description	Period
240575	Caroline	A wooden smack belonging to Porthmadoc. It was lost on a voyage from Mostyn in 1874.	Post Medieval
271180	Stanleigh	A steel-hulled steamship built by G Seebeck G.Akt at Wesermunde, Germany, in 1912. At time of loss on 14 March 1941, the vessel was owned by Stanhope Steam Ship Company and registered at London. The ship had been requisitioned as an Admiralty collier and was part of an Irish Sea convoy. The ship was bombed by German aircraft and managed to reach Liverpool bay before it sank with the loss of 16 crewmembers and one passenger.	WWII
272372	Adelphea	A wooden sailing vessel belonging to Beaumaris. On 27 February 1842, the vessel was under the command of master Owens and on passage from Bangor to Liverpool when it foundered off the lightship. The crew were saved.	Post Medieval
271492	Sparks and Rebecca	A wooden snow which was on passage from Liverpool to Malta. On 16 April 1809, the snow had taken a pilot on board for the first part of the outward bound journey from the Mersey. The pilot did not return and so it was presumed that the vessel had sunk off Anglesey sometime the following day, as three bodies were washed up on the coast. One of which was identified as the snow's master, Captain Service, by his clothing and by the bill of laden for the vessel in his pocket.	Post Medieval
271368	Endeavour	A wooden sloop built at Chester in 1817. The sloop was carrying a cargo of cast iron ingots from Glasgow to Saltney where it was caught in a northerly force 10 gale on 3 October 1854. It was blown ashore near Abergele and the crew were rescued by the Rhyl lifeboat.	Post Medieval
271446	Vine	A wooden sloop built at Northwich in 1788. At time of loss on 5 June 1877, the vessel was owned by O Thomas of Runcorn and was carrying 105 tons of roofing slate from Port Dinorwic to Liverpool. The sloop was caught in a south westerly gale force 9 and sprang a leak due to the stress of weather. The sloop eventually foundered 10 miles southeast of the Great Orme. A wreck was reported at this location in October 1986, but nothing was found by HMS Hectate during a hydrographic survey undertaken in June 1988.	Post Medieval
271392	Nancy	Was on passage from Liverpool to South Carolina in late April/early May 1769. The report printed in Lloyds List on 19 May 1769 noted the master's name as Minshall and that the vessel had caught fire off Ormeshead. The crew had escaped into the ship's boats.	Post Medieval

NMRW	Name	Description	Period
271725	Ann	A wooden sloop on passage from Liverpool to Amlwch. The report printed in Lloyds List on 20 April 1821 noted the master's name as Roberts and that the vessel had foundered off the Great Orme on 14 April 1821. The crew had been saved.	Post Medieval
271695	James	A wooden sailing vessel on passage from Liverpool to Ross. It was lost off the Great Orme on 10 October 1817.	Post Medieval
271694	Elizabeth and Mary	A wooden sailing vessel on passage from Liverpool to Milford Haven. The report printed in Lloyds List on 29 July 1817 noted that the vessel had been run down by the Kelsick (master Wood) off the Orme's Head. The crew of the Elizabeth and Mary were landed at Liverpool by the Kelsick.	Post Medieval
271584	HMS Thistle IV	A steam drifter built in 1906 at Lossiemouth. The drifter had been hired by the Admiralty for use as an anti-submarine net tender (number 2861). The Thistle was rammed and sunk by the Elder Dempster steamship Tarquah on 30 June 1915. Sources suggest that the Tarquah believed the drifter to be a u-boat. No lives were lost.	WWI
271317	Guardian Angel	A wooden barque built in 1856. At time of loss 2 December 1867, the vessel was on passage from Liverpool to New York with coal. The barque was caught by a northerly force 10 gale and wrecked on the Constable Bank. All eight crewmembers were drowned.	Post Medieval
271447	Esther	A wooden sloop built at Ulverston in 1842. At time of loss on 5 June 1877, the vessel was owned by T Roberts of Conway and registered at Beaumaris. The sloop was carrying 38 tons of coal from Liverpool to Cemaes when it was caught in a south-southwesterly force 10 gale. The heavy seas breaking over the vessel caused the holds to fill. The crew abandoned the vessel 3miles east of the Great Orme and it sank about 30 minutes later.	Post Medieval
271503	Triton	A wooden schooner built in 1820 and registered at Maryport. At time of loss on 4 July 1876, the vessel was owned by W Hughes of Morfa Nevin and was carrying 90tons of coal from Liverpool to Holyhead. The schooner foundered 4 miles east-southeast of Little Ormes Head.	Post Medieval
271292	Unnamed wreck	This wooden sloop foundered off the Great Orme after being caught in a northwest force 8 gale on 18 March 1854. One crewmember was rescued by the steamship Prince of Wales.	Post Medieval
271571	Alice	A wooden sloop belonging to Liverpool. It was abandoned in a foundering state off the Great Orme on 25 March 1857. The crew landed safely in their own boat.	Post Medieval
271740	Catherine	A wooden sloop sailing vessel on passage from Liverpool to Pwllheli. The report printed in Lloyds List on 25 January 1820 noted that master's name as Jones and that the vessel had foundered off the Orme Head on 18 January 1820.	Post Medieval

NMRW	Name	Description	Period
271675	Albion	A wooden sailing vessel belonging to the port of Whitehaven. On 27 December 1825, vessel was on passage from Whitehaven to Dublin under the command of master Fisher, when it capsized near the Great Orme. The majority of the crew abandoned ship, but the master and a boy remained onboard. The vessel is believed to have foundered soon after. The crew who escaped were landed at Whitehaven on 9 January.	Post Medieval
271502	Speedwell	A wooden smack built at Pwllheli in 1808. In 1875 it sprang a leak while carrying 47 tons of stone and foundered 2 miles north of Great Ormes Head.	Post Medieval
271741	Unnamed Wreck	A sloop of 80 tons that had seen to founder on 2 March 1820 off Great Ormes head.	Post Medieval
271473	Union	A wooden sailing ship on passage from Virginia to Liverpool, February 1794. Lloyd's list on 4 February 1794 noted the master's name as Snow and the vessel had been lost 'off Ormshead'.	Post Medieval
271425	Union	A wooden sailing vessel on passage from Liverpool. The report printed in Lloyds List on 6 November 1812 noted that the vessel had sunk off the Orme's head on 1 November 1812. The crew had been saved.	Post Medieval
271760	Lark	A wooden sloop which had set out from Newport under the command of master Morgan. It foundered off the Great Orme on 17 October 1808. The crew escaped into their boat but were drowned.	Post Medieval
271739	Hero	A wooden sloop belonging to Bangor. At time of loss on 18 January 1820, the vessel was on passage from Liverpool to Pwllheli or Caernarfon (sources differ) under the command of master Jones. The vessel foundered off the Great Orme.	Post Medieval
271728	Laura and Mary	A wooden sloop lost in a heavy gale on 14 November 1821 during passage from Mostyn. No lives were lost.	Post Medieval
271154	Penrhyn	An unpowered barge that was refitted with a steam engine during its service life. At time of loss on 15 November 1940, the vessel was owned by the Liverpool Lighterage Company Ltd. The barge was on passage from Liverpool to Caernarfon when it was lost near Gamma Bay.	WWII
271629	Rose	A wooden yawl built in 1875. At time of loss on 21 October 1894, the vessel was owned by P Speakman of Runcorn and registered at that port. The vessel was carrying limestone from Llandulas to Widnes and had set off into an easterly force 6 gale. Shortly afterwards it foundered approximately 1 miles northwest of Llandulas. The yawl's two-man crew were lost in the incident. A wreck was reported in this vicinity in 1996, but nothing was located by HMS Hectate in 1988.	Post Medieval

NMRW	Name	Description	Period
271230	Stag	A wooden dandy built in 1843 and registered at Liverpool. At time of loss sometime after 21 December 1894, the vessel was owned by G Beck of Hoylake. The STAG was returning to Hoylake from Bangor and was last see off the entrance to the Menai Straits on 21 December 1894. It is presumed that it foundered with all four crewmembers somewhere along the north coast of Wales.	Post Medieval
271451	Llysfaen	Composite-built steamship built in 1867. At time of loss on 3 August 1900, the vessel was owned by H Lupton of Liverpool and registered at that port. The ship was on passage from Widnes to Llandulas when it was caught by a northerly force 7 gale and ran ashore on Abergele Beach.	Modern
271453	Doon	An iron-hulled steamship built by Rhoodee Shipbuilding Company at Chester in 1855. At time of loss on 10 January 1903, the vessel was owned by the Ayre Steam Ship Company and registered at Glasgow. The DOON was carrying bottled beer, empty beer cases and limestone from Dublin to Ayr when it went ashore on Llandulas Beach. An easterly force 8 gale is likely to have been a contributing factor to the loss.	Modern
271455	Progress	A wooden schooner built in 1853 and registered at Dublin. At time of loss on 12 February 1904, the vessel was owned by G Scott & Sons of Newport. Under the command of master T Kearns, the schooner was carrying coal from Garston to Kinsale. It was caught by a south-easterly force 9 gale and went ashore near Pensarn.	Modern
271454	City of Verviers	An iron-hulled steamship built by J Readhead & Co at South Shields in 1875. At time of loss on 6 July 1903, the vessel was owned by D C Thomas & Sons and registered at London. The ship was carrying limestone from Preston to Ardrossan under the command of master J Pirie, when it was caught by a north-westerly force 9 gale in the Abergele Roads. The vessel went ashore on Llandulas Beach	Modern
271450	Conway's Pride	A wooden ketch built in 1859. At time of loss on 16 June 1897, the vessel was owned by J Jones of Pwllheli (also the master). The ketch was carrying coal from Runcorn to Port Galmon (Porth Colman?) when it was caught in a north-westerly force 9 gale. The ketch was blown ashore from the Abergele Road, near Llandulas.	Post Medieval
271017	William Neilson	A wooden sailing vessel which was on passage from Liverpool to New Orleans. The report printed in Lloyds List on 12 October 1832 noted the master's name as Platt and that the vessel had been totally lost. The report also referred to fears that the crew and passengers had been drowned.	Post Medieval

NMRW	Name	Description	Period
271173	Viceroy	A wooden sailing packet used on the Liverpool to Dublin run. In December 1797, the packet loaded an unusual mix of passengers and cargo in the form of a troop of equestrian performers and their horses managed by the well-known circus manager Benjamin Handy. The vessel was heavily loaded nearly to gunwhale height when it left Liverpool sailing into a gale and it is presumed that the packet foundered as it was not heard from again.	Post Medieval
271240	Kate	A wooden sailing vessel built in 1824 and belonging to the port of Ispwich. The vessel was lost in Liverpool Bay in 1833.	Post Medieval
271234	Swift	A wooden schooner built by Peter Stidiford in the Isles of Scilly in 1858. At time of loss 7 January 1839, the vessel was owned by J Tregarthen and J Edwards of the Isles of Scilly and registered at St Marys. The schooner's registry was closed after it was reported that the vessel had been lost in Liverpool Bay whilst under the command of Thomas Edwards junior.	Post Medieval
271156	Gertie	A wooden-hulled steamship built by J Woodcock at Northwich in 1892. At time of loss on 9 July 1930, the vessel was owned by executors of the will of Ian Bradburn. It was carrying granite chips from Trevor to Liverpool when it was lost in Liverpool Bay.	Modern
271555	Newhaven	A wooden brig belonging to the port of Dublin. At time of loss 26 January 1883, the vessel was owned by W Robinson of Dublin and under the command of G Nichols. It was on passage from Dublin to Liverpool and was caught in a south-south easterly force 9 gale. The vessel went ashore near Llandulas.	Post Medieval
271731	No 4 Pilot Boat	A report printed in Lloyds List on 10 December 1822 noted that the No 4 Pilot Boat had been wrecked bear Abergele on the 5 December. The master and two boys had been drowned.	Post Medieval
271590	Thomas	A wooden sailing vessel on passage from Liverpool to Jamaica in early/mid January 1784. The report printed in Lloyds List on 23 January 1784 noted the master's name as Boothby and that the vessel was onshore at 'Abergally'. At that time it was expected that the vessel would become a total loss, and that any cargo that might be saved would be damaged.	Post Medieval
271102	Ceres	A wooden sailing vessel on passage from Liverpool to Newry. The report printed in Lloyds List on 26 February 1830 noted that the vessel had been run down by the steamer *Corsair* from Belfast on 24 February and that the master had been drowned.	Post Medieval
271229	Ellen and Ann	A wooden dandy built in 1848 and registered at Douglas, Isle of Man. At time of loss on 25 December 1894, the vessel was owned by J Eccles of Hoylake (as the owner). The dandy had five crewmembers onboard and left Bangor for Hoylkae on the 21 December 1894. The vessel was not heard from again.	Post Medieval

NMRW	Name	Description	Period
271141	Villa De Llanes	A wooden brigantine built by Schaw & Oltmann's at Geestemunde in 1875. The brigantine had a change a name during its service life - ex -Roman Von Benningsen. At time of loss on 17 October 1890, the vessel was owned by R Romano of Barcelona and registered at that port. The vessel had picked up a pilot to navigate the first part of its passage from Liverpool to Laguna with coal under the command of master J Onate. It was caught in a force 9 gale and became stranded. All those onboard were also lost.	Post Medieval
271362	Ocean Queen	A wooden brigantine built by J Tredwen at Padstow in 1858. The vessel was re-registered in 1885 and it was reported that a gammon knee had taken the place of the figurehead and also that the vessel had been re-rigged as a schooner. The Ocean Queen was carrying a cargo of coal from Runcorn to Padstow on 7 November 1890 when it was caught in a north-westerly force 10 gale. The schooner's sails were blown out and it became unmanageable drifting to strike on Penmaenhead. It floated off and subsequently foundered 137 m offshore from the old quarry at Llanddulas. Four men were seen to climb the rigging. On the sixth attempt the quarrymen managed to get the rowing boat launched and rescued the Ocean Queen’s crew. Three quarrymen and a shopkeeper were awarded RNLI silver medals.	Post Medieval
271208	Henry	A wooden schooner built in 1858. At time of loss on 27 October 1897, the vessel was owned by H Lupton of Liverpool and registered at that port. The schooner was carrying limestone from Llandulas to Fleetwood when the cargo began to overheat and set fire to the vessel. The Henry burmt to the waterline and before it sank in Liverpool Bay.	Post Medieval
507181	Maria and Ann	A wooden schooner built at New Quay in 1830. At time of loss, the vessel was registered at Aberystwyth and its history of ownership reveals that shares in the vessel were divided amongst several New Quay people including mariners, shopkeepers and widows. The schooner's registry was closed on 14 January 1875 with the annotation 'vessel foundered at sea between Holyhead and Liverpool in October 1868'.	Post Medieval
507234	Thistle	A drifter hired by the Admiralty. It sank off the Great Orme on 30 June 1915 after a collision with the steamship Tarquah.	WWI
240705	Pacific	No description available.	Post Medieval
507106	Alliance	A 67 ton wooden sloop built at Towyn in 1803. The vessel was registered at Aberystwyth on 8 July 1833 by Hugh Jones of Towyn who gave the master as Richard Jones. The sloop's registry was closed on 20 January 1834 with the notation that the vessel had been lost near Liverpool on 11 December 1833.	Post Medieval

NMRW	Name	Description	Period
240942	Jane	A wooden smack built by George Llwhelling at Swansea in 1829. At time of loss in July 1835, the smack was owned by Thomas Howell Woodward of the parish of Ilston and registered at Swansea. The master was Richard Jones of Swansea. The smack was run down off Liverpool, the master and boy were drowned. The mate survived the accident.	Post Medieval
240022	Ardent	A sloop that foundered off the Flintshire coast on 8 October 1808 after being caught by a severe gale.	Post Medieval
240596	Adela	A smack belonging to Llandudno. On 1 January 1910 the Adela sank to the north of the Orme's head.	Modern
240493	Lady Louisa Pennant	A wooden schooner completed by John Parry at Bangor on 3 May 1847. The Lady Louisa Pennant left Caernarfon on 14 October 1902 in company with Bangor schooner Fomalhaut. Both were carrying slate and neither was heard from again leading to speculation that they may have collided and both sunk with all hands.	Modern
240597	Ada Mary	A wooden ketch which was carrying timber from Ireland to Hoylake. On 27 March 1919, the ketch got into difficulties off the Little Orme after its sails were blown away. The Llandudno lifeboat was launched and on its way out the lifeboat was 'buried three times by the sea and on one occasion the men were only saved from being washed overboard by clinging to the lifelines'. The coxswain, John Owen, was later awarded a RNLI Bronze Medal.	Modern
506865	Unnamed wreck	A wreck was reported by HMS Gleaner within an area of sandwaves in 1940 but has subsequently not been found.	Post Medieval
240456	Trefriw Trader	A flat built at Chester in 1826. At time of loss, William Jones merchant of Llanwst, Denbigh (52 shares); Jane Jones, widow, and Hugh Davies, Yeoman, both of Conwy joint owners (eight shares); and Harriet Vaughan, widow of Conwy (four shares). The flat's Register entry is closed with the annotation *'Lost at sea 3 miles off Great Ormes Head, 29 January 1865'*.	Post Medieval
240492	Formalhaut	A Bangor-registered schooner that left Caernarfon on 14 October 1902 in company with another similarly registered schooner Lady Louisa Pennant, both were carrying slate and, it is suggested, families of emigrants as a consequence of the fact that when slate was shipped, its weight in relation to their bulk left a great deal of empty hold space which could be used for passengers. Neither schooner was heard from again, and it is thought the two schooners may have collided and sank with all hands and passengers as a consequence.	Modern
515644	Avro Anson N9917	This Anson was built by Avro at Chadderton and assigned to 3 OAFU (Observers Advanced Flying Unit). The controls of the aircraft iced up and it ditched of the Orme head on 14 December 1942	WWII

NMRW	Name	Description	Period
240031	Mona	On 22 June 1809, the North Wales Gazette reported that materials from the Mona had washed ashore.	Post Medieval
240050	Margaret	A wooden galliot carrying slate from Port Penrhyn, Menai Strait, to Chester. The galliot was reported lost on 21 December 1815.	Post Medieval
240052	Diligence	A sloop lost on passage from Liverpool to Amlwch in early March 1818 during adverse weather conditions.	Post Medieval
515445	Hawker Henley III L3316	This Henley was assigned to 1 AACU. On 16 October 1940, the aircraft crashed into the sea in Liverpool Bay.	WWII
240576	Eagle	A pleasure boat belonging to Abergele. Wrecked in 1876 at Llandulas.	Post Medieval
240578	Dido C	A ketch built in Sweden and registered at Runcorn. The ketch was wrecked in 1886 and a silver medal was awarded to the coxswain of the Llandulas lifeboat for rescuing the crew.	Post Medieval
515454	Airspeed Oxford I L4656	This Oxford's service life included assignments to 8 FTS and 5 FTS. On 7 July 1940, the aircraft was dived into the sea off the Little Orme.	WWII
506979	Avro Lancaster I Pb799	Built by Avro of Manchester and was assigned to 49 Squadron. The aircraft went missing on a night navigation exercise on 11 December 1944 and is believed to have ditched into the sea off Great Orme's Head.	WWII
240577	Richard	The Richard was a sailing vessel, which was stranded near the quarry pier, Llandulas in December 1845. Richard Thomas of Conway was praised by the RNLI for his part in the rescue of the crew.	Post Medieval
515805	Avro Anson I EG447	This Anson was built by Avro at Yeadon and its service life include assignments to 1 OAFu and 11 RS. On 17 July 1944, the aircraft ditched into sea 8 miles east of Llandudno.	WWII
515887	Supermarine Spitfire I X4425	This Spitfire's service assignments include Squadrons 19, 92, 57 OTU and lastly 61 OTU. The aircraft flew into sand and crashed at Llandulas on 4 April 1943.	WWII
515680	De Havilland Vampire Fb5 Wa339	This Vampire was built by English Electric, Preston, and was assigned to 202 AFS (Advanced Flying School). It crashed in Livepool Bay on 21 January 1953.	Modern
515583	Bristol Blenheim IV R3833	This Blenheim was built by Rootes and, at time of loss, was assigned to 5 AOS (Air Observers School). The aircraft's engine cut and it lost height and eventually ditched into the Irish Sea between Jurby and Rhyl on 15 November 1942.	WWII

NMRW	Name	Description	Period
515133	Caerwy's Castle	A wooden schooner built at Flint in 1861. From April 1874, the vessel was owned by James Hughes of Holywell, Flint, bootmaker. The Caerwy's Castle register entry is closed with the annotation 'Vessel lost on passage from Laxey, Isle of Man, to Saltney, Port of Chester, on or about 14 November 1875'.	Post Medieval
525166	Lively	A wooden schooner built at Burcough, Lancashire, in 1813. The schooner's Port of Beaumaris Shipping Register entry is closed with the annotation 'Vessel lost viz sunk off Little Ormes Head 10 Feb 1866'.	Post Medieval
515132	Collier	A wooden flat built by Jaes Boydell at Kings Ferry, Dee Estuary, in 1840. The Collier's last owners were the Davison family of Connah's Quay (Charles Davison, merchant, and Thomas Davison, shipowner). The Collier's register entry is closed with the annotation 'Vessel missing, supposed to have foundered on or about 8 January 1889 with all hands on her passage from Connah's Quay to Ramsey, Isle of Man.'	Post Medieval
525143	Eagle	A wooden sloop built at Newquay in 1819. It is likely that the sloop was lost during the Royal Charter Gale, 25-26 October 1859, somewhere near Abergele/Llandrillo yr Rhos, although other sources suggest Conwy.	Post Medieval
524809	Albert	A wooden steamship built by John Stephens, Cornwall, in 1879. The vessel's register entry is closed with annotation 'Vessel lost on or about 10 September 1916 in Liverpool Bay'.	WWI
524791	Mersey	A wooden sloop built at St Helens, Lancashire, in 1798. The sloop's register entry is closed with the annotation 'Lost off the Ormeshead 19 October 1872'.	Post Medieval
524867	Britannia	A wooden sloop built at Pwllheli in 1805. At time of loss, the vessel was owned by William Edwards of Pwllhellli, earthenware maker, and the nominated master was Robert Williams. The sloop's port of Caernarvon Shipping Reguster entry is closed with the annotation 'The vessel was totally lost with all official papers off the Great Ormes head in June 1866'.	Post Medieval
240579	Glynne	A wooden schooner which was built at Connah's Quay in 1867. It is presumed that the schooner foundered somewhere in Liverpool Bay during the north-westerly force 10 gale which blew 6-7 November 1890.	Post Medieval
524887	Annabella	A wooden flat built at Northwich in 1796. The flat's port of Caernarvon Shipping Register entry is closed with the annotation '1848, Sunk between Ormeshead and Chester River, Register, etc, lost, 25 May 1848.'	Post Medieval
525148	Maria and Anna	A 45 ton wooden schooner built at Newquay in 1830. It foundered between Holyhead and Liverpool 1868 with the loss of all hands.	Post Medieval
525151	Skylark	A 59 ton wooden sloop built at Newquay in 1831. It was run down off the Great Orme in 1867.	Post Medieval

NMRW	Name	Description	Period
515131	Lota	A wooden ketch built by J Stock at Old Widnes in 1878. The LOTA's register entry is closed with the annotation 'Vessel lost in Liverpool Bay 31 December 1916'.	WWI
524901	Edward	A wooden schooner built at Dundee in 1827. The schooner's port of Caernarvon Shipping Register is closed with the annotation 'Vessel and Certificate of Registry lost on 19 Feb 1868 on a voyage from Liverpool to Porthmadoc'.	Post Medieval
524881	Deborah	A wooden sloop built at Pwllheli in 1812. The sloop's port of Caernarvon Shipping Register entry was closed with the annotation 'Foundered off the Great Orme 3 July 1845'.	Post Medieval
525177	Susannah	Built at a cutter at Barmouth in 1821 by William Griffith. Its Port of Beaumaris Shipping Register entry is closed with the annotation 'Foundered near the Great Orme Head 14 April 1869'.	Post Medieval
525554	Lytham	A wooden lugger built by Nichlas Barrister at Lyuthan in 1830. At time of loss, the vessel was owned by Nicholas Barrister of Lytham, shipbuilder and the master was noted as William Swann. The lugger's port of Preston Shipping Register entry (46 in 1836) is closed with the annotation 'Lost off Ormes Head about 1838'.	Post Medieval
525198	Brilliant Star	A wooden sloop built at Winsford, Cheshire, in 1839. The sloop's Port of Caernarvon Shipping Reguster entry (5 in 1862) is closed with the annotation ' Lost in or about 8th March 1866 on a voyage from Caernarvon to Silloth'.	Post Medieval
525217	Marie Kaestner	A wooden schooner built at Porthmadoc in 1877. The schooner's Port of Caernarvon Shipping Register entry is closed with the annotation 'This vessel sailed from Liverpool on 1 January 1878 for Porthmadoc. There is no doubt whatever of the loss of the vessel with all hands. The certificate of Registry was on board and consequently lost'.	Post Medieval
525191	Jane Hughes	A wooden schooner built and completed at Porthmadoc on 2 October 1855. The schooner's port of Caernarvon Shipping Register entry is closed with the annotation ' Lost 6 January 1867 on her passage from Whitehaven to Cardiff. Registry closed 29 January 1869'.	Post Medieval
525200	Glan Conway	A wooden smack built at Taly Cafn, Denbighshire, in 1858. At time of loss, the vessel was owned by John Owens of Nevin, master mariner. The smack's Caernarvon Shipping Register entry (10 in 1862) is closed with the annotation 'This vessel was lost with all official papers off the Great Orms head on the 17 November 1869'.	Post Medieval
544287	Jane and Margaret	A wooden schooner built at Amlwch in 1836 (official number 18309). The schooner's Port of Beaumaris Shipping Register entry is closed with the annotation 'Lost 10 Feb 1861 on voyage from Runcorn to Amlwch.'	Post Medieval

NMRW	Name	Description	Period
544276	Fletcher	A Mersey flat built at Northwich in 1811. The flat's Port of Beaumaris Shipping Register entry is closed with the annotation '1836 Vessel foundered off the Ormeshead. Register lost.'	Post Medieval
544288	Catherine	A wooden sloop built in 1819 at Chester. The sloop's Port of Beaumaris Shipping Register is closed with annotation 'Cancelled vessel foundered near Ormes Head in September 1852'.	Post Medieval
240489	Vron	A 110 ton wooden schooner belonging to Nefryn. It departed from Bangor on 17 December 1880 and was not heard from again.	Post Medieval
544233	Caroline	A wooden smack in Jersey in 1843. The smack's port of Aberystwyth Shipping Register entry is closed with the annotation 'Vessel sprung a leak and foundered off Great Orme's head on 19 September 1863'.	Post Medieval
240563	Jane and Margaret	A wooden sailing vessel which left Liverpool on 6 February 1837 with 200 passengers bound for New York. Wreckage and two bodies were subsequently washed up on the Isle of Man.	Post Medieval
525553	Europa	A brig built and completed by David Owen at Cardigan in September 1849. The brig was lost off Orme's Head on 29 April 1860.	Post Medieval