MORGAN AND MORECAMBE OFFSHORE WIND FARMS: TRANSMISSION ASSETS

Environmental Statement

Volume 2, Annex 8.1: Marine archaeology technical report

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Glossary

Term	Meaning
Anthropogenic	An activity resulting from or relating to the influence of humans.
Applicants	Morgan Offshore Wind Limited (Morgan OWL) and Morecambe Offshore Windfarm Ltd (Morecambe OWL).
Baseline	The status of the environment without the Transmission Assets in place.
Bathymetry	A measurement of the depth of water in the ocean.
Cone Penetrometer Test	A method used to determine the geotechnical engineering properties of soils and delineating soil stratigraphy. Tip resistance, friction and dynamic porewater pressure are measured by transducers in the cone, which can be interpreted to provide a profile of soil type and strength.
Effect	The term used to express the consequence of an impact. The significance of effect is determined by correlating magnitude of the impact with the importance, or sensitivity, of the receptor or resource in accordance with defined significance criteria.
Environmental Impact Assessment	The process of identifying and assessing the significant effects likely to arise from a project. This requires consideration of the likely changes to the environment, where these arise as a consequence of a project, through comparison with the existing and projected future baseline conditions.
Environmental Statement	The document presenting the results of the Environmental Impact Assessment process.
Export cable corridor	The specific corridor of seabed (seaward of Mean High Water Springs and land (landward of Mean High Water Springs) from the Generation Assets to the National Grid Penwortham substation.
Fluvial	Sediments that are transported and deposited by rivers.
Gazetteer	A geographical index or dictionary.
Glaciolacustrine	Sediments deposited into lakes that have come from glaciers are called glaciolacustrine deposits. These lakes include ice margin lakes or other types formed from glacial erosion or deposition. Sediments in the bedload and suspended load are carried into lakes and deposited.
Glaciomarine	An environment containing both glacial ice and marine water.
Generation Assets	The generation assets associated with the Morgan Offshore Wind Project and the Morecambe Offshore Windfarm include the offshore wind turbines, inter-array cables, offshore substation platforms and platform link (interconnector) cables to connect offshore substations.
Impact	Change that is caused by an action/proposed development, e.g., land clearing (action) during construction which results in habitat loss (impact).
Intertidal area	The area between Mean High Water Springs and Mean Low Water Springs.
Lacustrine	Sediments formed at the bottom of lakes by incoming water from rivers or stream.

Term	Meaning
Landfall	The area in which the offshore export cables make landfall (come on shore) and the transitional area between the offshore cabling and the onshore cabling. This term applies to the entire landfall area at Lytham St. Annes between Mean Low Water Springs and the transition joint bay inclusive of all construction works, including the offshore and onshore cable routes, intertidal working area and landfall compound(s).
Magnetic anomaly	A notable localised variation in the earth's magnetic field.
Magnetometer	A device that measures magnetic fields.
Mean High Water Springs	The height of mean high water during spring tides in a year.
Mean Low Water Springs	The height of mean low water during spring tides in a year.
Method Statements	A document that describes how a particular task or action should be undertaken correctly.
Mitigation measures	This term is used interchangeably with Commitments. The purpose of such measures is to avoid, prevent, reduce or, if possible, offset significant adverse environmental effects.
Morecambe Offshore Windfarm: Generation Assets	The offshore generation assets and associated activities for the Morecambe Offshore Windfarm.
Morecambe Offshore Windfarm: Transmission Assets	The offshore export cables, landfall and onshore infrastructure required to connect the Morecambe Offshore Windfarm to the National Grid.
Morecambe OWL	Morecambe Offshore Windfarm Limited is a joint venture between Zero-E Offshore Wind S.L.U. (Spain) (a Cobra group company) (Cobra) and Flotation Energy Ltd.
Morgan and Morecambe Offshore Wind Farms: Transmission Assets	The offshore and onshore infrastructure connecting the Morgan Offshore Wind Project and the Morecambe Offshore Windfarm to the national grid. This includes the offshore export cables, landfall site, onshore export cables, onshore substations, 400 kV grid connection cables and associated grid connection infrastructure such as circuit breaker compounds. Also referred to in this report as the Transmission Assets, for ease of reading.
Morgan Offshore Wind Project: Generation Assets	The offshore generation assets and associated activities for the Morgan Offshore Wind Project.
Morgan Offshore Wind Project: Transmission Assets	The offshore export cables, landfall and onshore infrastructure required to connect the Morgan Offshore Wind Project to the National Grid.
Morgan OWL	Morgan Offshore Wind Limited is a joint venture between bp Alternative Energy investments Ltd. and Energie Baden-Württemberg AG (EnBW).
National Policy Statement(s)	The current national policy statements published by the Department for Energy Security and Net Zero in 2023 and adopted in 2024.
Non-statutory consultee	Organisations that an applicant may choose to consult in relation to a project who are not designated in law but are likely to have an interest in the project.
Offshore export cables	The cables which would bring electricity from the Generation Assets to the landfall.

Term	Meaning
Offshore export cable corridor	The corridor within which the offshore export cables will be located.
Offshore Permanent Infrastructure Area	The area within the Transmission Assets Offshore Order Limits (up to Mean Low Water Springs) where the permanent offshore electrical infrastructure (i.e. offshore export cables) will be located.
Offshore Order Limits	See Transmission Assets Order Limits: Offshore (below).
Offshore substation platform(s)	A fixed structure located within the wind farm sites, containing electrical equipment to aggregate the power from the wind turbine generators and convert it into a more suitable form for export to shore.
Palaeoenvironmental	An environment of a past geological age.
Planning Inspectorate	The agency responsible for operating the planning process for applications for development consent under the Planning Act 2008.
Policy	A set of decisions by governments and other political actors to influence, change, or frame a problem or issue that has been recognized as in the political realm by policy makers and/or the wider public.
Preliminary Environmental Information Report	A report that provides preliminary environmental information in accordance with the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017. This is information that enables consultees to understand the likely significant environmental effects of a project and which helps to inform consultation responses.
Scoping Opinion	Sets out the Planning Inspectorate's response (on behalf of the Secretary of State) to the Scoping Report prepared by the Applicants. The Scoping Opinion contains the range of issues that the Planning Inspectorate, in consultation with statutory stakeholders, has identified should be considered within the Environmental Impact Assessment process.
Statutory consultee	Organisations that are required to be consulted by an applicant pursuant to section 42 of the Planning Act 2008 in relation to an application for development consent. Not all consultees will be statutory consultees (see non-statutory consultee definition).
Study area	This is an area which is defined for each environmental topic which includes the Transmission Assets Order Limits as well as potential spatial and temporal considerations of the impacts on relevant receptors. The study area for each topic is intended to cover the area within which an impact can be reasonably expected.
Survey area	The area within which each survey has been undertaken. This may differ from the Study Area as a Survey Area will be based on species or survey-specific guidance on the extent of survey required, which may be limited by, for example, habitat conditions, or be defined in terms of buffer areas around an area of potential impact.
Transmission Assets	See Morgan and Morecambe Offshore Wind Farms: Transmission Assets (above).
Transmission Assets Order Limits	The area within which all components of the Transmission Assets will be located, including areas required on a temporary basis during construction and/or decommissioning (such as construction compounds).
Transmission Assets Order Limits: Offshore	The area within which all components of the Transmission Assets seaward of Mean Low Water Springs will be located, including areas required on a temporary basis during construction and/or decommissioning. Also referred to in this report as the Offshore Order Limits, for ease of reading.

Term	Meaning
Transmission Assets Scoping Boundary	The term used to define the boundary used at the time the Scoping Report was submitted.
Transmission Assets Survey Area	The extent of geophysical survey data coverage for the Transmission Assets. This will overlap and, in places, exceed the Offshore Order Limits and excludes the Generation Assets areas.
Transmission Assets Study Area	The Offshore Order Limits plus a 2 km buffer.
Triassic	A geological period of time from 252 million years ago to 201 million years ago.

Acronyms

Acronym	Meaning
AD	Anno domini
ADS	Archaeology Data Service
AMAPs	Areas of Maritime Archaeological Potential
BC	Before Christ
BGS	British Geological Society
BP	Before Present
COARS	Coastal and Offshore Archaeological Research Services
EIA	Environmental Impact Assessment
ES	Environmental Statement
HE	Historic England
HSC	Historic Seascape Characterisation
JNAPC	Joint Nautical Archaeology Policy Committee
LGM	Last Glacial Maximum
MBES	Multibeam Echo Sounder
MCA	Maritime and Coastguard Agency
MOD	Ministry of Defence
MPS	Marine Policy Statement
NWMP	North West Marine Plan
NPS	National Policy Statement
NRHE	National Record of the Historic Environment
PAD	Protocol for Archaeological Discoveries
PWA	Protection of Wrecks Act
RoW	Receiver of Wreck
SBP	Sub-bottom Profiler

Acronym	Meaning
SSS	Sidescan Sonar
TVG	Magnetometer
UK	United Kingdom
UNESCO	United Nations Educational, Scientific and Cultural Organisation's Convention
UNCLOS	United Nations Convention on the Law of the Sea
UKHO	United Kingdom Hydrographic Office
WCPS	West Coast Palaeolandscape Study
WIS-A	Western Irish Sea A

Units

Unit	Description
km	Kilometres
km^2	Square kilometres
m	Meters
nm	Nautical mile
nT	Nanotesla
°	Degrees

1 Marine archaeology technical report

1.1 Introduction

1.1.1.1 This document forms Volume 2, Annex 8.1: Marine archaeology technical report of the Environmental Statement (ES) prepared for the Morgan and Morecambe Offshore Wind Farms: Transmission Assets (hereafter referred to as the Transmission Assets). The ES presents the findings of the Environmental Impact Assessment (EIA) process for the Transmission Assets.

1.1.1.2 This document provides the baseline information in relation to the Transmission Assets in the east Irish Sea in order to inform the EIA process. The scope of the technical report covers the Offshore Order Limits seaward of Mean Low Water Springs; Transmission Assets Order Limits: Offshore, hereafter referred to as Offshore Order Limits for ease of reading. The archaeology and cultural heritage assessment of the onshore and the intertidal area are addressed in Volume 3, Annex 5.1: Historic environment desk-based assessment of the ES.

1.1.1.3 The objectives of this report are explained below.

- Provide an overview of the archaeological baseline associated with the Offshore Order Limits.
- Summarise the potential for submerged prehistoric archaeology to be encountered within the Offshore Order Limits (**Figure 1.1**).
- Identify known maritime and aviation archaeology sites and assess the potential for the existence of unknown archaeological sites and materials within the Offshore Order Limits. Present site-specific geophysical data from surveys within the Survey Area (**Figure 1.2**) 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.
- Review available site-specific geophysical and geotechnical data of the Survey Area for sediments of archaeological and palaeoenvironmental interest and integrate the results with the findings of the desktop study.

1.2 Legislation, policy and guidance

1.2.1 Overview

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. Legislation, policy and guidance as specific to marine archaeology is set out here to provide an appropriate context for the baseline. Further legislation, policy and guidance relating to marine archaeology in EIA terms is detailed within Volume 2, Chapter 8: Marine archaeology of the ES.

1.2.1.2 With regard to marine licensing, United Kingdom (UK) territorial waters is classed as the area of sea within the limits 12 nm of the territorial coastline.

This also includes any area of sea beyond 12 nm, that is within the Exclusive Economic Zone 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; and
- 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 World Heritage Convention (UNESCO, 1972), United Nations Convention on the Law of the Sea 1982 (UNCLOS, 1982), the European Convention on the Protection of the Archaeological Heritage (Revised) (Council of Europe,1992 (the Valletta Convention)) and the United Nations Educational, Scientific and Cultural Organisation's Convention on the Protection of Underwater Cultural Heritage 2001 (UNESCO, 2001).

1.2.2 Legislation

Protection of Wrecks Act 1973

1.2.2.1 Section one of the Protection of Wrecks Act 1973 (PWA) states that wrecks and wreckage of historical, archaeological, or artistic importance can be protected by way of designation and that it 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).

Protection of Military Remains Act 1986

1.2.2.2 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

1.2.2.3 This Act details the procedures for determining the ownership of maritime finds that turn out to be 'wreck'. These include finds located within UK territorial waters both offshore and onshore including the intertidal area. 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 they be given to the RoW. The Act is administered by the MCA.

1.2.2.4 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.

Ancient Monuments and Archaeological Areas Act 1979 (as amended)

1.2.2.5 This Act is primarily terrestrial, 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 or their equivalent are afforded statutory protection by the Secretary of State, and consent is required for any major works. The law is administered by Historic England (HE) and the Department of Culture, Media and Sport.

1.2.3 Policy

National Policy Statements

1.2.3.1 National Policy Statement (NPS) EN-1 (Overarching National Policy Statement for Energy) (Department for Energy Security and Net Zero (DESNZ, 2023a)) and NPS EN-3 (National Policy Statement for Renewable Energy Infrastructure) (DESNZ, 2023b) include guidance on what is to be included in the ES and as such they are described in detail in Volume 2, Chapter 8: Marine Archaeology of the ES.

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 areas 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.

North West Marine Plan

1.2.3.6 The North West Marine Plan (NWMP) (UK Government, 2021) has been prepared for the purposes of Section 51 of the Marine and Coastal Access Act 2009.The NWMP applies national policies in a local context and should enable activities to move more quickly from concept to consent and enable early identification of proposals that are inappropriate or unfeasible.

1.2.3.7 Section 3.2 of the NWMP relates to a 'mitigation hierarchy' to manage adverse impacts on other marine users or environmental receptors. With regards to heritage assets, the NWMP states that:

1.2.3.8 '*Proposals that demonstrate they will conserve and enhance the significance of heritage assets will be supported. Where proposals may cause harm to the significance of heritage assets, proponents must demonstrate they will, in order of preference: a) avoid; b) minimise; c) mitigate any harm to the significance of heritage assets. If it is not possible to mitigate, then public benefits for proceeding with the proposal must outweigh the harm to the significance of heritage assets'* (UK Government, 2021).

1.2.3.9 The policy aim with regards to heritage assets is to '*conserve and enhance marine and coastal heritage assets by considering the potential for harm to their significance. This consideration will not be limited to designated assets and extends to those non-designated assets that are or have the potential to become significant. The policy will ensure that assets are considered in the decision-making process and will make provisions for those assets that are discovered during developments'* (UK Government, 2021).

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.

- International.
  - European Directive for Environmental Impact Assessments (2014/52/EU).
  - Code of Practice for Seabed Development (Joint Nautical Archaeology Policy Committee (JNAPC)) (2006).
- UK.
  - Code of Conduct (Chartered Institute for Archaeologists (CIfA), 2014a)).
  - Standard and Guidance for Historic Environment Desk Based Assessment (CIfA, 2014b (updated 2020)).
  - Conservation Principles Policies and Guidance for the Sustainable Management of the Historic Environment (English Heritage (now Historic England), 2008).

- COWRIE Historic Environment Guidance for the Offshore Renewable Energy Sector (Wessex Archaeology, 2007a).
- Offshore Renewables protocol for Archaeological Discoveries (The Crown Estate, 2014).
- Offshore Geotechnical Investigations and Historic Environment Analysis: Guidance for the Renewable Energy Sector (Gribble and Leather, 2011).
- Archaeological Written Schemes of Investigation for Offshore Wind Farm Projects (Wessex Archaeology, 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).
- Deposit Modelling and Archaeology Guidance for Mapping Buried Deposits (Historic England, 2020).
- Advice Note 15 Commercial Renewable Energy Development and the Historic Environment (Historic England, 2021).

1.3 Methodology

1.3.1 Sources of information

1.3.1.1 This baseline characterisation has primarily been informed by site-specific geophysical and geotechnical survey data collected for the Transmission Assets. It has also drawn on the site-specific geophysical and geotechnical survey data collected for the Morecambe Offshore Windfarm: Generation Assets and the Morgan Offshore Wind Project: Generation Assets (hereafter referred to collectively as the Generation Assets) as well as site-specific geotechnical survey data collected for the Mona Offshore Wind Project. The site-specific geophysical data for the Generation Assets has been reported as desktop data in this document.

1.3.2 Study area

1.3.2.1 The Transmission Assets marine archaeology study area (hereafter referred to as the study area) is defined as the Offshore Order Limits 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 study area allows for a greater understanding of the 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.

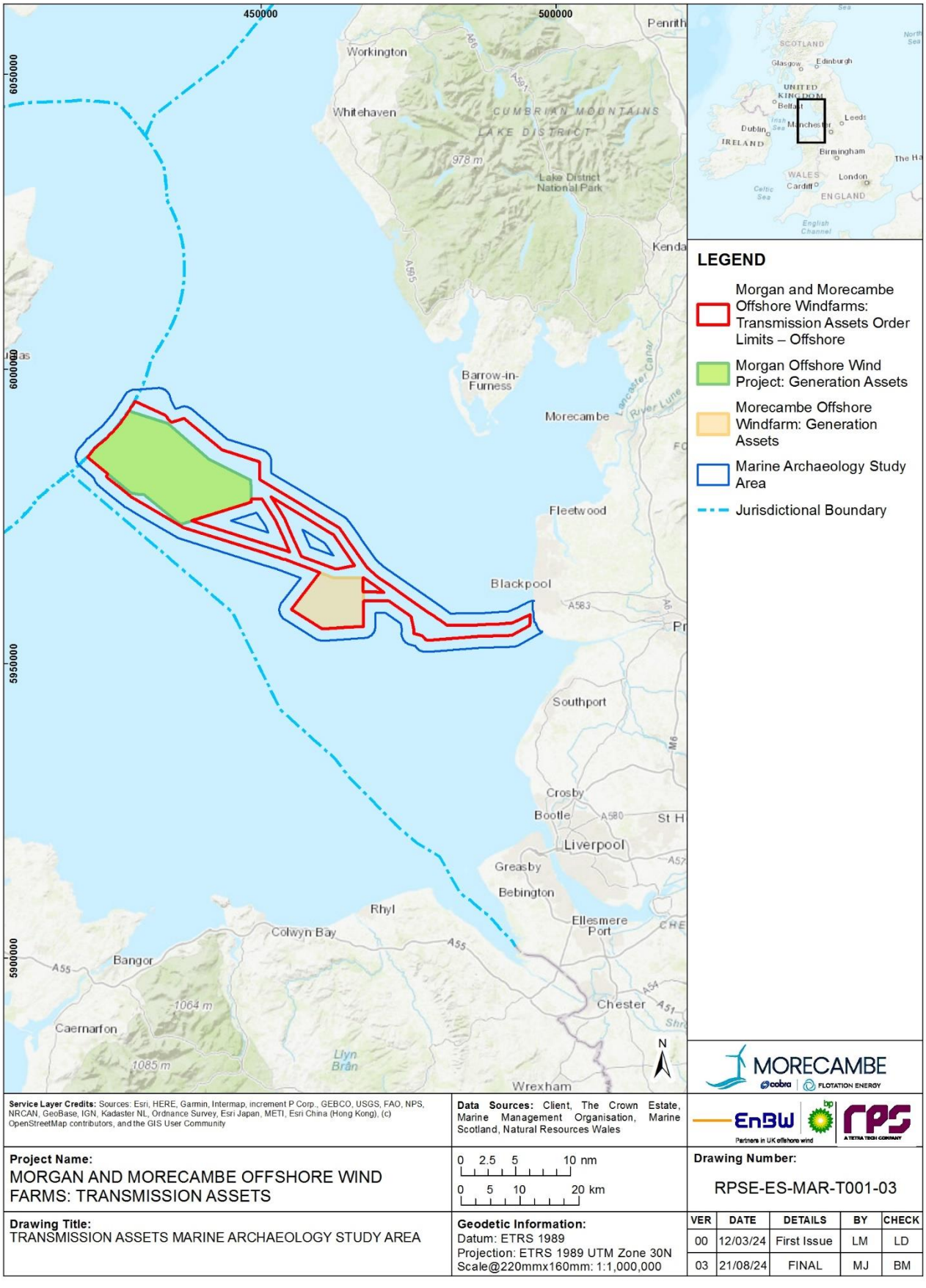

Figure 1.1: The Transmission Assets study area

1.3.3 Desktop study – baseline characterisation

1.3.3.1 The marine archaeology of the study area is considered within the following categories.

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

Data sources

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

Table 1.1: Summary of key desktop data sources

Title	Source	Year	Author
United Kingdom Hydrographic Office (UKHO) Wreck and Obstructions Data	UKHO	2024	UKHO
Historic Environment Record Data	National Record of the Historic Environment (NRHE)	2021	Historic England
Merseyside Historic Environment Record	Sefton Council	2021	Merseyside Environmental Advisory Service
Isle of Man Shipwreck Inventory data	Manx National Heritage	2023	Manx National Heritage
Historic Seascape Characterisation: The Irish Sea (English Sector)	Archaeology Data Service (ADS)	2011	Historic England
West Coast Palaeolandscapes Survey	ADS	2011	Fitch, S., Gaffney, V., Ramsey, E., and Kitchen, E.
Submerged Landscapes Data	EMODnet Geology	2022	British Geological Survey

Data structure

1.3.3.3 In order to compile a marine archaeological baseline for the purposes of this technical report, these sources were compiled into gazetteers (**Appendix A** to **Appendix C**).

1.3.3.4 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.

1.3.3.5 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.

1.3.4 Site-specific surveys

Geophysical Survey

1.3.4.1 Site-specific geophysical surveys were carried out from 1 April 2022 to 19 September 2022 over three separate survey campaigns conducted by Gardline Limited (Gardline, 2022a; Gardline, 2022b), Titan Environmental Surveys Limited (2022) and XOcean (2022) respectively. The survey campaigns collected data using Multibeam Echo Sounder (MBES), Sidescan Sonar (SSS), Magnetometer, parametric Sub-bottom Profiler (SBP), and Pinger SBP.

1.3.4.2 Geophysical survey operations were undertaken within a pre-defined boundary of approximately 250 km^2, the pre-defined boundary lies within the Offshore Order Limits and is referred to within this report as the Survey Area (**Figure 1.2**).

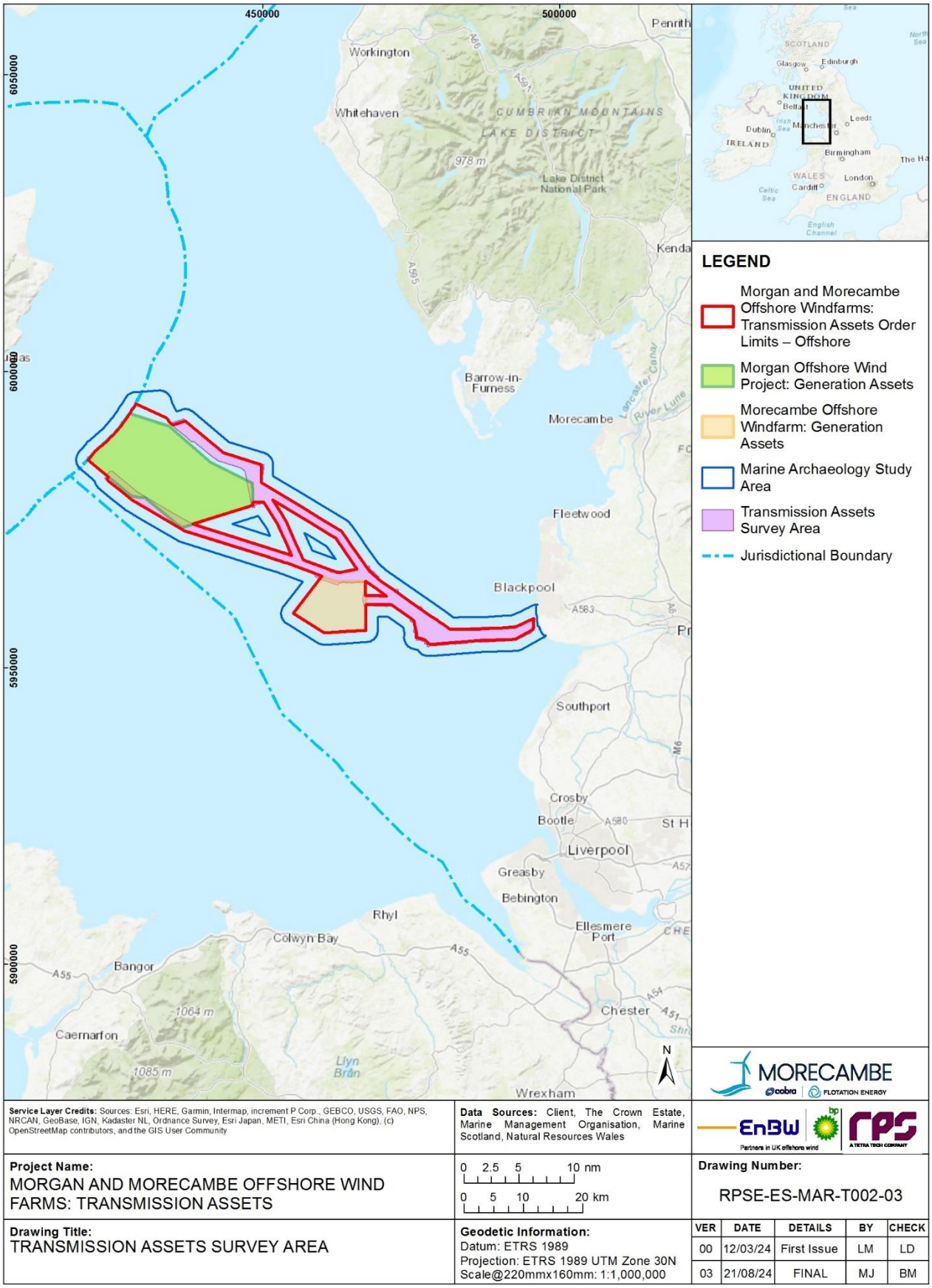

Figure 1.2: The Transmission Assets survey area

Technical specifications

1.3.4.3 All geophysical data within the Survey Area was 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) and in accordance with the site-specific Outline Offshore Written Scheme of Investigation for Archaeology produced in advance of the geophysical survey campaign (Coastal and Offshore Archaeological Research Services (COARS), 2022)).

1.3.4.4 The data were collected to a specification appropriate to achieve the following interpretation requirements.

- Sidescan Sonar: ensonification of anomalies > 0.5 m.
- Multibeam Bathymetry: ensonification of anomalies > 1.0 m.
- Magnetometer (TVG): 5 nT threshold for anomaly picking.
- Parametric SBP: penetration of up to 10 m was achieved.
- Pinger (SBP): penetration of up to 10 m was achieved.

Data quality and limitations

1.3.4.5 The data collected across the extents of the pre-defined survey boundary within the Survey Area is of good quality overall, and in the case of MBES provided 100% coverage. SBP data was collected to a pre-determined line plan, largely providing suitable coverage and penetration for the interpretation of the palaeoenvironment. The Magnetometer data was 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.

1.3.4.6 The data is considered of an appropriate specification, coverage and quality to undertake a robust marine archaeological assessment to inform the EIA process.

Processing

1.3.4.7 The archaeological processing of data was undertaken by a qualified and experienced marine archaeologist at MSDS Marine with a background in geophysical and hydrographic data acquisition, processing and interpretation (MSDS, 2023).

1.3.4.8 MSDS Marine were provided with the survey deliverables by RPS, including both raw and processed data, alongside interpretations and operations reports. The data deliverables are shown in **Table 1.2**. The archaeological assessment considers the full extents of the survey data, which was collected within the Transmission Assets survey area. The assessment of UKHO and NRHE data was undertaken within the study area.

Table 1.2: Data deliverables received by MSDS Marine

Sensor	Data Type	Format
Sidescan Sonar	Raw lines (LF and HF)	.xtf
	Processed lines (HF)	.xtf
	Mosaic (HF) 0.2 ppm	.tif
	Contacts	.shp
Sub-bottom profiler (both)	Raw lines	.sgy
	Processed lines	.sgy
	Isopach	.shp
	Horizons	.tif
TVG	Raw lines	.csv
	Contacts	.csv
Multibeam bathymetry	Raw lines	.xyz
	Grids (at 0.2 and 1.0 m)	.xyz
	Mosaic (at 1.0 m)	.tiff
Geographical Information System	Geodatabase	.gdb
Reports	Interpretation report (Gardline, 2022a; Titan Environmental Surveys, 2022)	.pdf
	Operations report (XOcean, 2022)	.pdf

1.3.4.9 The data was analysed in conjunction with the desktop datasets listed in **Table 1.1** in order to determine any potentialarchaeological material that may be present within the study area. The criteria for the archaeological assessment of archaeological material is presented in **Table 1.3**.

Table 1.3: 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 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.

Combined assessment

1.3.4.10 Following the archaeological assessment of all datasets, the results were loaded into ESRI ArcGIS Pro 3.0.3, a Geographical Information System, and reviewed alongside each other, along with Geotiffs of the SSS, MBES, and Magnetometer data. The concurrent review allows the amalgamation of duplicate anomalies, the assessment of its context, and an understanding of the extents of a feature that may be partially buried or span across two or more lines of data.

1.3.4.11 Data from the UKHO, including the positions of wrecks and obstructions, the relevant NRHE records and all other relevant data such as third-party assets were reviewed to ensure that any additional information is drawn upon. This aimed to ensure that anomalies were not unnecessarily identified as having archaeological potential when the origination can be identified. The resultant remaining anomalies are considered to have archaeological potential were compiled into a gazetteer (**Appendix C**) and a shapefile.

1.3.4.12 The interpretation of geophysical and hydrographic data is, by its very nature, subjective. However, with experience and by analysing the form, size, and characteristics of an anomaly, a reasonable degree of certainty as to the origin of an anomaly can be achieved.

1.3.4.13 Measurements can be taken in most data processing software, and whilst largely accurate, discrepancies can be noted due to a number of factors. Where there is uncertainty as to the potential of an anomaly or its origin, a precautionary approach of assigning archaeological significance is always taken to ensure the most appropriate mitigation for the historic environment.

1.3.4.14 It should be noted there may be instances where an anomaly may exist on the seabed but not be visible in the geophysical data. This may be due to being covered by sediment or being obscured from the line of sight of the sonar. The use of both SSS and MBES data mitigates this by visualising anomalies from multiples angles, including from above. Anomalies were named following the standard MSDS Marine convention, [PROJECTYEAR_ID], e.g., MG23_XXX.

Geotechnical Survey

1.3.4.15 The results of geotechnical survey data aid in the characterisation of the submerged prehistory of the Transmission Assets. As such, the results of geotechnical investigation from a number of projects are considered within this report including Morgan Offshore Wind Project: Generation Assets (COARS, 2023), Morecambe Offshore Windfarm: Generation Assets, Transmission Assets, and Mona Offshore Wind Project.

1.3.4.16 Deep geotechnical site investigations undertaken for the Morgan Offshore Wind Project: Generation Assets and and Mona Offshore Wind Projects (up to 70 m below the seabed) were undertaken by Fugro (2022) aboard the MV Normand Mermaid, from the 19 June 2022 to 23 July 2022, and the MV Fugro Synergy, from the 10 June 2022 to 7 October 2022. These on-site investigations resulted in the collection of

1127 downhole wireline push samples, 17 downhole piston samples, 296 Fugro extended marine core barrel core samples and 413 GeoborS cores, taken from 45 geotechnical borehole locations (Fugro, 2022).

1.3.4.17 Shallow geotechnical investigation were undertaken for the Transmission Assets (within the Offshore Order Limits) and for the Mona Offshore Wind Projects, along the Mona Offshore Cable Corridor by Gardline (2022a) aboard the M.V. Ocean Observer, from the 27 April 2022 to 10 July 2022, and the Forth Jouster, from the 29 August 2022 to 4 September 2022. These on-site investigations resulted in 66 locations selected for Cone Penetration Test with pore water pressure measurement and 66 for vibrocores (plus 28 repeats).

1.3.5 Consultation

1.3.5.1 A summary of the key topics raised during consultation activities undertaken to date specific to marine archaeology is presented in **Table 8.5** of Volume 2, Chapter 8: Marine Archaeology and of the ES. All consultation is presented in the Consultation report (document reference E1).

1.4 Marine archaeology: submerged prehistory

1.4.1 Submerged prehistory

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

- innomar SBP data collected by Gardline (2022a) and Pinger SBP data collected by Titan (2022);
- legacy boreholes and oil and gas wells (NSTA, 2022);
- interpretation reports, including:
  - Gardline, 2022a: Morgan Export Cable Routes Interpretation Report Ref: 11781.3 (Final). This covers the Offshore Permanent Infrastructure Area;
  - Wood, 2022: Technical File Note Preliminary Ground Model Morgan & Mona Windfarm Development, Irish Sea which relates to the Morgan Offshore Wind Farm Generation Assets but has been referred to in the Transmission Assets interpretations; and
  - COARS, 2023: Mona and Morgan Offshore Wind Farm Stage 1 Geoarchaeological Assessment.
- geotechnical investigations, including boreholes and vibrocores, and seismic surveys undertaken by the British Geological Society (BGS) (Jackson *et al*., 1995);
- development-led studies including:
  - Morecambe Offshore Windfarm: Archaeological Assessment of Geophysical and Hydrographic Data (MSDS Marine, 2022b);

  - geoarchaeological review of cores collected within the nearby Walney Extension Offshore Wind Farm (MSDS Marine, 2019); and
  - archaeological assessments associated with the Rhiannon Offshore Wind Farm (not progressed to construction) (Wessex Archaeology, 2012 and 2013).
- a review of prehistoric archaeological remains within Strategic Environmental Assessment Area 6 (Flemming, 2005);
- West Coast Palaeolandscape Survey (WCPS) (Fitch *et al*, 2011);
- research papers and publications including:
  - Mellett *et al*. (2015) Geology of the seabed and shallow subsurface: The Irish Sea;
  - Jackson *et al*. (1995) United Kingdom Offshore Regional Report (ORR): The geology of the Irish Sea;
  - BGS, 1984. Liverpool Bay Sheet 53°N- 04°W. 1: 250,000 Series: Seabed Sediments and Quaternary Geology; and
  - BGS, 1990. Anglesey Sheet 53°N- 06°W. 1: 250,000 Series: Quaternary Geology.

Geology

1.4.1.2 The geological processes which form a sequence of seabed deposits provide baseline information to inform an understanding of the study areas submerged prehistoric archaeological potential. This section therefore describes the seabed geological sequence and seabed topography within the study area, as a foundation for the sections which follow. It has been informed by a characterisation of the results of the project specific geophysical surveys, as described in **section 1.3.4**, and by relevant documentary sources.

1.4.1.3 The study area lies within the east Irish Sea. Bedrock within the study area is predominantly characterised by Triassic rocks with areas of the St Bees and Ormskirk Sandstone Formations present in the south, south east and north extents of the study area. There are also areas of Coal Measures Group, Namurian rocks, Permian and Upper Permian rocks present in the north extent.

Quaternary sequence

1.4.1.4 Seismic data from the Survey Area (MSDS Marine, 2023) demonstrates that Quaternary units overlay the bedrock, including both Pleistocene and Holocene deposits. Together these units average 5 - 50 cm thick across the site. However, there are variations in thickness across the Survey Area with the nearshore areas being characterised by slightly thicker deposits. This is correlated with information from the British Geological Society (BGS) Offshore Geoindex (2014) and the results of the Stage one geoarchaeological assessment (COARS, 2023). It is worth noting that the maximum depth of seabed disturbance associated

with the Transmission Assets is 3 m so the potential for encountering units with geoarchaeological potential will vary across the Transmission Assets Study Area, in line with the depth from the surface the quaternary units could be encountered.

1.4.1.5 Geophysical survey from the Mona and Morgan Offshore Wind Projects has provided data from which an evolving Ground Model is being developed. This combined with the geotechnical datasets provides a greater understanding of the geomorphology of the area. The ground model has classified the geomorphology as glacial (Wood and Deeks, 2022). Features observed within the data support the interpretation there was grounded ice retreat within the area (Chiverrell *et al*. 2013) such as drumlinised (elongated sub-glacial deformation) minor moraines, which appear to have been heavily deformed along with a series of subtle lineations within the Mona Offshore Wind Project: Array Area (hereafter referred to as the Mona Array Area) which are interpreted as floodplain terraces potentially related to a pro-glacial outwash plain (COARS, 2023). For the Morecambe Generation Assets Study Area, it is possible that deltaic or infill deposits associated with the west Irish Sea (A) Formation have been laid down in association with subaerially exposed landscapes during the Holocene. While the climate during this time was still likely to have been cold and not likely hospitable, the conditions may not have been ultimately prohibitive to human activity and the area could have been used for resource exploitation (Fitch, *et* al. 2011; MSDS Marine, 2022).The sub-surface Quaternary stratigraphic sequence is shown in **Table 1.4**.

Table 1.4: Quaternary Sequence

Stratigraphy		Unit	Depositional Facies	Lithology
Formation	Member			
Mobile Sands	Mobile Sands	Unit I	Marine	Loose to dense gravelly sand
Western Irish Sea A (WIS-A)	Mudbelt	Unit II	Glaciomarine	Very low to low strength clay
	Prograded Sands	Unit III	Glaciomarine	Dense to very dense sand and gravel
	Chaotic	Unit IVa	Phase 4 Channels (distal)	Dense to very dense sand
		Unit IVb	Phase 3 Channels (proximal)	Dense to very dense sand
		Unit IVc	Ice-marginal Fan	Gravel and dense to very dense sand
		Unit IVd	Sheet sands and gravels	Gravel and dense to very dense sand
		Unit IVe	Phase 2 Channels	Dense to very dense sand
		Unit IVf	Phase 1 Channels	Dense to very dense sand
		Unit IVg	Phase 1 Channels	High to ultra-high strength gravelly sandy clay
		Unit Va	Upper glacial lakes	Low to high strength sandy clay
		Unit Vb		Low to high strength clay
		Unit Vc		Medium dense to very dense sand
		Unit Vd		Dense to very dense sand
		Unit Ve		Unknown – probably dense to very dense sand
		Unit VIa	Lower glacial lakes	Low to high strength sandy clay
		Unit VIb		High to very high strength clay
		Unit VIc		Dense to very dense sand
Cardigan Bay	Upper Till	Unit VIIa	Sub-glacial till	Extremely to ultra-high gravelly clay

Stratigraphy		Unit	Depositional Facies	Lithology
Formation	Member			
		Unit VIIb		Extremely to ultra-high sandy gravelly clay
		Unit VIIc		Weathered Sands and Clays over Carboniferous
	Infill Member	Unit VIII	Sub-glacial Tunnel Valley/Pro-Glacial Channel	Dense to very dense sand

Sea level data

1.4.1.6 Available sea level data is limited for the east Irish Sea and predominantly restricted to the current coastline which dates to after the maximum extents of the Last Glacial Maximum (LGM). Available data indicates the study area was a fluctuating environment, periodically submerged and exposed during the LGM. The date of final submergence is unknown with several theories and landscape models available offering differing interpretations.

1.4.1.7 Geological sources produced by the BGS (Jackson *et al.,* 1995 and Mellett *et al.,* 2015) agree that during the Devensian the area that includes the study area would have been subject to subglacial to glaciomarine conditions but disagree over whether there are no deposits which indicate sub-aerial exposure following the LGM. Jackson *et al*. (1995) argues for a lack of sub-aerial exposure whilst Mellett *et al*. (2015) suggests there are deposits which indicate the possibility the area (which includes the study area) would have been exposed prior to full submergence. These differing theories are based on the interpretation of the Western Irish Sea Formation, which may correlate with Units II to VI within the Survey Area.

1.4.1.8 Landscape modelling has been undertaken by Brooks *et al*. (2011) and Fitch *et al.* (2011) which present theories the area that includes the study area would have been a terrestrial or intertidal environment during some periods following the LGM. Brooks *et al.* (2011) indicates the central and east areas would have experienced fluctuating sea levels with final submergence occurring as late as 8,000 BP (Before Present) (**Figure 1.3**). Data from the WCPS also suggests the area that includes the study area would have been a terrestrial or intertidal environment at 10,000 BP (**Figure 1.3**).

1.4.1.9 Finally, Shennen *et al.* (2018) presents a study of sea level changes across the UK and Ireland following the LGM and indicates that areas in proximity to the study area, such as Morecambe Bay and the Isle of Man, would have experienced fluctuating sea levels with a period of sea level rise around 11,700 BP. It is suggested the current coastline of the Liverpool Bay Area would have been established c. 6,000 BP.

1.4.1.10 Units I to VI within the Survey Area may be able to provide further evidence of the marine transgression of the study area and help to determine the prehistoric submerged landscape.

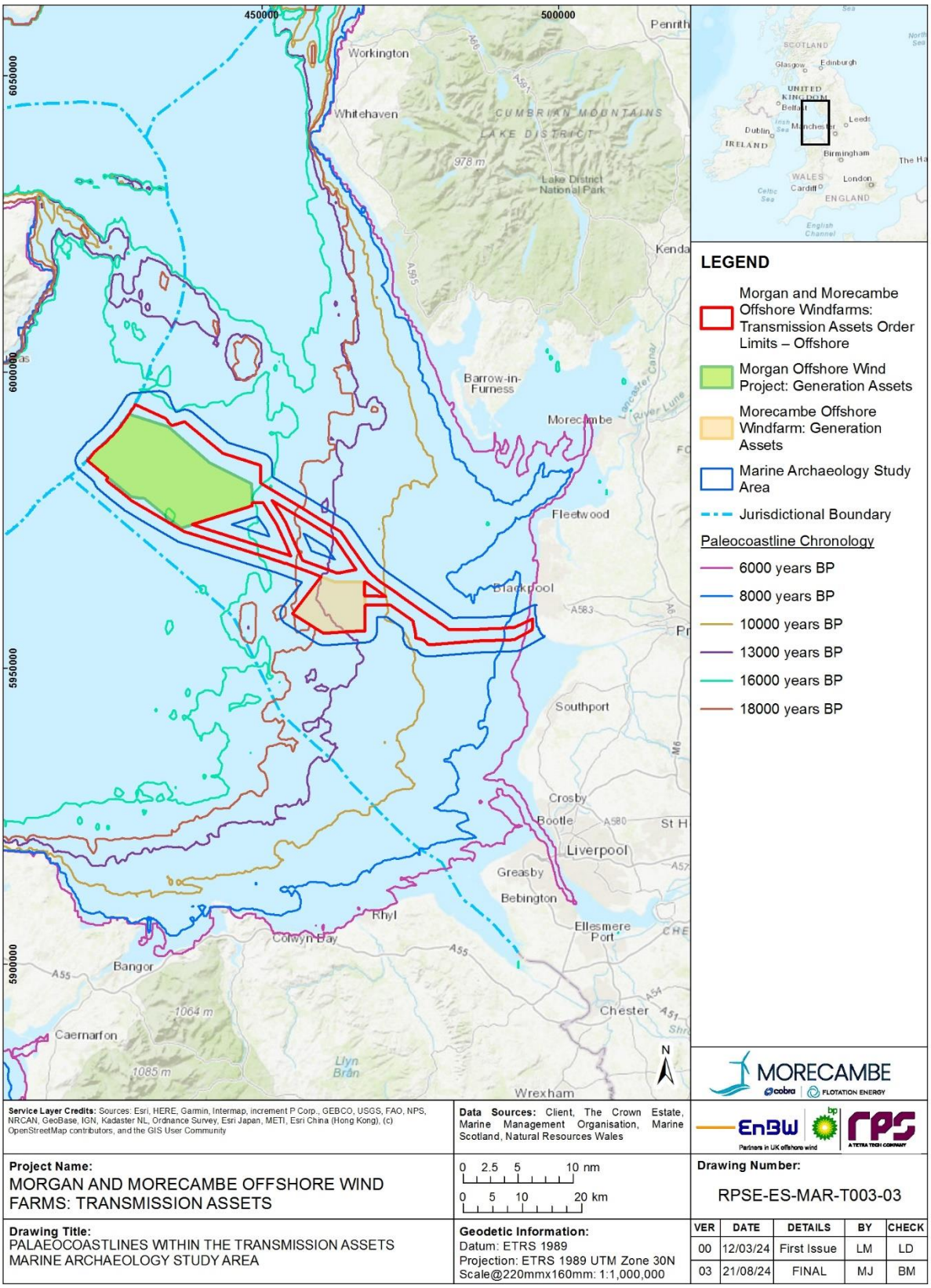

Figure 1.3: Palaeocoastlines within the Transmission Assets marine archaeology study area

1.4.2 Geoarchaeological assessment

Overview

1.4.2.1 In 2022, Fugro Marine Limited and Gardline were commissioned to undertake geotechnical site investigations within the Offshore Order Limits and across both the Morgan Offshore Wind Project: Generation Assets Red Line Boundary and the Mona Offshore Wind Project Red Line Boundary (COARS, 2023).

1.4.2.2 The coring targeted seabed and sub-seabed features identified through the geophysical survey campaigns. A complete marine geoarchaeological investigation should consist of four constituent stages, following the guidance provided by Gribble and Leather (2011), of which Stage 1 evaluation was completed in 2023 by COARS (2023). 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.

1.4.2.3 The ground model indicates a series of glacial and post-glacial deposits are present within the study area. Deposits of potential significance may include the Unit V and VI postulated glacial lakes, as well as the Unit IV palaeochannels. These sequences have the potential to be associated with terrestrial palaeolandscape features, which might have supported human activity. These sequences could also provide a greater understanding of the Late Devensian palaeogeography of the area, in particular the marine transgression of the area.

Transmission Assets

1.4.2.4 Geophysical survey and geotechnical sampling of shallow vibrocores within the Offshore Order Limits shows the presence of Holocene marine sands and gravels (Unit I, **Table 1.4**) decreasing in thickness towards the English coastline, and locally up to 5 m in thickness. These overlay the Unit II WIS-A deposits (**Table 1.4**) that are thickest within the middle of the Offshore Order Limits, up to 12 m thick, but generally less than 5 m, and found within relatively wide and shallow channel areas. This comprises very low to low strength clays and form the east Irish Sea Mud Belt. Underlying these are the Unit III (**Table 1.4**) dense to very dense gravelly sands, which thicken towards the coast, generally exceeding 6 m thickness, though are locally absent towards the edge of Morgan Offshore Wind Project: Generation Assets Red Line Boundary. Within the Offshore Order Limits, Unit IV (and earlier) deposits (**Table 1.4**) were identified by the seismic survey, and were occasionally reached by the Cone Penetrometer Tests, but were not sampled by the vibrocores. The vibrocores, typically having a penetration of 2 – 4 m, only sampled the Unit I and Unit II deposits, occasionally reaching the surface of the underlying Unit III deposits. None of these vibrocore samples were identified as having any geoarchaeological potential (COARS, 2023).

1.4.2.5 Although only shallow vibrocores were sampled for the Transmission Assets within the Offshore Order Limits, deep boreholes were taken for the Morgan Offshore Wind Project: Generation Assets and Mona Array Area. Only the deep boreholes were considered for Stage 1 Geoarchaeological analysis due to the limited depth of CPT and vibrocores within the Offshore Order Limits. Stage 2 assessment and any subsequent geoarchaeological analysis is the responsibility of the Generation Assets projects as set out within the respective WSI documents.

1.4.2.6 Based on the core descriptions, available photographs, and the evolving ground model interpretation (Wood, 2022). The cores from the deep boreholes collected from the Morgan Generation Assets and Mona array area were used to construct the model and were then assessed in relation to their geoarchaeological potential.

1.4.2.7 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, and presence of a submerged palaeolandscape, within the region, as well as provide palaeoenvironmental information that can help improve the classification of these features and provide additional refinement to the evolving ground models.

1.4.2.8 The boreholes undertaken for the Morgan Offshore Wind Project: Generation Assets 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 better understand the late Devensian dynamics of the Irish Sea Ice Stream, including the timing of ice retreat within the east Irish Sea region.

1.4.2.9 Following the Stage 1 geoarchaeological assessment, three boreholes from the Morgan Offshore Wind Project: Generation Assets were recommended for Stage 2 geoarchaeological assessment. Core section depths for the samples identified as suitable for Stage 2 recording are:

- MRG-BH22-09: 27.00-29.80 m; 32.00-32.60 m; 34.00-34.80 m; 37.00-37.80 m; 44.00-44.80 m; 48.0 to 48.80 m; 68.50 to 68.80 m; 69.50-69.90 m Unit VIIb;
- MRG-BH22-16: 5.00-6.00 m; 6.00-7.00 m; 8.00-8.50 m; 8.50-9.00 m; 9.50-10.00 m; 11.00 to 12.00 m; 12.00-12.70 m Unit Vb; and
- MRG-BH22-19: 21.75-22.35 m; 25.75-26.45 m Unit VIIa.

1.4.2.10 The results of Stage 2 assessment for the above boreholes will provide further evidence of the marine transgression of the study area to determine the prehistoric submerged landscape. These results will inform the evolving ground model and final reports summarising the

results of the geoarchaeological investigation for the Morgan Generation Assets and Mona Array Area will be published in line with the project timetables defined for the above projects.

1.4.2.11 Two boreholes from the Morecambe Offshore Wind Farm: Generation Assets surveys were identified as containing sediments of possible archaeological interest. These were:

- BH109: 6.65-9.65 m; 16.30-18.51 m; and
- BH118: 12.50-14.50 m; 15.50-18.84 m.

1.4.2.12 Upon further review by a geoarchaeologist, it was determined that samples above did not contain sediments of geoarchaeological interest and were not recommended for Stage 2 assessment (Morecambe Offshore Wind Farm Limited, 2024).

1.4.3 Submerged prehistoric archaeology potential

1.4.3.1 This section characterises the potential for submerged prehistoric archaeology to be present within the study area. For example, deposits containing archaeological material (e.g., flint tools) or submerged landscapes. This section is informed by the geophysical baseline data (see **section 1.3.4**), the results of the Stage 1 geoarchaeological assessment (**section 1.4.2**) and desk-based review of secondary sources cited within the text.

1.4.3.2 The prehistoric period of the UK covers from the earliest hominin occupation (potentially as early as c. 970,000 BP) to the end of the Iron Age and the Roman invasion of Britain in 43 AD (Anno domini). The coastline of the UK underwent dramatic changes during this time, and areas of the seabed that are now fully submerged would have been exposed allowing the opportunity for hominins to exploit and inhabit the landscape. Glacial events including the Anglian (480,000 to 430,000 BP), the Wolstonian (350,000 to 132,000 BP) and the Devensian (122,000 to 10,000 BP) and intervening periods of marine transgression have affected the coastline of the UK and the archaeological potential of these areas.

1.4.3.3 Prehistoric archaeological potential is determined with reference to evidence for human activity in the UK during each period, and the contemporary environment within the Offshore Order Limits. Depositional environment and post-depositional factors are also key to understanding potential, and as such, geological deposits present within the Offshore Order Limits form an important consideration in understanding archaeological, palaeoenvironmental and palaeolandscape potential. Geological periods referred to in this section are defined by the date ranges presented in **Table 1.5**.

Table 1.5: 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 to 45,000 BP/184,000 to 43,000 BC)

1.4.3.4 Units VII and VIII may contain deposits representing the final glacial stage of the Wolstonian glaciation are present within the study area, indicating the area was subglacial during this period and therefore uninhabitable by humans.

1.4.3.5 Evidence of human occupation of the UK during the Palaeolithic is scarce but does exist, including a Palaeolithic cave site at Llandudno on the north coast of Wales at which worked animal bone and bone beads have been recovered, the site has been dated to 123,800 to 11,500 BP. One of only three currently known examples of Neanderthal remains discovered in the UK is located at Pontnewydd Cave, c.50 km south of the study area. Excavations were carried out at Pontnewydd Cave in 1872 and 1978 and produced the oldest dated hominid remains in Wales. These comprise jaw fragments and teeth of Neanderthals dating from c.225,000 BP. Also, contemporary tools comprising handaxes, sharp Levallois-type flakes and scrapers.

1.4.3.6 While most deposits within the study area are thought to relate to the Devensian and Holocene periods (e.g. Units I to IV), Unit V may relate to deposits that are associated with the Cardigan Bay Formation (BGS, 2020), laid down during the transition into the Ipswichian Interglacial. Improvements in climate during the Ipswichian Interglacial may have

allowed for environments which were more conducive to human activity. However, no such activity or deposits associated with human activity have been identified within the UK dating to this period (Marshall *et al*., 2020). The analysis of seismic data from within the Survey Area and evidence from the surrounding environment therefore suggests that deposits representing environments favourable for human occupation dating to the Late Middle Palaeolithic are not likely to be present within the study area (Jackson *et al*., 1995, Mellett *et al*., 2015 and Wood, 2022).

Upper palaeolithic (45,000 to 10,000 BP/43,000 to 12,000 BC)

1.4.3.7 The Devensian glaciation coincides with the Upper Palaeolithic and follows the Ipswichian Interglacial, which was the last period of glaciation to affect the UK. Deglaciation may have commenced from c. 20,000 BP with the study area being ice free by 18,000 BP, although the retreating ice sheet may have been in close proximity at the time to the Isle of Man. Palaeoenvironmental potential has been demonstrated through the recovery of floral and faunal remains in the Irish Sea (Jackson *et al*., 1995). The remains of Giant Elk have been identified within the nearshore area of the WCPS area, c.65 km to the north of the Transmission Assets Survey Area, indicating that prey species may have been present near the Offshore Order Limits. However, the proximity of the 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 dating to this period is low.

1.4.3.8 As discussed in **section 1.4.1.6**, sea level and landscape changes within the study area and its surrounding environment during the Upper Palaeolithic are not conclusively understood. Some studies suggest the Liverpool Bay area would have been an entirely marine environment during this time, whilst other evidence indicates that it would have been a partially terrestrial environment dominated by fluvial systems and related floodplains (Brooks *et al*., 2011, Jackson *et al*., 1995, Mellett *et al*., 2015 and Fitch *et al*., 2011). The WCPS supports the latter in that areas of Liverpool Bay would have been terrestrial following the LGM and therefore potentially capable of supporting human habitation. The date around which the final submergence of the area took place is also not conclusive.

1.4.3.9 Even if the theory the study area was a partially terrestrial environment during the Upper Palaeolithic is accepted, it would likely 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. Any archaeological evidence is likely to have been impacted by glacial and marine processes; however, the potential for the survival of prehistoric archaeological material exists and is considered low.

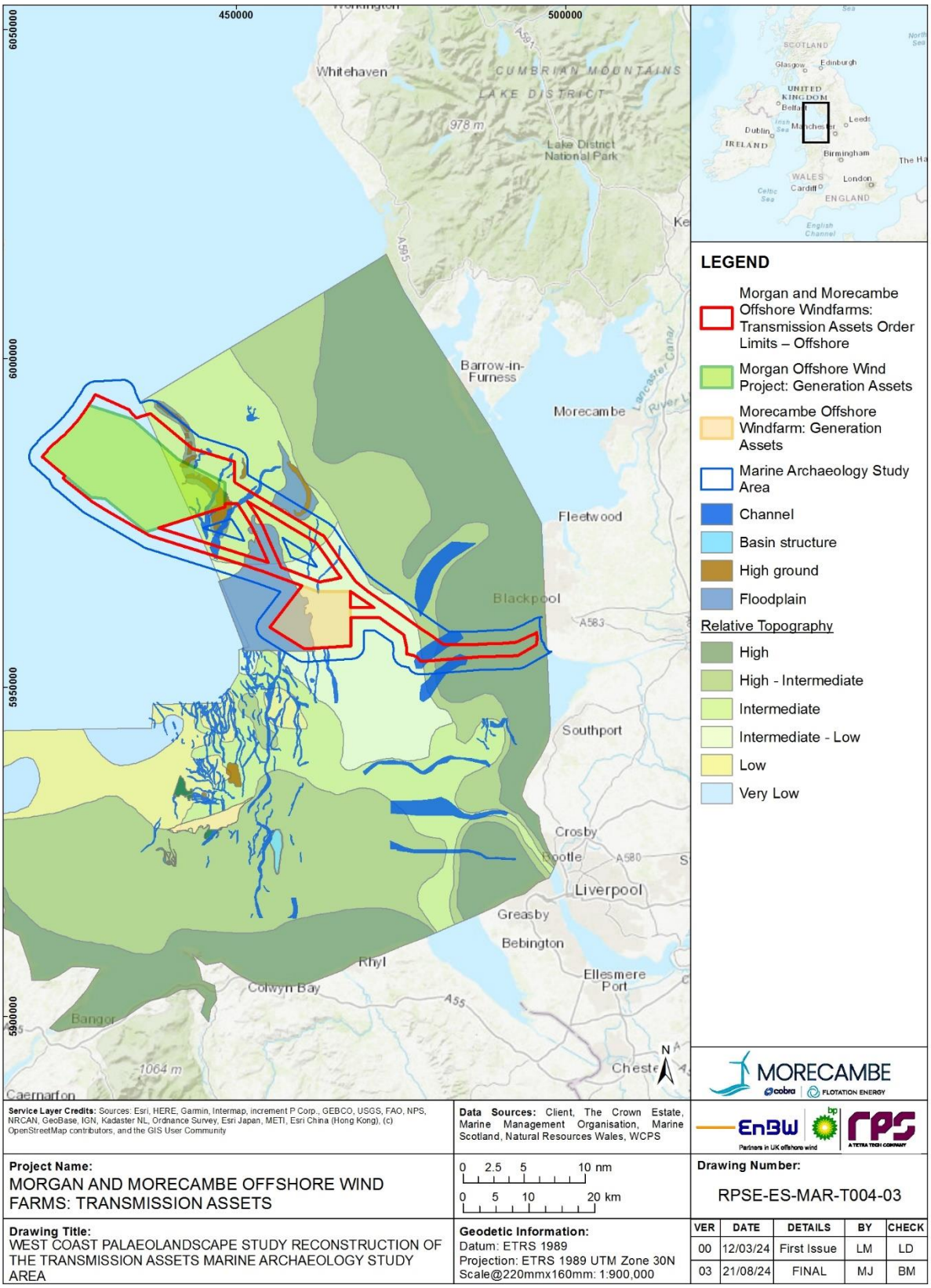

Figure 1.4: West Coast Palaeolandscape study reconstruction of the study area

Mesolithic (10,000 to 6000 BP/12,000 to 4000 BC)

1.4.3.10 The debated chronology for the submergence of the 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 material.

1.4.3.11 The WCPS has interpreted channels within its datasets as Mesolithic fluvial features (Fitch, *et al.*, 2011); these channels have also been identified within the Survey Area and may represent a terrestrial or intertidal landscape during the Mesolithic (Wood, 2022; Wood and Deeks, 2022). The WCPS has also mapped features such as kettle hole lakes which would represent attractive, resource rich environments for human exploitation. Access to the sea would provide humans a food source in the form of fish and shellfish. The results of the geophysical survey (Wood, 2022) support the WCPS, as the presence of a glacial lake has been identified within the data. The intertidal area is also an environment which provides suitable habitat for vegetation that could be utilised for food and resources. The landscape would have been one of low energy river systems, kettle holes and water-filled incisions, these features may have also been focal points of prehistoric activity and kettle holes have the potential for Mesolithic and palaeoenvironmental assemblages as evidenced at other kettle hole sites in Killerby, North Yorkshire and Slotseng, Denmark (Hunter and Waddington, 2018; Noe-Nygaard *et al*., 2007).

1.4.3.12 Evidence of Mesolithic activity in Wales is well documented; excavations at Ynys Enilli and Glaslyn Estuary in Gwynedd identified coastal scatters, shell middens, lithic scatters, and post glacial peat-horizons as well as land surfaces having been identified within the Menai Straits also in Gwynedd. In Denbighshire, also on the north coast of Wales, Prestatyn and Pontnewydd Cave represent further evidence of Mesolithic occupation in onshore regions near to the study area (Brooks *et al*., 2011). Evidence of Mesolithic activity in the area has also been recorded in the form of Mesolithic footprints at Formby Point on the north west English coast (Burns, 2021), approximately 21 km from south of the Offshore Order Limits.

1.4.3.13 The potential for the survival of Mesolithic archaeological material within the study area, however, remains low due to the fluctuating marine environment and the sensitive nature of Mesolithic evidence.

1.5 Marine archaeology: maritime and aviation

1.5.1 Maritime archaeology potential

1.5.1.1 The maritime archaeology of the UK is the product of a complex interplay of constantly evolving coastal and marine activities,

international links and patterns of shipping and sea use since the earliest human occupation of the UK during the late Palaeolithic to modern periods. This section reviews the potential presence of maritime archaeology within the study area related to these maritime activities, such as ship and aviation wrecks and associated material. Military remains are also covered within the scope of maritime and aviation archaeology considered in this section.

1.5.1.2 Through this section, the maritime archaeological record of the study area has been considered chronologically for the broad temporal phases as described in **Table 1.6**. However, as the survival of maritime archaeological evidence during the Palaeolithic and Mesolithic is extremely rare, these chronological periods have been considered under the term Early Prehistoric.

1.5.1.3 Records of known wreck sites and losses in UK waters are biased towards the Post-Medieval and modern periods (**section 1.5.1**) and therefore the precise locations of most wrecks pre-dating these periods in UK waters are not known. The majority of known and recorded wreck sites lie relatively close to the coast. The proximity of many historical sailing routes to the coast and the natural hazards of the east Irish Sea can be expected to have been a determining factor in many maritime casualties in the past (Wessex Archaeology, 2008).

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

1.5.1.5 The chronological periods and their corresponding date ranges that are considered within the report are provided in **Table 1.6**.

Table 1.6: Overview of archaeological chronology in the UK

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

Early prehistory (Palaeolithic to Mesolithic)

1.5.1.6 There is no evidence in the UK for maritime archaeological remains that pre-date 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 the colonization of Australia approximately 40,000 BP involved island-hopping in or on primitive watercraft (Lourandos,1997).

1.5.1.7 During the Late Upper Palaeolithic (approximately 12,000 BC), it is possible that simple watercraft such as log boats or rafts were used for coastal journeys and fishing within the British Isles (Wessex Archaeology, 2007b and Dunkley, 2016); however, no evidence of Palaeolithic sea-faring craft is currently known in the UK.

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

1.5.1.9 Watercraft may have been used in the rivers and estuaries during the Mesolithic for coastal journeys, fishing expeditions, and possibly longer journeys in favourable weather. The evidence shown in **section 1.4.1** 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 study area, the potential for the survival of any archaeology associated with the maritime environment from the Palaeolithic and Mesolithic periods is considered low.

Neolithic and Bronze Age

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

1.5.1.11 Direct archaeological evidence for the exploitation of the marine environment and maritime activity within the Neolithic of the UK is rare and limited to logboat finds (Johnstone, 1980; Wilkinson and Murphy, 1995 and 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 study area is low.

1.5.1.12 The Bronze Age was a period of technological innovation and of expansion of trade and exchange networks, facilitated by the introduction of new forms of boats both for ocean and coastal/riverine trade. Clear advances occurred in maritime technology during this period and an increasingly substantial maritime archaeological record

allows a less speculative understanding of maritime culture than for earlier periods.

1.5.1.13 Evidence of Bronze Age maritime activity has been recorded throughout England in the discovery of a number of inland watercraft and sea faring vessels. Five sewn plank boats have been discovered at North 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.1500 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 c.1000 BC were discovered on the outskirts of Peterborough in 2013 (The Guardian, 2013). No such examples have been recorded in the Irish Sea; however, it is possible that similar crafts would have been utilised to traverse the area. The potential for the discovery of maritime archaeology from the Bronze Age is considered to be low.

Iron Age and Romano-British

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

1.5.1.15 The Poole logboat is one of the largest logboats to have been discovered in Britain and radiocarbon dating has dated it to c.295 BC, making it an excellent example of Iron Age watercraft (Wessex Museums, 2024). 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 the potential for the survival of Iron Age maritime archaeology within the study area is low.

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

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

anaerobic environment which facilitates the preservation of organic material.

Early Medieval and Medieval

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

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

1.5.1.20 The Sutton Hoo boat burial is arguably one of Britain's most important archaeological discoveries. Found near Woodbridge, Suffolk and dating to the 7th century AD, it is a clinker built vessel and was over 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 long. The Graveney boat is particularly unique in that it is an example of a trading vessel as opposed to the high-status warships of the previous examples (Fenwick, 1978). All of these boats would have been capable of sea-voyages and indicate an increase in long-distance trade and exploration during this time. A trend that continues to increase during the medieval period.

1.5.1.21 With the medieval period came a boom in maritime trade across Northern Europe and the Mediterranean 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 trade routes emerged. Trade expanded across the Irish Sea at this time also, with Dublin becoming an increasingly important commercial port, contributing to the maritime transportation of goods through the Irish Sea.

1.5.1.22 Increased demand for goods meant that ship construction advanced rapidly during this period to accommodate larger cargoes. Examples of types of boats dating from early medieval and medieval include larger clinker-built merchant vessels called keels, cogs and possibly reverse clinker-built vessels termed hulks (Friel, 2003). Examples of trading vessels from this period include the Magor Pill, a 12th century clinker built vessel with a cargo of iron ore found on the banks of the Severn Estuary near Newport, in South Wales and the protected wreck located at Pwll Fanog in the Menai Strait, Gwynedd. The Pwll Fanog wreck is 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 14th or 15th century date for the vessel (Fenwick and Gale, 1998).

1.5.1.23 The rapid technological advances in ship construction during the medieval period can also be attributed to increased military campaigns. This is particularly true in the Irish Sea where the campaigns of Edward I and Edward II against the Scots in the 14th century were supplied with men and resources from Ireland.

1.5.1.24 There is one recorded loss of a medieval vessel in the study area (NRHE 1447861). The record pertains to an unnamed wooden cargo vessel which stranded at Lytham St. Annes on passage from Ireland with "goods and victuals for the munition of the castles in North Wales" in 1296.

1.5.1.25 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 medium.

Post Medieval and Modern

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

1.5.1.27 International trade with ports around the Irish Sea becomes increasingly important in the post medieval period. An example of a European trade ship that was discovered in the Irish sea is the Tal-y-Bont or Bronze Bell wreck which is thought to be a Genoese wreck depicted on an Admiralty chart from the 18th century close to Sarn Badrig reef. The wreck was discovered in Cardigan Bay with a cargo of uncut blocks of Italian Carrera marble. The wreck site has undergone several archaeological investigations and was designated in 1978 (Wessex Archaeology, 2005).

1.5.1.28 Another designated wreck from the post medieval period is the wreck of the Royal yacht *Mary* which 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 *Mary* was discovered in 1971 by divers and was designated as a protected wreck in 1974 under the Protection of Wrecks Act 1973.

1.5.1.29 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 Maryport on the Solway Firth to the north of the study area.

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

1.5.1.31 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, 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.

1.5.1.32 The potential for the discovery of unknown maritime archaeology from the post medieval and modern periods within the study area is high.

Modern military remains

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

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

1.5.1.35 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 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; these are HMS *H5* and SS *Rutherglen*. The HMS *H5* was lost off Anglesey after being rammed by a British cargo ship the SS *Rutherglen* during U-boat manoeuvres. The submarine was mistaken for a U-boat, and all hands were lost.

1.5.1.36 One record of a World War I German submarine, the U3 (NRHE 1597596), having been lost has been identified within the desktop data for the study area. U3 was one of two U-Boats commissioned for the German navy with that name, it foundered whilst being towed to Preston to be broken up following the end of World War I, but its final position is unknown.

1.5.1.37 Advances in maritime technology during the World War II meant an increase in naval offenses, this means 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.

Recorded losses

1.5.1.38 110 recorded losses have been identified within the NRHE and HER data for the study area. Most of these represent records of the loss of post medieval or 19th century maritime vessels, however, some notable exceptions include the records of five World War II aircraft that were lost in the area and are discussed further below (**section 1.5.2**). The record of one World War I German submarine, U3, is discussed above (Modern military remains) and the record of an unknown medieval vessel lost in 1296.

1.5.1.39 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 study area.

1.5.2 Aviation archaeological potential

1.5.2.1 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 south east coasts of England. However, there is evidence for substantial numbers of aircraft casualties in the east Irish Sea (Wessex Archaeology, 2008).

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

1.5.2.3 One record relating to a potential aircraft crash site was returned from the UKHO (5418) and NRHE (909495) data within the Morgan Offshore Wind Project: Generation Assets and considered ‘live’ by the UKHO is discussed further in **section 1.5.5**.

1.5.2.4 Five records of World War II aircraft lost in the vicinity of the study area have been identified within the NRHE data. These were all lost in 1942 and 1943 at the height of the war. Of particular note is a record of a British Blackburn Botha, Botha MK I L6141 (NRHE 1327855) These aircraft are now considered to be extinct and any positively identified

remains would be considered of at least national significance. Full details of the aircraft record are presented in **Appendix A**.

1.5.2.5 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.

1.5.2.6 The full potential for post-war aircraft remains to be discovered within the study area based on the available data is considered to be low at this time. Civilian aircraft wrecks are not subject to protection under the terms of the Protection of Military Remains Act 1986.

1.5.3 Historic Seascape Characterisation

1.5.3.1 In 2009 English Heritage (now Historic England) commissioned an Historic Seascape Characterisation (HSC) (Turner and Newman, (2011). An HSC follows the same principles as Historic Landscape Characterisation, and is designed to complement marine and coastal planning, this is with particular regard to the statutory responsibilities of Historic England.

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

1.5.3.3 The Irish Sea HSC covers coastline and territorial waters of the north west 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 most of the study area. The utilisation and exploitation of the east Irish sea has been summarised in the marine archaeological baseline (**section 1.5**).

1.5.3.4 The HSC method characterises historic trends and process that have shaped the marine archaeological environment to provide information for the sustainable management of English marine and coastal environments. The marine environment is considered in four 'levels': the sea surface, the water column, the sea floor and the sub-sea floor. The results are available in Geographical Information System compatible downloads from the Archaeology Data Service which allows key characteristics within the study area to be identified. These are presented in **Table 1.7**.

Table 1.7: HSC within the study area

Character Area	Character type within the study area	Date
Conflated	Bottom trawling	Modern (AD 1900 to Present)
	Fishing ground (concentration of bottom trawling and shellfish dredging)	Modern (AD 1900 to Present)
	Maritime debris	Modern (AD 1900 to Present)
	Navigation routes	Modern (AD 1900 to Present)
	Potting	Modern (AD 1900 to Present)
	Shellfish dredging	Modern (AD 1900 to Present)
	Submarine power cable	Modern (AD 1900 to Present)
	Submarine telecommunications cable	Modern (AD 1900 to Present)
	Coarse sediment plains	Unknown
	Fine sediment plains	Unknown
Sea Surface	Bottom trawling	Modern (AD 1900 to Present)
	Fishing ground (concentration of bottom trawling, shellfish dredging)	Modern (AD 1900 to Present)
	Maritime debris	Modern (AD 1900 to Present)
	Navigation routes	Modern (AD 1900 to Present)
	Potting	Modern (AD 1900 to Present)
	Shellfish dredging	Modern (AD 1900 to Present)
	Submarine power cable	Modern (AD 1900 to Present)
	Submarine telecommunications cable	Modern (AD 1900 to Present)
	Coarse sediment plains	Unknown
	Fine sediment plains	Unknown
Water Column	Bottom trawling	Modern (AD 1900 to Present)
	Fishing ground (concentration of bottom trawling, shellfish dredging)	Modern (AD 1900 to Present)

Character Area	Character type within the study area	Date
	Maritime debris	Modern (AD 1900 to Present)
	Navigation routes	Modern (AD 1900 to Present)
	Potting	Modern (AD 1900 to Present)
	Shellfish dredging	Modern (AD 1900 to Present)
	Submarine power cable	Modern (AD 1900 to Present)
	Submarine telecommunications cable	Modern (AD 1900 to Present)
	Coarse sediment plains	Unknown
	Fine sediment plains	Unknown
Sea Floor	Bottom trawling	Modern (AD 1900 to Present)
	Fishing ground (concentration of bottom trawling, shellfish dredging)	Modern (AD 1900 to Present)
	Maritime debris	Modern (AD 1900 to Present)
	Navigation routes	Modern (AD 1900 to Present)
	Potting	Modern (AD 1900 to Present)
	Shellfish dredging	Modern (AD 1900 to Present)
	Submarine power cable	Modern (AD 1900 to Present)
	Submarine telecommunications cable	Modern (AD 1900 to Present)
	Coarse sediment plains	Unknown
	Fine sediment plains	Unknown
Sub-Sea Floor	Submarine power cable	Modern (AD 1900 to Present)
	Submarine telecommunications cable	Modern (AD 1900 to Present)
	Coarse sediment plains	Unknown
	Fine sediment plains	Unknown

1.5.3.5 The sub-character types can be broken down into the following categories.

- Fishing activities such as bottom trawling, potting, and shellfish dredging in the modern period.
- Modern installations and activities such as submarine cables.
- Modern maritime debris.
- Modern navigation routes.
- Seabed types and characteristics of find and course sediment plains.

1.5.3.6 The historical cultural processes which have shaped the character of the marine archaeology study area are predominantly related to fishing and navigation activity. These activities may have left a legacy of archaeological material relating to fishing and transport vessels that may be as yet unknown but present within the study area.

1.5.4 Navigation hazards

1.5.4.1 In 2009 Bournemouth University (commissioned by English Heritage, now Historic England) undertook the project Mapping Navigational Hazards as Areas of Maritime Archaeological Potential. Historical records of shipwreck data were analysed in combination with areas of seabed 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 were also parameters considered within the project. These combined factors were considered Areas of Maritime Archaeological Potential (AMAPs).

1.5.4.2 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 study area.

Overview of potential

1.5.4.3 An overview of the marine archaeological potential within the study area is presented in **Table 1.8**.

Table 1.8: Overview of marine archaeology potential

Receptor	Potential	Significance
Submerged prehistoric archaeology	Low	Local/Regional/National
Palaeoenvironmental 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 Medium	National
Early medieval and medieval maritime evidence	Medium	Regional/National

Receptor	Potential	Significance
Post medieval and modern maritime evidence	High	Local/Regional/National
Modern military remains	High	Local/Regional/National
Aviation material	Low	Local/Regional/National

1.5.5 Desktop data

Designated and known wrecks

1.5.5.1 No designated wreck sites have been identified within the datasets for the study area.

UKHO data

1.5.5.2 Within the UKHO data there are 13 'live' entries that relate to possible material of anthropogenic origin including wreck sites within the study area. Of these, nine are named wreck locations, one indicates the possible remains of an aircraft, and two more entries correspond with unknown wrecks or debris. These are presented in **Figure 1.5** and **Appendix B**.

1.5.5.3 There are a further 93 'dead' entries, ranging from recordings of fisherman's fasteners to possible wrecks, however, the fact they are recorded as dead indicates that no remains of these are currently visible on the seabed. The geophysical survey has confirmed that no material is visible on the seabed at these locations, however, there remains a possibility that material has become buried or dispersed over time.

1.5.5.4 Of the 13 live UKHO records, the geophysical survey undertaken for the Morgan Offshore Wind Project verified seven live UKHO records within the Offshore Order Limits: two have been verified through the site-specific geophysical survey data obtained for the Transmission Assets and five for the Morgan Generation Assets.

- UKHO 5462 (NRHE 909472, MG23_0053) is recorded as the *Ben Rein*, previously the *Starling*, a general cargo ship that was built by G Brown & Co, Greenock in 1905 and sunk by the German submarine UB57 in 1918 whilst on passage from Liverpool to Belfast with a cargo of soap. *Ben Rein* was also verified during site-specific survey for the Morgan Generation Assets as anomaly Morgan_096.
- UKHO 8292 (NRHE 1027211, MG23_0059) is recorded as an unknown fishing vessel.
- UKHO 5463 (NRHE 909403, Morgan_008) is recorded as *Limesfield*, British steamship sunk by submarine UB57 on 7 February 1918 whilst on passage from Belfast to Preston.
- UKHO 8250 (NRHE 909493, Morgan_0017) is recorded as *Flying Meteor*, a British paddle steamer tug built in 1864 and sank on 13

March 1874 whilst towing the barque Ravensbourne from Liverpool to Troon.

- UKHO 7458 (NRHE 909402, NMRW 506875, Morgan_0097) is recorded as *Hibernian*, a British steam ship built in 1875 and lost on 12 August 1894 following a collision with the British paddle steamer Prince of Wales whilst on passage from Garston to Glasgow.
- UKHO 7559 (NMRW 506874, Morgan_0098) is recorded as *Lucy*, a small British steam ship built in 1899 and sunk on 21 July 1910 whilst on passage from Weston Point to Douglas.

1.5.5.5 Further details from the geophysical survey are presented in **section 1.5.6** and **Appendix B**.

1.5.5.6 Of the remaining eight live UKHO records, one record (UKHO 5418, NRHE 909495) relates to a potential aircraft crash site is recorded within the north east extent of the Offshore Order Limits and considered 'live' by the UKHO (**Figure 1.5**). This relates to aircraft wreckage reported by divers in 1991. No wreck, or material of anthropogenic origin was identified within the geophysical data at the stated position. The record may require further investigation as if a crashed military aircraft is present and identified as being British, then it will be automatically afforded 'protected place' status under the Protection of Military Remains Act 1986. As a precautionary approach a Temporary Archaeological Exclusion Zone of 100 m from the UKHO coordinates is established to ensure the protection of any aviation material.

1.5.5.7 Six UKHO records are located beyond the extents of the geophysical survey undertaken for the Morgan Offshore Wind Project but within the study area; therefore, it is considered they may be located at these positions (**Figure 1.5, Appendix B**). All six described below are recorded as being located more than 100 m from the extents of the Offshore Order Limits and are therefore not recommended for AEZs as there is no pathway for direct impact.

- The *Malaguena* (UKHO 58669), a fishing vessel which sank in August 2000 whilst under tow by the tug *Wendy Ann* from the Isle of Man to Millom. The vessel consisted of a decommissioned hull. The UKHO records the wreck beyond the extents of the geophysical survey and c.900 m outside of the Offshore Order Limits.
- The *Peveril* (UKHO 7460) was a British steam ship sunk on 16 September 1899 following a collision with the British steam ship *Monarch* while on passage from Liverpool to Douglas. The wreck was first recorded following survey in 1991 and confirmed by divers in 1993. In 1995 divers recovered items marked with Isle of Man Steam Packet Company indicating the wreck of the *Peveril*. The wreck is reported as largely collapsed with the engine and boilers standing 3 m proud of the seabed. The wreck lies 385 m outside of the south-west boundary of the Offshore Order Limits.
- UKHO 8094 (NRHE 90901) is the record of the *Montreal* and is listed within the UKHO data as an entire wreck. The *Montreal* was built in 1900 by C Swan & Hunter Ltd and was utilised as a troop

transport in 1915 and in 1918 when it sank following collision with SS *Cedric* whilst part of a convoy. The UKHO records the wreck c.200 m outside of the Offshore Order Limits.

- The *Irene Chalmers* (UKHO 8279) was a modern (1995) fishing vessel that took on water and sank whilst on a delivery run from Preston to the Isle of Man; the crew of three were recovered. The wreck is located c.600 m from the Offshore Order Limits.
- The remains of a broken up wreck (UKHO 8295, NRHE 1605439) with boilers and engine visible on the seabed were identified in 1987. In 1995 a sports diver provided the possible identity of the *Leeds*, a 19th century small steamship. The wreck is located c.400 m from the Offshore Order Limits.

1.5.5.8 An unknown wreck (UKHO 79646) is recorded as being located c.1 km from beyond the extents of the Offshore Order Limits.

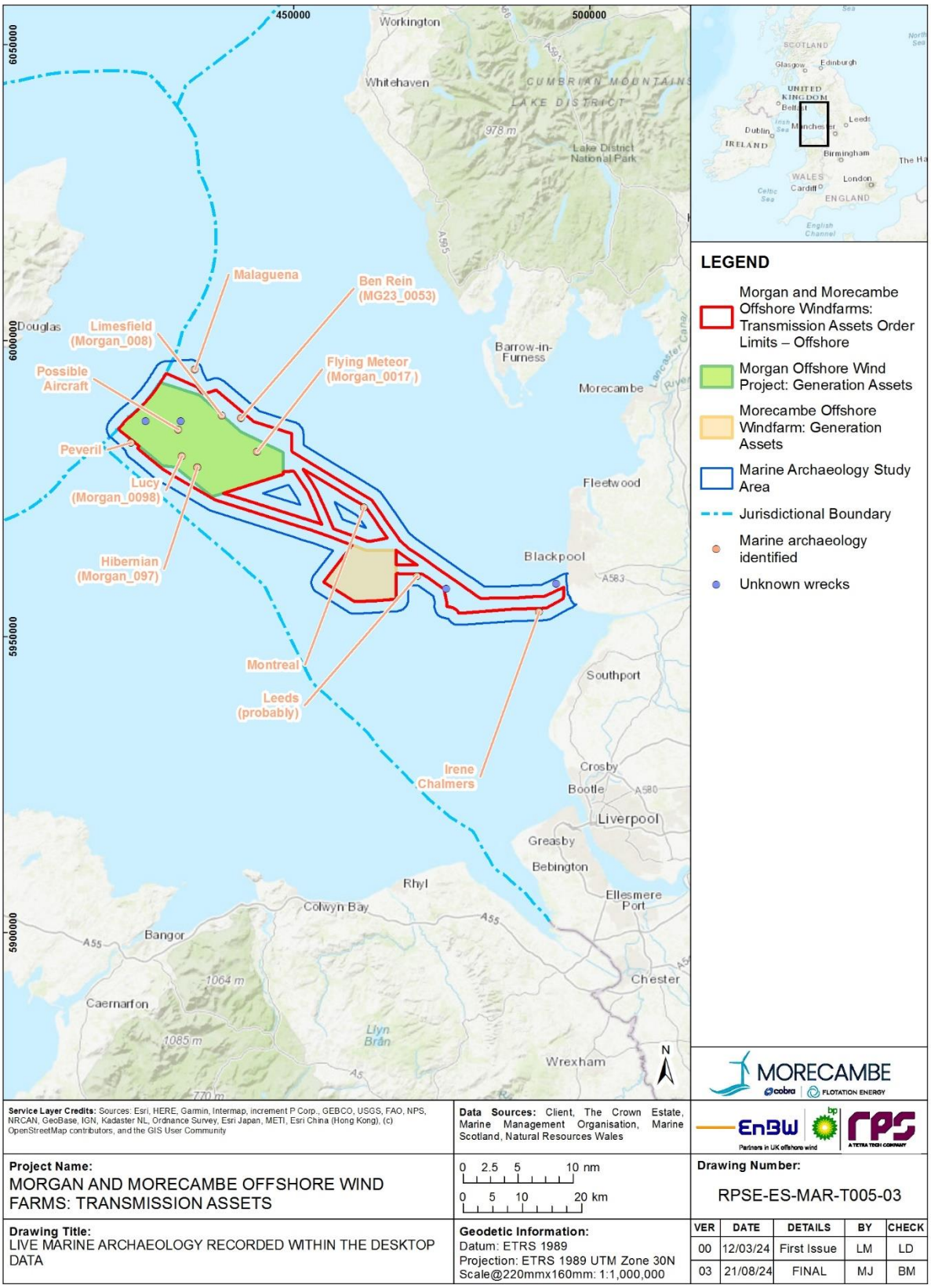

Figure 1.5: Live marine archaeology recorded within the desktop data

1.5.6 Geophysical seabed features

1.5.6.1 Geophysical surveys were undertaken within Offshore Order Limits for Morgan Offshore Wind Project: Generation Assets (Morgan Offshore Wind Project Ltd, 2024, MSDS Marine, 2022a), Morecambe Offshore Windfarm: Generation Assets (Morecambe, 2024, MSDS Marine, 2022b), and Morgan and Morecambe Transmission Assets.

1.5.6.2 The results of the surveys have informed the maritime and aviation baseline and have identified archaeological anomalies that are present within the Offshore Order Limits.

1.5.6.3 One hundred and forty-seven anomalies of potential archaeological interest were identified within the Survey Area. Of these, eight have been classified as high potential anomalies, 14 as medium potential and 125 as low potential anomalies. The distribution of these can be seen in **Figure 1.6**. While the geophysical anomalies presented in this section are within the Offshore Order Limits, for legibility the distribution of the anomalies are presented and grouped according to their survey campaign origination. Full details of the anomalies of archaeological interest identified during the geophysical survey are presented in **Appendix C**.

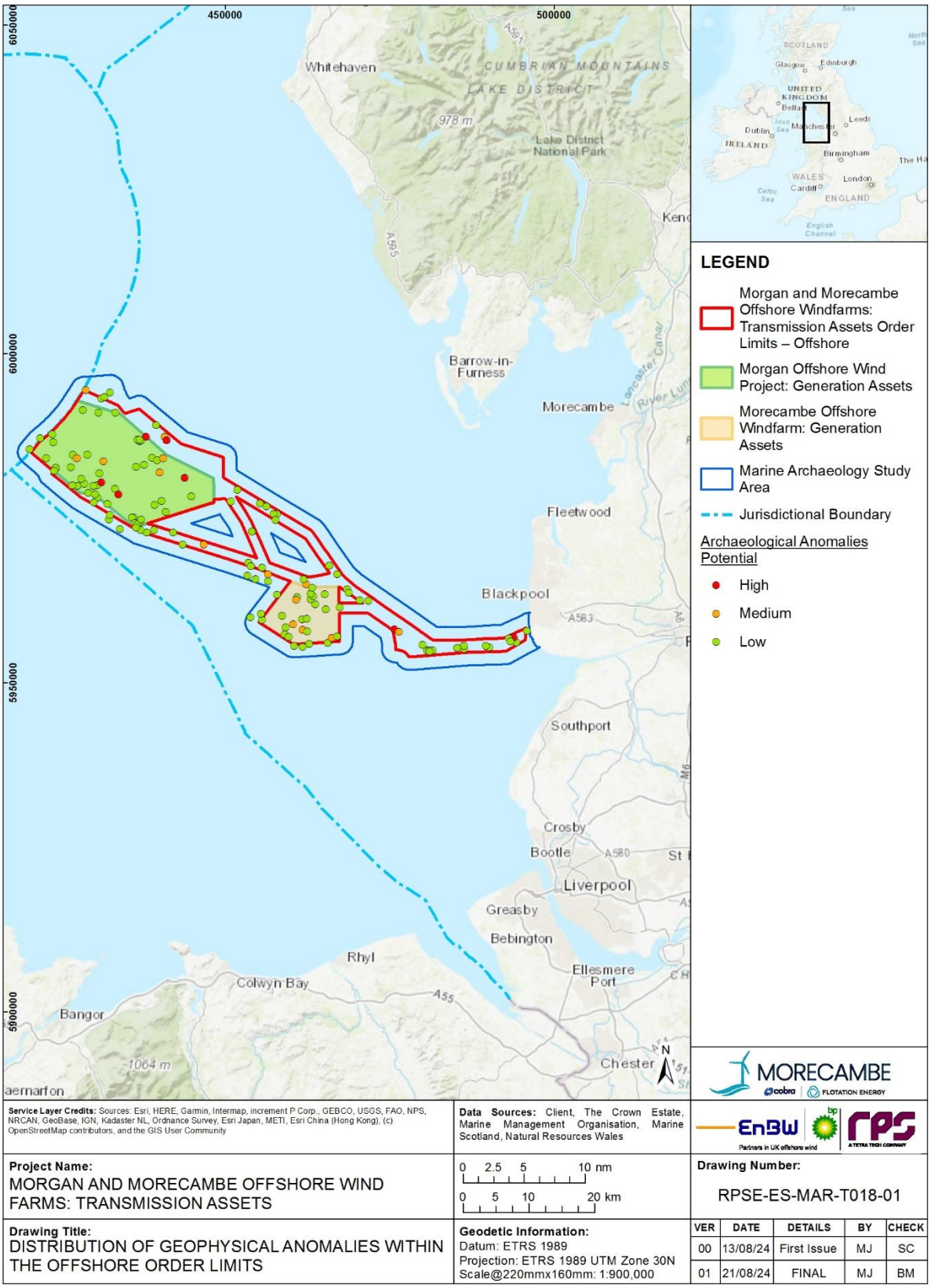

Figure 1.6: Geophysical anomalies within the Offshore Order Limits

Low potential anomalies

1.5.6.4 The 127 low potential anomalies predominantly represent likely geological features, modern debris such as chain, cable or rope and linear feature. None of these are considered to represent material of archaeological potential and are therefore not considered further within this report.

Medium potential anomalies

1.5.6.5 The 13 medium potential anomalies and the distribution of these is shown in **Table 1.9**, full details of the anomalies of archaeological interest identified during the geophysical survey are presented in **Appendix C**.

1.5.6.6 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 1.9: Transmission Assets medium potential anomalies within Offshore Order Limits

ID	Category	Description
MG23_0045	Possible anthropogenic material.	MG23_0045 (**Figure 1.7**) is visible in both the SSS and MBES data, has no associated magnetic anomaly (although lies c. 76 m from the closest track) and does not directly correspond with any UKHO or NRHE records. The origination of the anomaly is not clear, and whilst the overall form could represent anthropogenic material, such as the remains of a wrecked vessel, it is not dissimilar in form to geological features in the surrounding area. However, notable differences in form, and a precautionary approach, mean that a medium potential rating has been assigned.
MG23_0051	Possible anthropogenic material.	MG23_0051 (**Figure 1.7**) is visible in both the SSS and MBES data, has no associated magnetic anomaly, and does not directly correspond with any UKHO or NRHE records. The origination of the anomaly is not clear, and whilst the overall form could represent anthropogenic material, such as the low-lying remains of a small, wrecked vessel, it could potentially be related to the Morecambe CPP1 to DP3 electricity cable, or the additional cables and pipelines which run to the east. Due to the potential for both scenarios, a medium potential rating has been assigned.
MG23_0052	Material of anthropogenic origin.	MG23_0052 (**Figure 1.7**) is visible in both the SSS and MBES data, has no associated magnetic anomaly (although lies c. 52 m from the closest track) and does not directly correspond with any UKHO record. The anomaly lies c. 26 m south west of NRHE 1027663, an unidentified seabed obstruction reported by fishermen. The overall form of the feature indicates material of anthropogenic origin. The form, and the presence of multiple

ID	Category	Description
		elements, alongside the size suggests there is potential for the anomaly to represent material of archaeological interest, and a medium potential rating has been assigned. The nearby location of the NRHE record of an obstruction may confirm the presence of the anomaly since the creation of the record (1999) but adds little weight to the presence of material of archaeological interest due to the nature of the origination.
MG23_0060	Material of anthropogenic origin.	MG23_0060 (**Figure 1.7**) is visible in both the SSS and MBES data, with an associated magnetic anomaly of 82 nT on the closest track c. 21 m to the south west. The position does not directly correspond with any UKHO or NRHE records. The association of the feature with a magnetic anomaly of 82 nT indicates the presence of ferrous, and thus anthropogenic, debris over an area of 10.5 m x 3.7 m. However, the low-lying nature of the feature may indicate that further material lies buried, but close to the surface in the vicinity. With the origination of the debris unknown a precautionary medium potential has been assigned.
Morgan_005	Seabed disturbance	Morgan_005 (**Figure 1.7**) lies within the Transmission Assets marine archaeology study area approximately 5 m from the north of the Offshore Order Limits. The anomaly has been interpreted as an area of seabed disturbance measuring 33.7 m x 16.2 m with a measurable height of 0.2 m. Whilst likely a geological feature, a number of small features within the anomaly may indicate anthropogenic material.
Morgan_0015	Unidentified debris	Morgan_0015 (**Figure 1.7**) lies in the west of the study area approximately 3.4 km from the east boundary of the Offshore Order Limits. The anomaly measures 12.6 m x 7.3 m with a measurable height of 0.4 m and is made up of at least three smaller features. The anomaly is largely incoherent, but potentially represents material of anthropogenic origin.
Morgan_0116	Potential debris	Morgan_0116 (**Figure 1.7**) lies the west of the study area approximately 5.4 km from the east boundary of the Offshore Order Limits. The anomaly measures 16.4 m, with a measurable height of 2.3 m, at the widest point it measures 6.4 m and is a prominent irregular mound. The form of the anomaly is unusual within the surrounding geology and potentially represents material of anthropogenic origin.
Morgan_0025	Potential wreck	Morgan_0025 (**Figure 1.7**) lies west of the study area approximately 7.6 km from the north west boundary of the Offshore Order Limits. The anomaly is characterised by a number of incoherent features covering an area 23.2 m x 8.7 m, with a measurable height of 1.2 m. The form of the anomaly is not consistent with other geological features in the vicinity and may represent anthropogenic debris.

ID	Category	Description
Morgan_0030	Potential debris	Morgan_0030 (**Figure 1.7**) lies in the west of the study area, approximately 3.9 km from the north west boundary of the Offshore Order Limits. The anomaly is in an area of poor data and is only visible in the MBES data as a small depression. However, the SSS shows the anomaly as a number of linear striations in a depression measuring 13.9 m x 3.2 m, with a measurable height of 0.4 m. Although potentially geological in origin, the linear form of the anomaly combined with the poor data means a precautionary medium potential rating is appropriate.
MC22_0013	Potential debris	MC22_0013 (**Figure 1.7**) is only visible within the SSS data and has no associated magnetic anomaly and its position does not correspond with any records within the UKHO or NRHE datasets. The anomaly is visible as a curvilinear feature in association with a small area of seabed disturbance, and two further distinct features, covering an area 12.4 m x 7.3 m with a maximum height above seabed of 0.2 m. The anomaly is largely incoherent, but the form of the features may indicate anthropogenic origin.
MC22_0014	Unidentified debris	MC22_0014 (**Figure 1.7**) is visible in both the SSS and MBES data, has no associated magnetic anomaly, and does not directly correspond with any UKHO or NRHE records. The anomaly is visible in the SSS data as two prominent, and joined, curvilinear features over an area 6.6 m x 1.9 m with a measurable height of 0.3 m. Within the MBES data the anomaly lies within a slight depression, likely caused by scour, with a number of irregular features. The overall form of the anomaly indicates anthropogenic debris, although the origin cannot be determined.
MC22_0020	Unidentified debris	MC22_0020 (**Figure 1.7**) is visible in both the SSS and MBES data, has no associated magnetic anomaly, and does not directly correspond with any UKHO or NRHE records. Within the SSS data the anomaly appears as a boulder-like feature measuring approximately 2 m x 1.5 m with irregular scour extending north east, south west. Within the MBES data the anomaly appears irregular with a prominent, roughly linear, feature orientated north east, south west measuring 3.9 m x 1.7 m. Up to 1.4 m to the north east smaller features are visible. Scour is evident all around the anomaly, but most prominent to the east. The form of the anomaly is indicative of anthropogenic debris, although the origin is not clear. The prominence of the associated scour may suggest a large object, or a number of smaller solid objects.

ID	Category	Description
MC22_0039	Unidentified debris	MC22_0039 (**Figure 1.7**) is visible in both the SSS and MBES data, with a correlating magnetic anomaly of 437.7 nT. The position does not correspond directly with any UKHO or NRHE records, however UKHO record 8299 lies 280 m to the north east, however, it is not believed the anomaly and the UKHO record are related. The anomaly is visible in the SSS data as a small feature within a sandwave, quite boulder like, and measuring 1.5 m x 1.4 m with a measurable height of 0.1 m. Within the MBES data the anomaly is visible as a small break in the sand, with a slight mound and a shallow depression. The anomaly has been identified primarily due to the associated large magnetic anomaly. Whilst the form of the anomaly, and the data in the surrounding area, does not suggest further buried material the magnetic anomaly indicates ferrous, and thus anthropogenic, material.

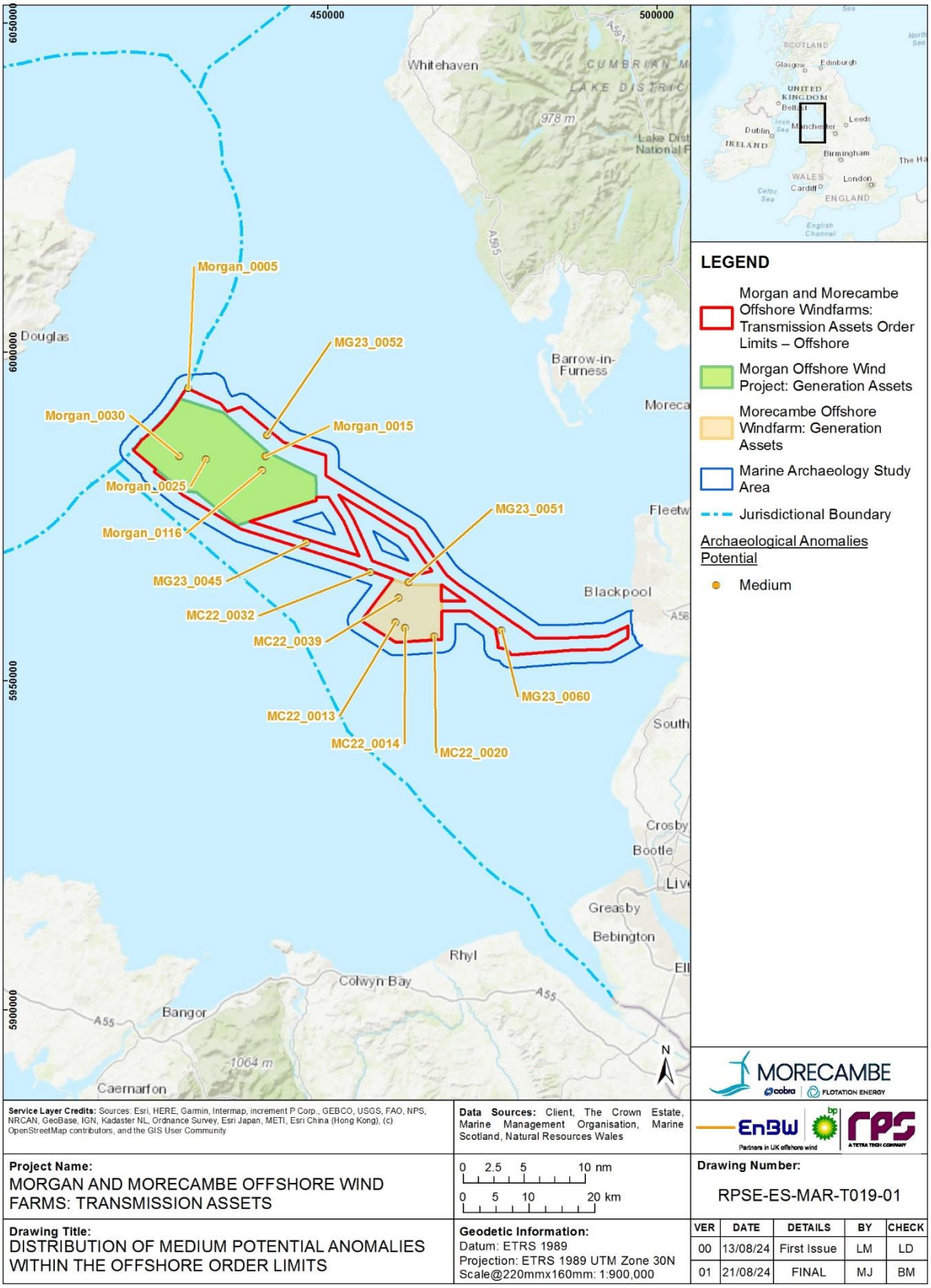

Figure 1.7: Distribution of medium potential anomalies within the Offshore Order Limits

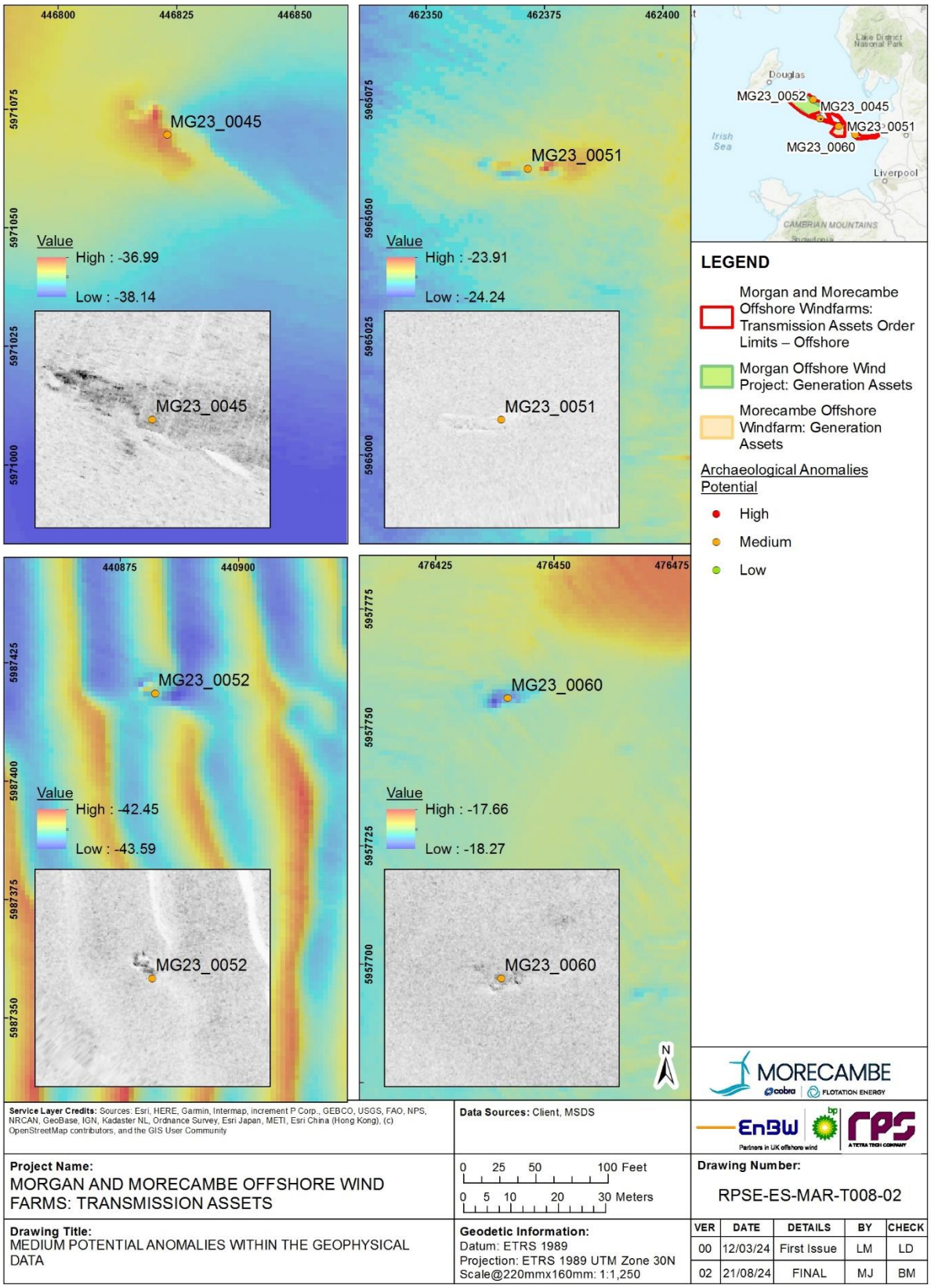

Figure 1.8: Medium potential anomalies within the geophysical data for the Offshore Order Limits (excluding Generation Assets)

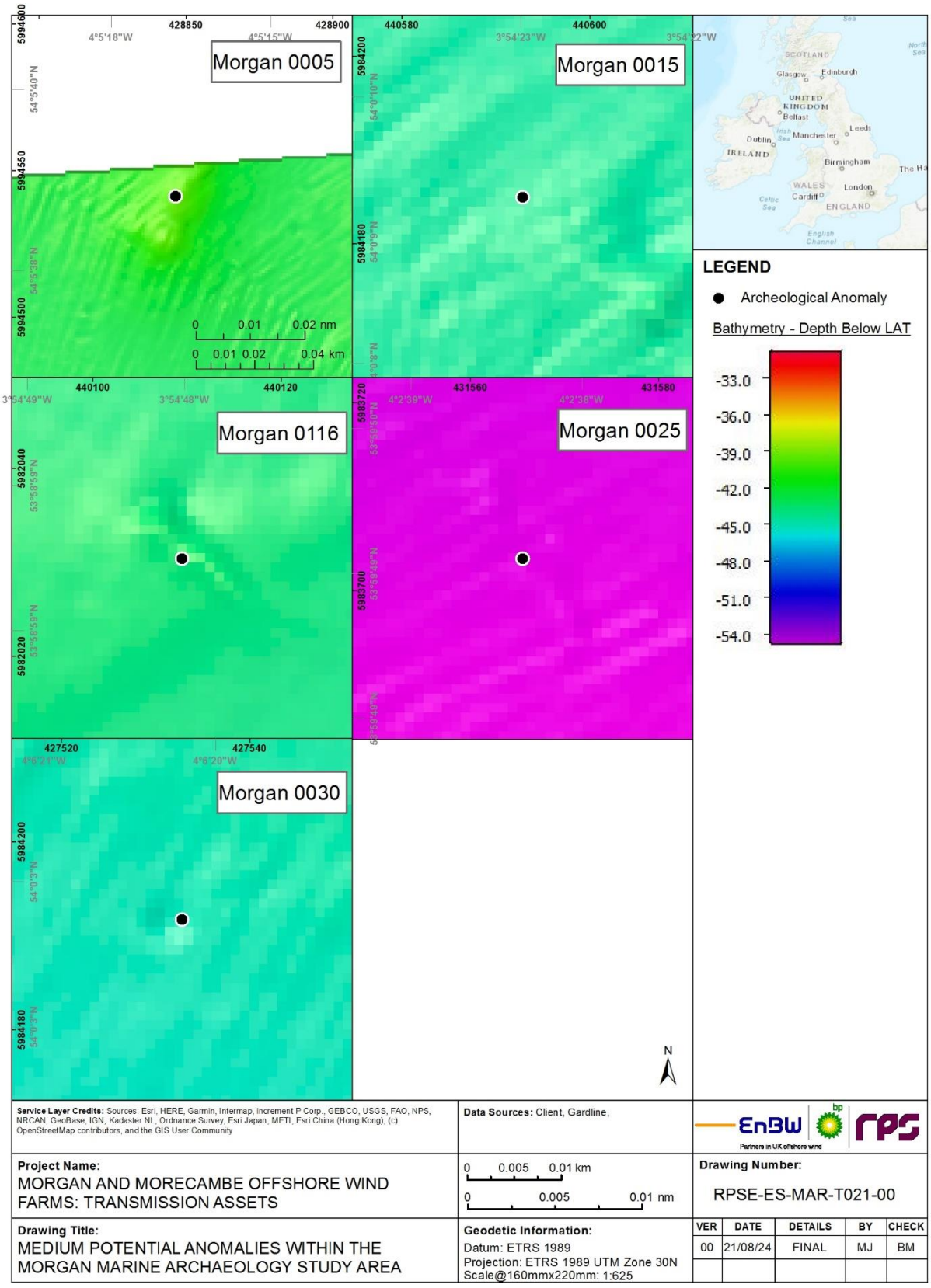

Figure 1.9: Medium potential anomalies within the geophysical data for Offshore Order Limits within Morgan Offshore Wind Project: Generation Assets

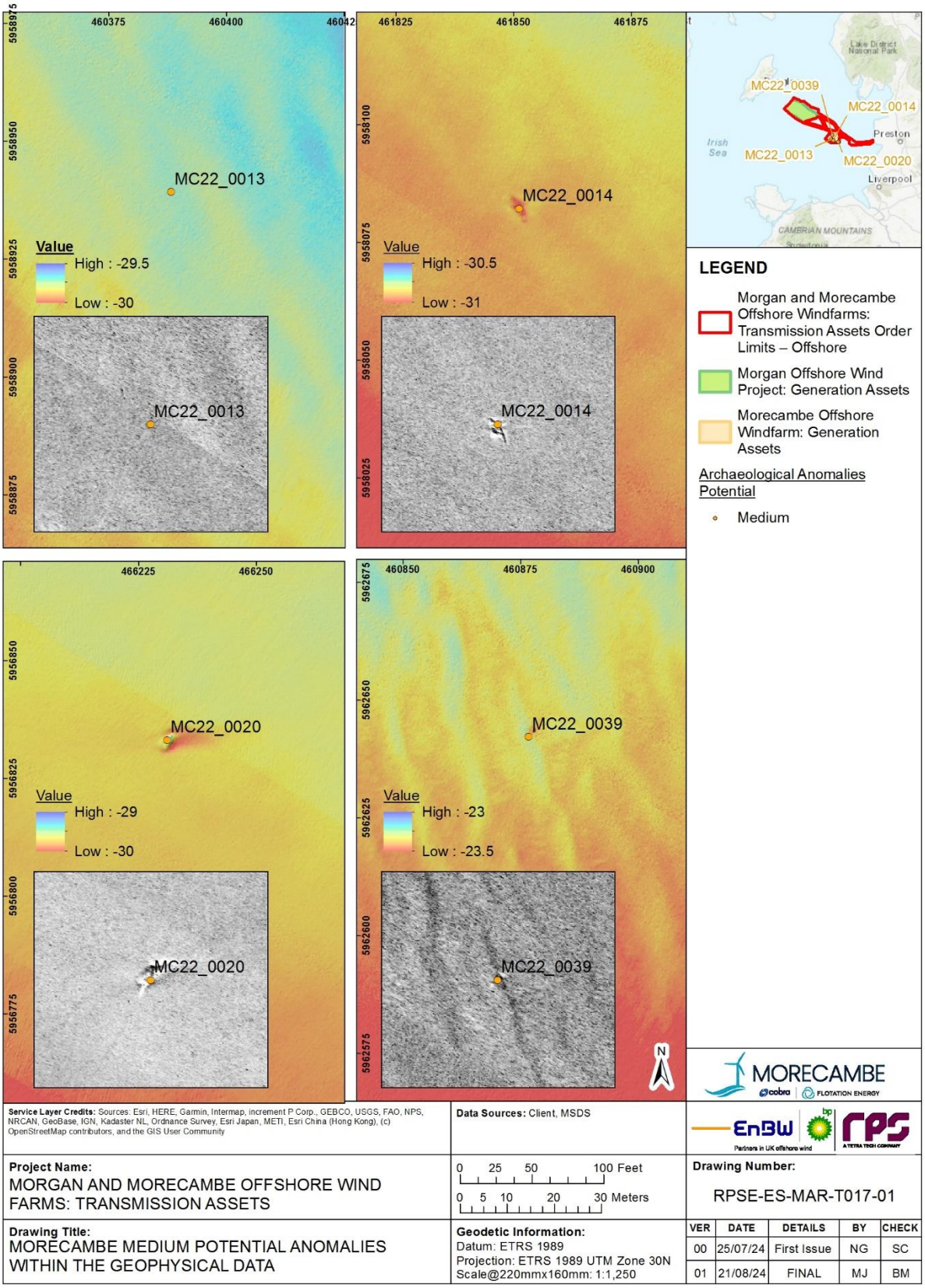

Figure 1.10: Medium potential anomalies within the geophysical data for Offshore Order Limits within Morecambe Offshore Windfarm: Generation Assets

High potential anomalies

1.5.6.7 The eight high potential anomalies are presented below in **Table 1.10** and the distribution of these is shown in **Figure 1.11**, full details of the anomalies of archaeological interest identified during the geophysical survey are presented in **Appendix C**.

1.5.6.8 Anomalies classed as high potential anomalies consists of one potential wreck and two confirmed wrecks.

Table 1.10: Transmission Assets high potential anomalies

ID	Category	Description
MG23_0014	Potential wreck	MG23_0014 (**Figure 1.11**) lies within the nearshore section of the Transmission Assets Survey Area, approximately 2.5 km from landfall. The anomaly is visible in both the SSS and MBES data, has no associated magnetic anomaly and does not directly correspond with any UKHO records but may correspond with one of the entries within the NRHE data as the positions of the NRHE data have not been verified. The anomaly has been classified as high potential based on its form, the association with a large item of potential debris, and the uniqueness in the surrounding environment which could all indicate the presence of a potential wreck.
MG23_0053	Wreck	MG23_0053 (**Figure 1.11**) lies within the north west extents of the Transmission Assets Survey Area. The anomaly is visible in both the SSS and MBES data and has an associated magnetic anomaly of 70 nT on the closest track c. 30 m to the north east. The anomaly directly corresponds with the UKHO record 5462 for the wreck of the Ben Rein and is located 0.6 km west of NRHE 909472 the record for the *Ben Rein*. The *Ben Rein* was a British carrier sunk by gunfire from UB57 on 7 February 1918 whilst enroute from Liverpool to Belfast with a general cargo. The crew were allowed to leave the vessel and there was no loss of life. The vessel is reported to have had as built dimensions of 33.5 m x 6.7 m. Diver reports from 1997 and 1998 describe an upright and intact wreck with collapsed superstructure, a large piece of debris off the bow, and a firmly attached trawl net floating 5 m above the wreck. Divers in 1997 report a cargo of soap packed tightly in the hold, however, the divers in 1998 report wooded crates containing waxed paper. The vessel was identified following recovery of the ship's bell.
MG23_0059	Wreck	MG23_0059 (**Figure 1.11**) lies towards the east of the Transmission Assets Survey Area, approximately 20 km west of landfall. The anomaly is visible in both the SSS and MBES data and has an associated magnetic anomaly of 7,925 nT on the closest track directly above the anomaly. The anomaly directly corresponds with UKHO 8292 and

ID	Category	Description
		there is an associated NRHE record (1027211) 45 m to the north west. The anomaly is visible in both the SSS and MBES as the remains of a low lying and collapsed vessel measuring 31 2 m x 6.9 m, and with a measurable height of 0.7 m. The vessel is orientated approximately north to south. It is not clear as to the orientation of the bow, however a high point to the south may indicate the remains of an engine/boiler, in turn potentially indicating the stern. Scour is visible predominantly to the east and the south east. The UKHO 8292 is an unidentified wreck. Diver reports from 2004 record a steam ship lying upright with the bow to the north, some damage along the port side, and appearing to be a fishing vessel. Whilst the description of the vessel is minimal, based on the MBES data it would appear the vessel has deteriorated significantly since the diver report in 2004. The nearby NRHE record is that of an unidentified seabed obstruction reported by fishermen, whilst likely related it provides no additional information relating to the identity or condition of the vessel.
Morgan_008	Wreck	Morgan_008 lies in the west of the study area, approximately 2.3 km south of the north east edge of the Offshore Order Limits. The anomaly is visible in both the SSS and MBES data and is recorded by the UKHO and NRHE as the *Limesfield* (UKHO 5463, NRHE 909403). A British steamship sunk by submarine UB57 on 7 February 1918 whilst on passage from Belfast to Preston with a cargo of cotton waste. There were no reported casualties. The wreck was originally recorded as a fastener by the Dutch Hydrographic Office in 1971 and confirmed as a wreck in 1991. Subsequent investigations by divers, including the recovery of the bell in 1995, confirmed the wreck as that of the *Limesfield*. The anomaly is visible in the data as a prominent feature measuring 48.8 m x 9.0 m with a measurable height of 4.8 m. The form of the feature is characteristic of a wrecked vessel. The wreck appears to be lying upright and is largely intact with the bow facing towards the north east. Slight scour is visible around the wreck to the north east, with accumulation along the west side. The coherent form of the wreck suggests either steel construction or a wreck of wooden construction of more recent origin.

ID	Category	Description
Morgan_0017	Wreck	Morgan_0017 lies in the west of the study area, approximately 4.8 km south of the north east boundary of the Offshore Order Limits. The anomaly is visible in the SSS and MBES data and is recorded by the UKHO and NRHE as the *Flying Meteor* (UKHO 8250, NRHE 909493). A British paddle steamer tug built in 1864 and sank on 13 March 1874 whilst towing the barque *Ravenbourne* from Liverpool to Troon. The crew of the *Flying Meteor* boarded the Ravensbourne which returned to Liverpool. The wreck was first recorded in 1991 as a fastener, and then amended to an isolated rock. In the same year divers noted the remains of a wreck. In 2000 divers identified the wreck as a paddle steamer tug, with the recovery of a wheel boss identifying it as the *Flying Meteor*. In 2001 divers reported the wreck to be well covered in shingle with the highest point being the paddle wheel boxes. The anomaly is visible in the MBES data as an incoherent mound in amongst a number of sand waves, within the SSS data the anomaly is still largely incoherent, but more wreck like in form. The anomaly consists of a number of parallel linear features in a broad wreck like shape over an area 28.9 m x 9.9 m with a measurable height of 1.7 m. The wreck appears in poor condition, with very little evidence of scour or accumulation.
Morgan_0096	Wreck	Morgan_0096 lies in the west of the study area, approximately 900 m south of the north east boundary of the Offshore Order Limits. The anomaly is visible in the SSS and MBES data and is recorded by the UKHO and NRHE as the *Ben Rein* (UKHO 5462, NRHE 909472). A British carrier built in 1905 and sunk by submarine UB57 on 7 February 1918. The crew were allowed to leave the vessel on a small boat and no casualties were reported. The vessel was on passage to Belfast from Liverpool with a general cargo. The wreck was originally recorded as a fastener by the Dutch Hydrographic Office in 1971 and confirmed as a wreck in 1996. The wreck was dived on multiple occasions in 1997 where soap was observed packed into the hull, and a bell recovered bearing the inscription Starling. A further dive in 1998 reported crates containing waxed paper. The anomaly is visible in the data as a coherent wreck in amongst sandwaves and measuring 34.5 m x 7.6 m and with a measurable height of 2.8 m. The wreck appears largely intact and likely lying upright. Scour, or a disturbance in the sand waves, is visible to the north east which is likely the stern. This wreck lies outside the Offshore Order Limits but within the marine archaeology study area.

ID	Category	Description
Morgan_0097	Wreck	Morgan_0097 lies towards the west of the study area, approximately 3.3 km north east of the south west boundary of the Offshore Order Limits. The anomaly is visible in the SSS and MBES data and is recorded by the UKHO (7458), NRHE (909402) and NMRW (506875) as the wreck of the *Hibernian*, a British steam ship built in 1875 and lost on 12 August 1894 following a collision with the British paddle steamer *Prince of Wales* whilst on passage from Garston to Glasgow. Of the ten crew, two were lost. The wreck was first identified in 1991 with divers recovering the ships wheel bearing the name of the builders of the *Hibernian* in 1993. The most recent diver accounts from 1996 report the wreck as very broken up and partially buried with the boilers at the highest point. The anomaly is visible in the MBES data as an incoherent mound with low lying debris to the south east, within the SSS data the anomaly is still largely incoherent, but more wreck like in form with significant height amidships. The anomaly consists of a number of parallel linear features in a broad wreck like shape over an area 48.9 m x 19.7 m with a measurable height of 3.7 m. The wreck appears in poor condition, with evidence of scour extending to the north east.
Morgan_0098	Wreck	Morgan_0098 lies towards the west of the study area, approximately 3.6 km north east of the south west boundary of the Offshore Order Limits. The anomaly is visible in the SSS and MBES data and is recorded by the UKHO (7559) and NMRW (506874). Identified as the wreck of the *Lucy*, a small British steam ship built in 1899 and sunk on 21 July 1910 whilst on passage from Weston Point to Douglas with a cargo of moulding. All four crew were recovered. The wreck was first identified in 1991, the bell was recovered in 2006 confirming the identity as the *Lucy*. The divers reported the wreck as very low lying with the engine and boiling protruding above the seabed by 4 m. The anomaly is visible in the MBES data as a prominent and irregular mound, increasing in prominence to the west. Within the SSS data the anomaly is characterised by incoherent features and a large mound to the west, the anomaly covers an area 24.7 m x 8.9 m with a measurable height of 5.8 m. The form of the anomaly is clearly of anthropogenic origin, and the size likely indicates the remains of a wrecked vessel. Scour is visible extending to the north east.

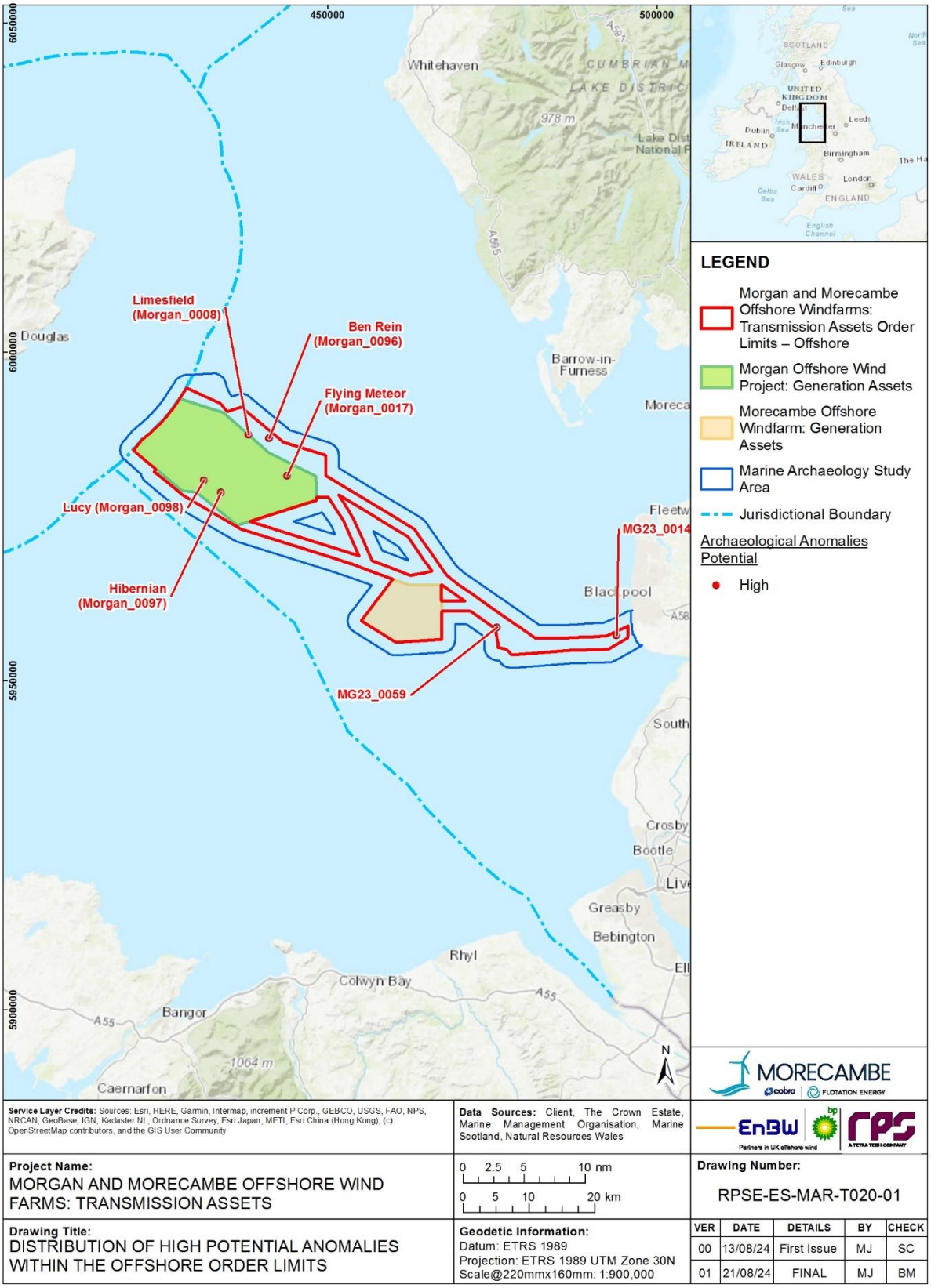

Figure 1.11: Distribution of high potential anomalies within the Offshore Order Limits

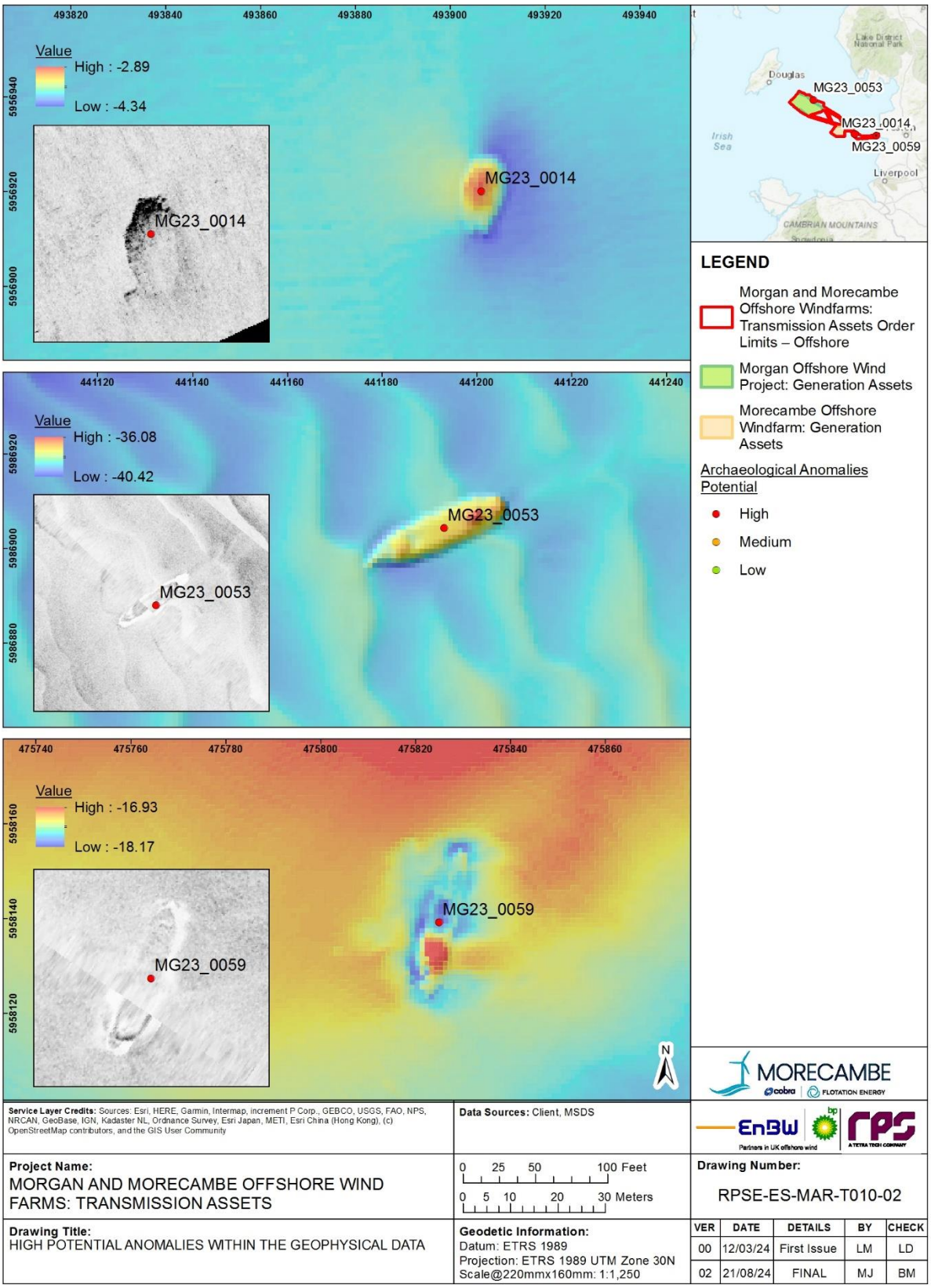

Figure 1.12: High potential geophysical anomalies within the Offshore Order Limits (excluding Generation Assets)

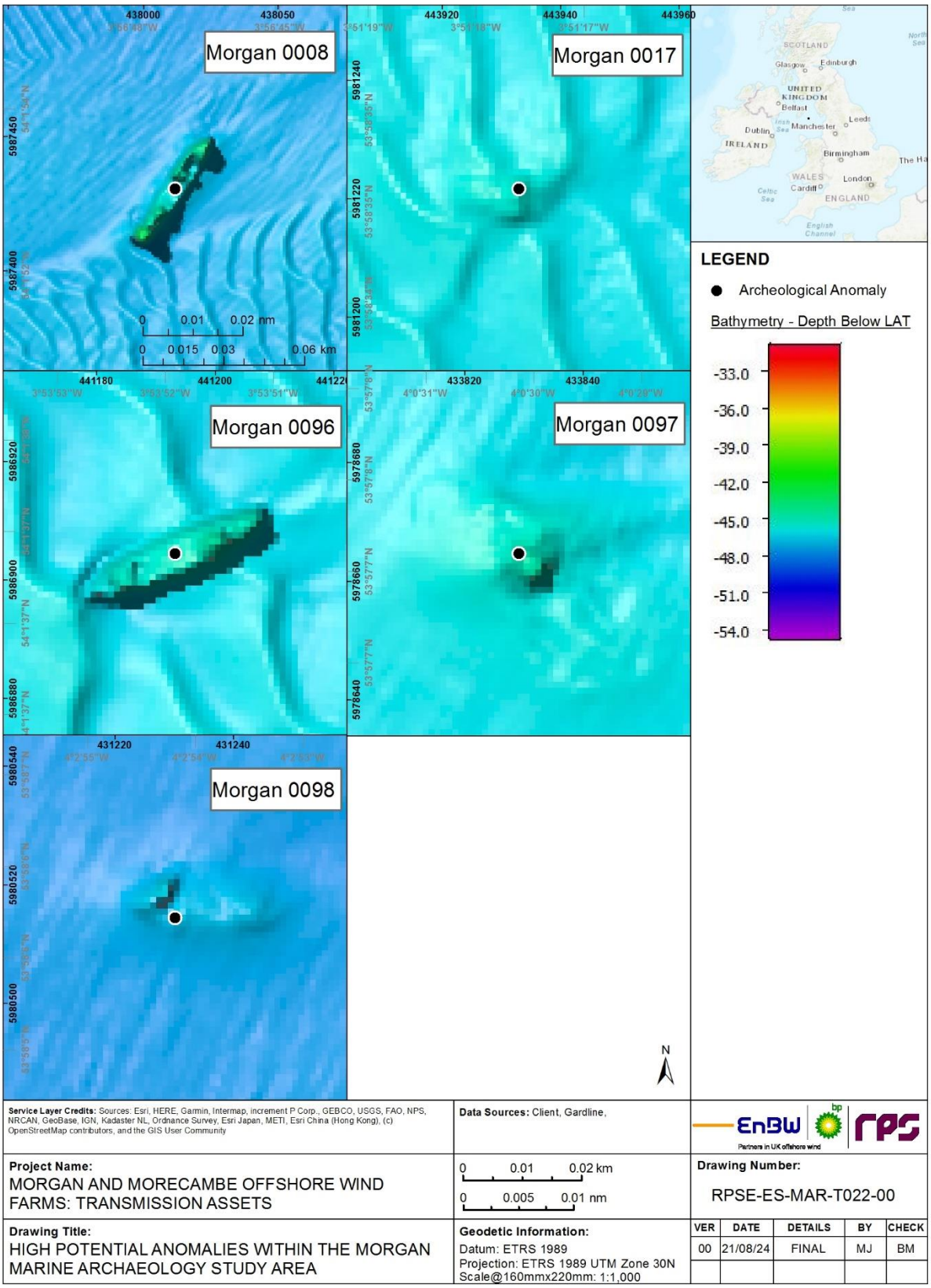

Figure 1.13: High potential anomalies within the Morgan marine archaeology study area

1.6 Summary

1.6.1 Submerged prehistoric archaeology

1.6.1.1 The potential for the survival of submerged prehistoric archaeology within the Offshore Order Limits is predominantly confined to the Upper Palaeolithic and Mesolithic periods. Geophysical survey data has identified deposits that may indicate that areas within the study area were a terrestrial or intertidal environment during these periods.

1.6.1.2 However, the environmental conditions in this area are unlikely to have been favourable for human occupation, making the potential for the survival of archaeological material low. The current geophysical surveys and studies such as the West Coast Palaeolandscape Study support the theory the study area would have been part of a terrestrial or intertidal environment until c. 6000 BP and therefore suitable for human activity. The results of the Stage 1 analysis of site investigation geotechnical surveys have concluded there is no geoarchaeological potential in the study area, though submerged landforms include subaerial, lacustrine, and fluvial environments across the Offshore Order Limits.

1.6.1.3 The shallow nature of the CPT and vibrocore surveys undertaken within the Transmission Assets Study Area do not warrant the inclusion of these data into the evolving ground model. However, Stage 2 analysis of the relevant Stage 1 deep boreholes extracted from the Morgan Generation Assets and Morecambe Generation Assets areas is recommended to advance the understanding of the contexts of environmental change following Devensian ice retreat in the east Irish Sea.

1.6.2 Maritime and aviation archaeology

1.6.2.1 Geophysical surveys conducted across the Offshore Order Limits (which encompasses the Generation Assets) have identified a total of eight anomalies of high archaeological potential, 13 of medium potential and 122 low potential anomalies within the Offshore Order Limits.

1.6.2.2 These represent a broad range of potential archaeological material to be present within the study area from established wreck sites to possible archaeological debris. Archaeological material from the post medieval to modern periods, including modern military remains, that relate to fishing and transport, or trade is most likely to be encountered within the study area.

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Appendix A Gazetteer of Recorded Losses within the study area

NRHE	Name	Description
1343461	William Leece	1814 incident in which a passenger vessel bound from the Isle of Man for Liverpool grounded near Lytham. The crew and passengers were saved, and the vessel was shortly afterwards recovered. Constructed of wood, it was a sailing vessel.
951914	Huntcliffe	Cargo vessel, 1894
952339	Menerva	Cargo vessel, 1811
952391	Unknown	Brig, 1817
952308	Unknown	Craft, 1809
952016	Unknown	Cargo vessel, 1820
952279	Unknown	Dutch Galliot, 1806
952311	Griffin	Brig, 1809
952241	Unknown	Brig, 1796
1374031	Unknown	1872 wreck of a schooner which stranded on Salthouse Bank. A wooden sailing vessel.
1507754	Eliza	1882 wreck of Welsh sloop which foundered 20 miles west of Blackpool en route from Fleetwood for Amlwch with coal. Constructed of wood, it was a sailing vessel.
952318	Unknown	Brig, 1810
952286	Unknown	Craft, 1806
952136	Tamworth	Norwegian Barque, 1863
1371591	Industrie	1833 wreck of Dutch craft lost near Lytham St. Anne's, en route from Liverpool for Rotterdam; a wooden sailing vessel. Alternatively, it has been suggested the vessel was French.

NRHE	Name	Description
952304	Betsy	Brig, 1809
952275	Unknown	Brig, 1806
952378	Padstow	Brig, 1816
952015	Peggy	Brig, 1820
952383	Unknown	Brig, 1816
1372975	Euxine	1861 wreck of a brig which stranded on Salthouse bank in a gale. A wooden sailing vessel built in 1855 which had a cargo of beans.
952255	Unknown	Swedish brig, 1800
952130	Quasi Rosa	Italian cargo vessel, 1862
1341380	Lavinia	Cargo vessel, 1809
952263	Sarah	Brig, 1802
1507756	Unknown	1824 wreck of sloop which foundered off the coast of Lancashire on its passage from Wales with limestone. Constructed of wood, it was a sailing vessel.
952315	Unknown	Spanish brig, 1810
1046731	London	1817 wreck of English sloop which foundered off Lytham en route from London to Liverpool; a wooden sailing vessel.
952018	Unknown	Brig, 1820
1372241	Clifton	1852 wreck of a British lifeboat which capsized off Lytham Saint Anne's. A wooden sailing vessel with oars which was out on exercise.
952326	Unknown	Brig, 1810
952306	Unknown	Craft, 1809
952365	Unknown	Sloop, 1815
952389	Unknown	Sloop, 1817
952287	Unknown	Craft, 1806

NRHE	Name	Description
952400	Unknown	Brig, 1818
952358	Unknown	1814 wreck of cargo vessel which was wrecked off the coast of Lancashire while bound with a general cargo, including machinery, from Norway for Jamaica. Constructed of wood, it was a sailing vessel.
952096	Portland	Scottish schooner, 1843
952139	Sarah	British smack, 1864
1364991	Anna	British craft, 1836
952256	Ann	Craft, 1800
952023	Unknown	Brig, 1821
952367	Unknown	Sloop, 1815
952280	Unknown	Sloop, 1806
952264	Unknown	1802 incident in which a smack with passengers from Ireland grounded on the Lancashire coast, but was recovered. A wooden sailing vessel.
952309	Unknown	Sloop, 1809
952000	Unknown	Sloop, 1819
952265	Ann	Craft, 1802
1343463	Friends	1814 wreck of British cargo vessel which stranded at Lytham St. Annes en route from Parnu for Liverpool. Constructed of wood, it was a sailing vessel. Another report of a vessel wrecked at Lytham St. Annes mentions a cargo of hemp and crates.
952111	Peru	Irish schooner, 1848
952017	Unknown	Sloop, 1820
1373401	Prudhoe	1866 wreck of an English barque which foundered off the Lancashire coast. A wooden sailing vessel built in Shields in 1860 which had a cargo of coal.
952372	St Petersburg	Brig, 1816

NRHE	Name	Description
952105	True Blue	1847 wreck of English cargo vessel which was wrecked off the Lancashire coast on its passage to Picton, Ontario, with coal, copper, iron, and salt, cargoes which suggest it had left from a north west port such as its home port of Liverpool. Constructed
952097	Robert Henry	Canadian schooner, 1843
952377	Fletcher	Brig, 1816
952390	Unknown	Sloop, 1817
952382	Unknown	Sloop, 1816
1507747	Fanny	1885 wreck of English schooner which was abandoned to founder off Blackpool en route from Runcorn for Strangford with coal. Constructed of wood, it was a sailing vessel.
952115	Joseph And Mary	British fishing vessel, 1851
952350	Unknown	Sloop, 1813
952269	Ann	Craft, 1803
952014	Unknown	Brig, 1820
952271	Unknown	Craft, 1804
952277	Unknown	Cargo vessel, 1806
952278	Unknown	Dutch galliot, 1806
952289	Unknown	Schooner, 1807
951997	Minerva	Brig, 1818
1372485	Denison	1852 wreck of an English craft which grounded on Barnard's Wharf and later foundered. A wooden sailing vessel built in Liverpool in 1831 which was en route from Liverpool for Antigua.
952338	Unknown	Schooner, 1811
952337	Unknown	Sloop, 1811
952026	General Goldie	Cargo vessel, 1821

NRHE	Name	Description
952343	Unknown	Sloop, 1812
1343462	Unknown	1814 wreck of a cargo vessel which stranded near Lytham St. Annes with a cargo of hemp and crates; this vessel was believed to be outward-bound, although hemp was not a cargo originating in Liverpool. Constructed of wood, it was a sailing vessel.
952361	Unknown	Smack, 1814
1046737	Whale	1818 wreck of British craft which was wrecked off Lytham. Initially identified as the WHALE from Carlisle to Liverpool, this may represent a different craft entirely, but one which was also a wooden sailing vessel.
1372897	Barbara	1859 wreck of a Welsh sloop which stranded on Salthouse Bank. A wooden sailing vessel which was en route from Amlwch. Possible remains of the wreck are also visible as a structure on air photographs examined as part of the North West Coast Rapid Coastal
1372999	Ceres	1862 wreck of a Scottish schooner which stranded on Salthouse Bank. A wooden sailing vessel built in Aberdeen in 1841.
1507725	Isabella	1818 wreck of cargo vessel which was lost on or around the coast of Lancashire en route from the United States for Liverpool with cotton. Constructed of wood, it was a sailing vessel. This may be a version of a known wreck near Workington.
1320853	Hurricane MK I P3899	British Fighter, 1942
1352871	Beaufighter MK VIF V8457	British Nightfighter, 1943
1327855	Botha MK I L6141	1942 wreck of a British Blackburn Botha trainer, which ditched 12 miles off Squire's Gate, Blackpool. The Blackburn Botha has been identified as an "extinct" aircraft type, with no complete surviving example: therefore any remains would be significant.
1318319	Typhoon IB DN438	British Fighter Bomber, 1943
1352736	Defiant MK I V1116	British Fighter, 1942
1447861	Unknown	1296 wreck of cargo vessel which stranded at Lytham St. Annes on its passage from Ireland with "goods and victuals for the munition of the castles in North Wales". Constructed of wood, it was a sailing vessel.
951951	Little Nellie	British cutter, 1906

NRHE	Name	Description
948761	Maurita	Cargo vessel, 1937
909279	Perseverance	Possible remains of British steam tug, 1936.
1597596	U 3	1918 wreck of a German submarine, which foundered while being towed towards Preston to be broken up following the end of the World War I. This vessel was one of two u-boats of the U 3 class built for the German Imperial Navy (U 3 and U 4).
952239	Unknown	Packet, 1796
952237	Unknown	Sloop, 1796
952219	Unknown	Sloop, 1790
952231	Unknown	Brig, 1794
952229	Unknown	Sloop, 1792
952228	Unknown	Sloop, 1792
952226	Unknown	Sloop, 1792
952220	Unknown	Wherry, 1790
952252	Unknown	Sloop, 1799
952238	Unknown	Sloop, 1796
952249	Unknown	Craft, 1797
952248	Unknown	Sloop, 1797
952242	Henry	Brig, 1796
952168	Ann And Mary	Sloop, 1745
1336431	Susannah	British craft, 1793
952214	Unknown	Whaler, 1783
952218	Unknown	Sloop, 1790
952254	Tyson	Cargo vessel, 1799

NRHE	Name	Description
1318437	Young William	Craft, 1755
952240	Unknown	Sloop, 1796

Appendix B: Gazetteer of Marine Archaeology Identified Within the Desktop Data

UKHO ID	NRHE ID	Name	X	Y	Description
	909497		431000.9273	5986402.631	Possible remains of a vessel.
	909496		425123.0677	5986432.608	Possible remains of a vessel.
5462/909472		Ben Rein (MG23_0053)	441204.9932	5986911.39	Entire wreck. Built in 1905 by G Brown & Co, Greenock. Sunk by gunfire from the German submarine UB57. Remains of 1918 wreck of Manx cargo vessel which foundered approximately 24 miles west of the Isle of Walney, following gun action by UB-57, Johannes L.
8250/909493		Flying Meteor	443924.8911	5981301.074	Notable debris from the Flying Meteor. Built in 1864 by Blackwood & Gordon of Port Glasgow. The Flying Meteor was engaged in towing the barque the Ravensbourne from Liverpool to Troon when a strap of connecting rod broke and fell to the bottom of the hull.
7458		Hibernian	433820.7065	5978666.931	Entire wreck. Built in 1875 by H Murray and Co, Port Glasgow. Sank following collision with British paddle steamer SS Prince of Wales whilst on passage from Garston to Glasgow. Hull only.
8279		Irene Chalmers	491555.6844	5954223.904	Vessel took on water and sank whilst on a delivery run from Preston to the Isle of Man. Crew of three recovered.
8295/1605439		Leeds (probably)	470903.4444	5960234.878	Built of wood in 1826 by John Wilson of Liverpool. Owned at the time of loss by the City of Dublin Steam Packet Company. Two cylinder side lever engine of 130NHP, paddle propulsion. Machinery by Fawcett of Liverpool. Scattered remains of a wreck.
5463		Limesfield	438004.7058	5987413.012	Entire wreck. Captured by the German submarine UB57 and subsequently sunk by gunfire. Had been on passage from Belfast to Preston with a cargo of cotton waste.
7459		Lucy	431229.2707	5980520.228	Entire wreck. Built in 1899 by Scott and Sons, Bowling. One boiler, compound expansion engine of 32NHP. Single shaft. At time of loss, on 21 July 1910, the vessel was on passage from Weston Point to Douglas with a cargo of moulding.

UKHO ID	NRHE ID	Name	X	Y	Description
58669		Malaguena	433437.4024	5995145.327	Entire wreck. Sank whilst under tow of the tug Wendy Ann on passage from the Isle of Man to Millom, Cumbria.
8094/909401		Montreal	461991.0016	5971860.902	Entire wreck. Built in 1900 by C Swan & Hunter Ltd. Owned at the time of loss by Canadian Pacific Ocean Services Ltd. Four boilers, triple expansion, engine of 720NHP, single shaft. Sank following collision with SS Cedric whilst part of convoy HG47.
7460		Peveril	422681.3187	5982768.98	Entire wreck. Sank following a collision with British SS. Monarch whilst on passage from Liverpool to Douglas.
5418/909495		Unknown	430634.9091	5985017.325	Possible aircraft.
8292/1027211		Unknown (MG23_0059)	475821.5124	5958124.483	Unidentified seabed obstruction reported by fishermen. Possibly indicative of wreckage or a submerged feature.
79646		Unknown	494433.9891	5958957.258	Entire wreck.

Appendix C: Gazetteer of potential anomalies within the Transmission Assets Survey Area

Gazetteer of archaeological anomalies within the Offshore Order Limits

MSDS ID	Potential	X	Y	UKHO	NRHE	Description	L	W	H
Morgan_0008	High	438011.8232	5987430.678	5463	909403	Wreck	48.75	9.04	4.76
Morgan_0017	High	443932.9304	5981221.749	8250	909493	Wreck	28.85	9.87	1.69
Morgan_0096	High	441193.2567	5986904.468	5462	909472	Wreck	34.53	7.61	2.77
Morgan_0097	High	433829.132	5978664.693	7458	909402	Wreck	48.9	19.7	3.67
Morgan_0098	High	431230.1609	5980514.483	7459	0	Wreck	24.73	8.92	5.81
MG23_0014	High	493906.6557	5956920.133	-	-	Potential wreck	16.6	9.5	1.4
MG23_0053	High	441193.1993	5986904.39	5462	-	Wreck (Ben Rein)	33.2	8.2	3.3
MG23_0059	High	475825.1411	5958139.242	8292	1027211	Wreck	31.2	6.9	0.7
MC22_0013	Medium	460388.2777	5958939.326	-	-	Unidentified debris	7.3	12.4	0.2
MC22_0014	Medium	461851.3453	5958082.265	-	-	Unidentified debris	6.6	1.9	0.3
MC22_0020	Medium	466231.124	5956833.227	-	-	Potential debris	4.6	2	0.9
MC22_0039	Medium	460876.753	5962642.231	-	-	Unidentified debris	1.5	1.4	0.1

MSDS ID	Potential	X	Y	UKHO	NRHE	Description	L	W	H
Morgan_0015	Medium	440592.8311	5984185.019	-	-	Unidentified debris	12.55	7.34	0.39
Morgan_0025	Medium	431565.5287	5983703.41	-	-	Potential debris	23.2	8.71	1.17
Morgan_0030	Medium	427532.8066	5984191.775	-	-	Unidentified debris	13.86	3.22	0.41
Morgan_0116	Medium	440109.4916	5982030.423	-	-	Unidentified debris	16.4	6.35	2.3
MG23_0045	Medium	446822.9981	5971069.726	-	-	Potential debris	39.6	11.8	0.9
MG23_0051	Medium	462371.6314	5965060.59	-	-	Potential debris	12.6	2.6	0.2
MG23_0052	Medium	440882.5396	5987418.603	-	1027663	Potential debris	6.09	2.73	0.83
MG23_0060	Medium	476440.3324	5957756.156	-	-	Unidentified debris	10.5	3.7	0
MG23_0002	Low	480737.9716	5954987.089	-	-	Fishing gear	49.08	1.18	0.08
MG23_0003	Low	481071.0146	5954927.952	-	-	Potential debris	1.45	0.81	0.18
MG23_0004	Low	481621.2838	5954992.982	-	-	Potential debris	2.58	0.92	0.1
MG23_0005	Low	494288.8976	5956206.431	-	-	Chain, cable or rope	48.88	0.2	0
MG23_0006	Low	490192.2558	5955446.16	-	-	Potential debris	2.45	0.53	0.22
MG23_0007	Low	495897.5912	5957968.727	-	-	Chain, cable or rope	26.62	0.29	0

MSDS ID	Potential	X	Y	UKHO	NRHE	Description	L	W	H
MG23_0008	Low	486351.9622	5955214.28	-	-	Unidentified debris	4.99	0.52	0.11
MG23_0009	Low	486297.046	5955680.466	8291	-	Rockdump	15.96	13.2	0.7
MG23_0010	Low	481125.1872	5954805.948	-	-	Linear feature	3.51	0.22	0.08
MG23_0011	Low	485336.4067	5955323.039	-	-	Potential debris	1.8	1.54	0.24
MG23_0012	Low	485333.0036	5955324.046	-	-	Potential debris	1.9	0.14	0.06
MG23_0013	Low	489657.8031	5955675.744	-	-	Potential debris	1.18	0.6	0.3
MG23_0015	Low	453975.0425	5967781.657	-	-	Potential debris	2.59	1.59	0.18
MG23_0016	Low	443610.9393	5971058.108	-	-	Fishing gear	19.81	7.32	0.03
MG23_0017	Low	438120.6301	5972852.922	-	-	Likely geological	2.36	0.78	1
MG23_0018	Low	437190.5148	5973245.626	-	-	Potential debris	2.26	0.47	0.85
MG23_0019	Low	439568.5265	5989174.229	-	-	Unidentified debris	4.06	1.9	0.33
MG23_0020	Low	450891.0842	5977582.086	-	-	Chain, cable or rope	4.22	0.29	0.02
MG23_0021	Low	480046.5212	5955800.159	-	-	Fishing gear	104.03	0.25	0
MG23_0022	Low	454153.9877	5973021.044	-	-	Linear feature	5.37	0.15	0.09

MSDS ID	Potential	X	Y	UKHO	NRHE	Description	L	W	H
MG23_0023	Low	454148.3179	5973059.284	-	-	Linear feature	4.28	0.13	0.05
MG23_0025	Low	424248.2422	5982645.312	-	-	Likely geological	2.86	0.44	1.06
MG23_0026	Low	424303.0085	5982653.187	-	-	Potential debris	17.61	22.43	0.4
MG23_0027	Low	424280.6856	5982688.148	-	-	Potential debris	52.56	3.5	0.2
MG23_0029	Low	429261.5776	5978914.133	-	-	Potential debris	2.71	0.8	0.15
MG23_0030	Low	430653.5411	5978146.914	-	-	Likely geological	9.44	4.24	0.32
MG23_0031	Low	457905.9497	5975724.568	-	-	Likely geological	14.85	1.98	0.24
MG23_0032	Low	437130.3196	5974473.48	-	-	Potential debris	4.33	1.5	0.3
MG23_0033	Low	436164.7903	5975185.704	-	-	Likely geological	3.02	0.8	0.37
MG23_0034	Low	435908.4667	5975161.594	-	-	Likely geological	2.99	0.55	0.35
MG23_0035	Low	471797.3236	5962500.415	-	-	Fishing gear	145.34	0.25	0
MG23_0036	Low	457420.118	5975715.084	8100	-	Modern debris	22.29	8.42	2.22
MG23_0037	Low	424093.1271	5982263.105	-	-	Potential debris	8.19	4.06	0.97
MG23_0038	Low	436398.8133	5974336.282	-	-	Potential debris	4.24	0.68	0.48

MSDS ID	Potential	X	Y	UKHO	NRHE	Description	L	W	H
MG23_0039	Low	436371.3874	5974301.446	-	-	Likely geological	0.79	0.86	0.43
MG23_0040	Low	470511.024	5962571.762	-	-	Fishing gear	4.93	4.71	0
MG23_0041	Low	442135.9965	5972900.15	-	-	Seabed disturbance	14.5	7.04	0.13
MG23_0042	Low	453628.0611	5968293.244	-	-	Linear feature	11.49	0.09	0
MG23_0043	Low	439250.7158	5973273.39	-	-	Likely geological	4.32	1.32	0.52
MG23_0046	Low	455622.8375	5967528.411	-	-	Potential debris	5.87	1.59	0.37
MG23_0047	Low	457724.7318	5974764.938	-	-	Likely geological	1.77	1.14	0.57
MG23_0048	Low	467056.65	5966548.98	-	-	Potential debris	1.49	1	0.31
MG23_0049	Low	465886.4241	5967862.986	-	-	Seabed disturbance	2.73	0	0
MG23_0050	Low	465886.758	5967848.924	-	-	Seabed disturbance	4.17	4.57	0
MG23_0054	Low	455377.846	5977339.516	-	-	Potential debris	3.9	1.53	0.22
MG23_0055	Low	451935.1329	5979355.324	-	-	Potential debris	3.86	2.2	0.76
MG23_0058	Low	468637.1796	5964299.818	-	-	Unidentified debris	2.46	1.19	0.4
MG23_0061	Low	493199.6116	5956775.803	-	-	Unidentified debris	2.7	2.3	0

MSDS ID	Potential	X	Y	UKHO	NRHE	Description	L	W	H
MG23_0062	Low	461995.367	5965782.831	-	-	Unidentified debris	0.6	0.7	0
MG23_0063	Low	468842.8044	5963748.528	-	-	Unidentified debris	2.4	1.2	0
MG23_0064	Low	493438.8415	5956351.292	-	-	Unidentified debris	1.2	0.6	0
MG23_0065	Low	456346.5691	5976843.46	-	-	Unidentified debris	1.7	1.4	0
MG23_0066	Low	427555.376	5979982.666	-	-	Unidentified debris	1.1	0.7	0
MG23_0067	Low	427595.4516	5979983.077	-	-	Unidentified debris	0.8	0.8	0
Morgan_0004	Low	431264.3558	5993280.476	-	-	Chain, cable or rope	16.85	15.46	0.19
Morgan_0006	Low	433383.688	5991078.569	-	-	Likely geological	59.47	14.55	0
Morgan_0010	Low	436720.7814	5986969.859	-	-	Potential debris	8.79	6.04	1.17
Morgan_0012	Low	437057.8157	5986980.328	-	-	Potential debris	9.85	6.34	1.21
Morgan_0013	Low	437021.4461	5986787.83	-	-	Potential debris	7.63	6.3	0.86
Morgan_0014	Low	437270.5967	5986867.572	-	-	Linear feature	14.63	0.4	0
Morgan_0016	Low	430815.1795	5991083.527	-	-	Linear feature	13	0.39	0.22
Morgan_0018	Low	439679.6792	5983879.407	-	-	Debris	3.24	2.75	0.51

MSDS ID	Potential	X	Y	UKHO	NRHE	Description	L	W	H
Morgan_0019	Low	438957.0868	5984251.467	-	-	Likely geological	3.14	0.53	1.16
Morgan_0020	Low	428434.8839	5991488.634	-	-	Likely geological	4.42	1.57	0.23
Morgan_0021	Low	437751.6239	5983211.466	-	-	Potential debris	3.74	0.75	0.29
Morgan_0022	Low	444923.0971	5978390.053	-	-	Chain, cable or rope	23.39	0.88	0
Morgan_0023	Low	436488.1719	5982903.093	-	-	Potential debris	7.24	2.22	0
Morgan_0024	Low	440377.7597	5977691.407	-	-	Likely geological	35.99	0.56	0.26
Morgan_0026	Low	429097.6184	5984724.895	-	-	Debris	4.48	0.87	0.38
Morgan_0027	Low	441016.4786	5976029.99	-	-	Potential debris	3.53	1.59	0.45
Morgan_0028	Low	423776.5504	5987799.685	-	-	Debris	5.24	1.57	1.84
Morgan_0029	Low	439342.385	5977091.074	-	-	Linear feature	7.41	0.56	0.17
Morgan_0031	Low	426909.2936	5984696.131	-	-	Potential debris	31.27	4.55	0.92
Morgan_0032	Low	430908.0099	5981868.716	-	-	Chain, cable or rope	40.12	0.47	0.2
Morgan_0033	Low	423940.5689	5986632.992	-	-	Potential debris	2.64	1.22	0.81
Morgan_0034	Low	433270.506	5979527.523	-	-	Fishing gear	190.82	0.39	0

MSDS ID	Potential	X	Y	UKHO	NRHE	Description	L	W	H
Morgan_0035	Low	437304.5798	5974903.921	-	-	Likely geological	12.63	2.75	0.57
Morgan_0036	Low	428192.5059	5981033.885	-	-	Potential debris	4.67	0.74	0.44
Morgan_0037	Low	428660.4834	5980301.567	-	-	Potential debris	4.5	0.56	0.51
Morgan_0038	Low	422857.1564	5984137.36	-	-	Chain, cable or rope	11.42	0.06	0.16
Morgan_0039	Low	430254.2267	5978690.913	-	-	Potential debris	3.7	3	0
Morgan_0040	Low	436645.4909	5974091.077	-	-	Chain, cable or rope	107.64	0.23	0.2
Morgan_0041	Low	432153.4418	5977220.743	-	-	Debris	3.18	2.48	1.38
Morgan_0043	Low	436516.5405	5973643.322	-	-	Debris	5.03	1.57	0.4
Morgan_0045	Low	426841.8033	5980081.564	-	-	Seabed disturbance	11.43	6.77	0
Morgan_0046	Low	430106.6743	5977432.18	-	-	Potential debris	5.71	3.16	0.57
Morgan_0095	Low	430011.1294	5980005.001	-	-	Potential debris	2.13	0.26	0.3
Morgan_0104	Low	430580.0201	5980091.758	-	-	Likely geological	1.19	0.6	0.43
Morgan_0107	Low	426564.8818	5982805.793	-	-	Unidentified debris	2.2	0.12	0.2
MC22_0007	Low	459110.9551	5957402.501	-	-	Chain, cable, or rope	4.5	0.4	0

MSDS ID	Potential	X	Y	UKHO	NRHE	Description	L	W	H
MC22_0008	Low	455668.2043	5959598.226	-	-	Likely geological	2.3	1.5	0.2
MC22_0009	Low	459700.8879	5957048.801	-	-	Potential debris	1.5	0.3	0.3
MC22_0011	Low	459271.6062	5958437.76	-	-	Potential debris	4.4	0.4	0.3
MC22_0015	Low	458699.515	5960213.931	-	-	Likely geological	4.1	1.5	0.8
MC22_0016	Low	462497.3486	5957889.855	-	-	Potential debris	2.4	1	0.2
MC22_0019	Low	461746.5041	5959673.347	-	-	Unidentified debris	4.3	0.3	0.3
MC22_0022	Low	462448.6347	5959733.179	-	-	Likely geological	7.4	3.8	0.5
MC22_0023	Low	467069.2084	5957065.729	-	-	Likely geological	4.8	0.7	0
MC22_0029	Low	460989.2669	5963039.541	-	-	Unidentified debris	6.6	0.3	0.3
MC22_0030	Low	453974.2866	5967781.484	-	-	Potential debris	5.5	0.3	0.0
MC22_0031	Low	463737.6072	5961959.485	-	-	Chain, cable, or rope	8.1	0.1	0.1
MC22_0033	Low	465312.2349	5961242.342	-	-	Chain, cable, or rope	9.3	1.2	0.3
MC22_0034	Low	463035.8551	5962777.858	-	-	Chain, cable, or rope	53.5	0.2	0
MC22_0035	Low	463463.722	5963189.824	-	-	Chain, cable, or rope	23.8	11	0

MSDS ID	Potential	X	Y	UKHO	NRHE	Description	L	W	H
MC22_0036	Low	463016.4611	5963581.473	-	-	Unidentified debris	5.1	4.1	0.4
MC22_0037	Low	467458.2124	5961507.208	-	-	Unidentified debris	10.8	0.4	0.0
MC22_0038	Low	463294.6158	5964457.487	-	-	Unidentified debris	2.4	2.3	0.2
MC22_0041	Low	465206.1058	5963514.953	-	-	Likely geological	4.7	2.1	0

Gazetteer of archaeological anomalies outside Offshore Order Limits, within Transmission Assets Study Area

MSDS ID	Potential	X	Y	UKHO	NRHE	Description	L	W	H
Morgan_0005	Medium	428856.5	5994556	-	-	Seabed disturbance	33.72	16.2	0.22
MC22_0032	Medium	456543.3	5966579	-	-	Unidentified debris	13.3	2.2	0.2
Morgan_0001	Low	432568.7	5994192	-	-	Potential debris	3.43	1.18	0.44
Morgan_0002	Low	431726.2	5993474	-	-	Potential debris	6.32	1.62	0.39
Morgan_0042	Low	420313.3	5985573	-	-	Unidentified debris	4.64	0.39	0.67
Morgan_0047	Low	432566.7	5975583	-	-	Linear feature	18.08	3.87	1.24
Morgan_0048	Low	432388.9	5974904	-	-	Chain, cable or rope	30.58	0.15	0.16
Morgan_0049	Low	434092.2	5973434	-	-	Potential debris	2.01	0	0.51
Morgan_0099	Low	421916.5	5987244	-	-	Chain, cable or rope	23.27	0.34	0.08
MC22_0002	Low	460532.5	5955683	-	-	Potential debris	2.1	0.2	0.2
MC22_0004	Low	453890	5959985	-	-	Likely geological	5.5	2.0	0.4
MC22_0006	Low	461857.3	5955533	-	-	Potential debris	1.2	0.2	0.9

MSDS ID	Potential	X	Y	UKHO	NRHE	Description	L	W	H
MC22_0010	Low	455516.1	5960505	-	-	Chain, cable, or rope	8.1	0.6	0.2
MC22_0017	Low	465638.9	5956111	-	-	Likely geological	5.1	2.8	0.3
MC22_0024	Low	453426.5	5966325	-	-	Chain, cable, or rope	15.1	0.2	0.0
MC22_0025	Low	457966.1	5963436	-	-	Potential debris	3.7	0.8	0.0
MC22_0027	Low	454668.2	5965766	-	-	Chain, cable, or rope	6.9	0.1	0.0
MC22_0028	Low	456540.9	5965518	-	-	Likely geological	4.1	2.1	0.1
MC22_0040	Low	462809.2	5955931	-	-	Likely geological	1.9	0.9	0.3