17. MARINE ARCHAEOLOGY

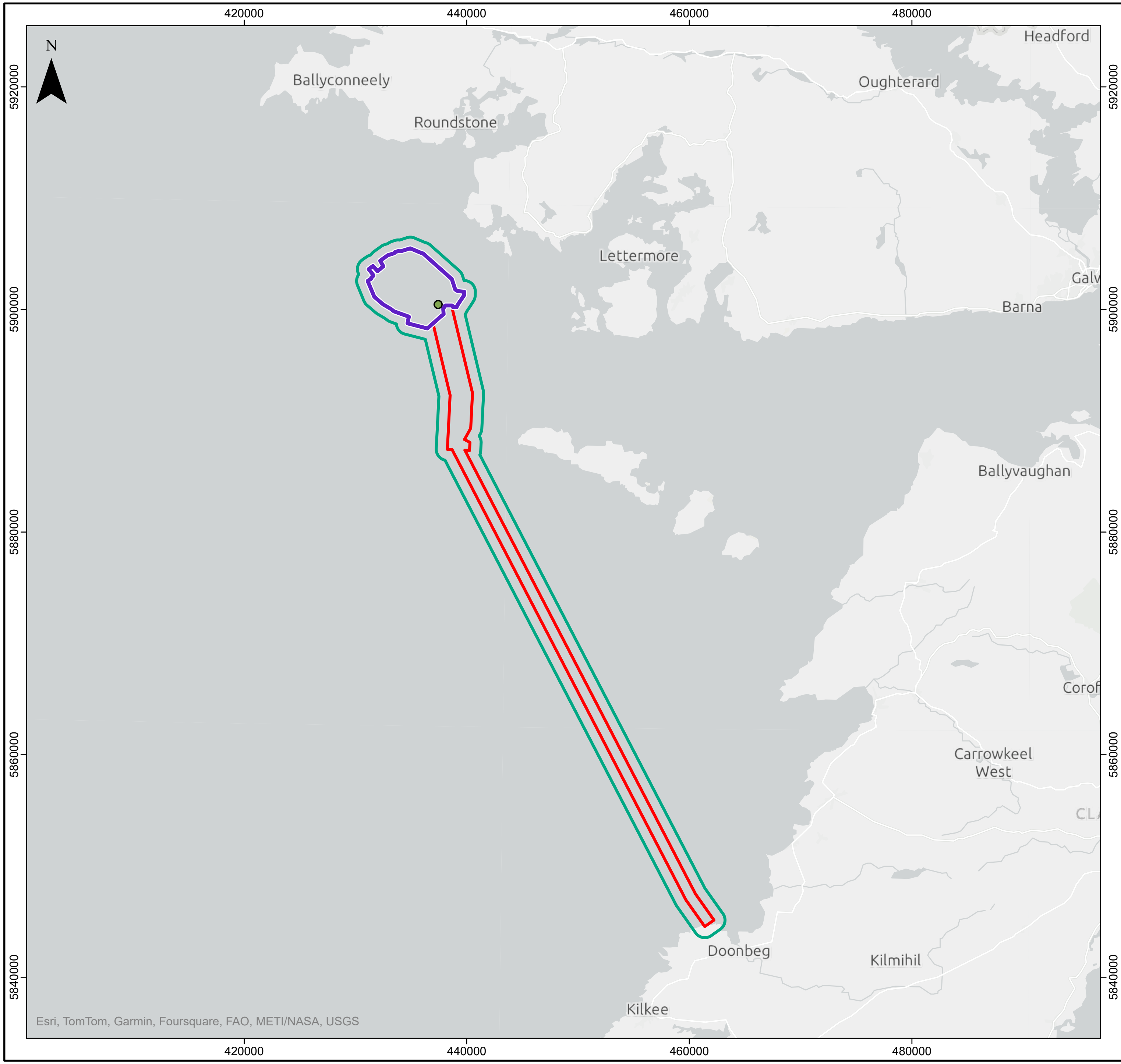
17.1 Introduction

This section of the Environmental Impact Assessment Report (EIAR) sets out the approach to the characterisation of known and potential underwater cultural heritage, including shipwrecks, across the Project and within the wider context of the Irish Sea. Specifically, this chapter considers the likely significant effects of the Offshore Site (as detailed in Chapter 5) of the Sceirde Rocks Offshore Wind Farm during its construction, operation and maintenance (O&M), and decommissioning phases,

The Offshore Site includes the Offshore Array Area (OAA) which will include up to 30 no. wind turbine generators (WTGs), an Offshore 220kV Electrical Substation (OSS), 31 gravity-base structure (GBS) fixed-bottom foundations and inter-array cables (IACs), as well as the Offshore Export Cable Corridor (OECC), containing the Offshore Export Cable (OEC) which will eventually make landfall at White Strand near Doonbeg Co. Clare (Figure 17-1). The OEC (total length 63.5 kilometres (km)) will transition to land using Horizontal Directional Drilling (HDD). The GBS foundations will be wet stored in Shannon Foynes Port prior to installation at the OWF site. The OEC will come ashore approximately 3.5 km northwest of Doonbeg. The OEC will be connected to the national grid via a proposed 220 kV substation near Moneypoint Co. Clare.

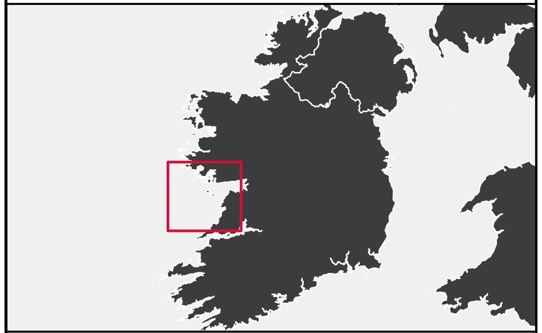
This EIAR chapter should be read in conjunction with the following documents included within the EIAR, due to interactions between cultural heritage aspects:

- Chapter 4 EIA Methodology
- Chapter 5 Project Description
- Appendix 5-11 - Archaeological Management Plan
- Appendix 17-3 - Sceirde Rocks Offshore Wind Farm Marine Geophysical Survey Archaeological Interpretation 22R0105 (ADCO, 2023).
- Appendix 17-4 - Sceirde Rocks OWF Marine Geotech and Geophysical Survey 2023 and 2024, 23R0366ext 23D0088ext Archaeological Interpretation (ADCO, 2024).



SCEIRDE ROCKS WINDFARM

Feirm Ghaoithe Charraigeacha Sceirde



LEGEND

- Offshore Array Area
- Offshore Export Cable Corridor
- Study Area
- Offshore Substation (OSS)

0 3 6 nm

0 6 12 km

Data Source: Contains public sector information, licensed under the Creative Commons licence v4.0; the Open Government Licence v3.0.

PROJECT TITLE

Sceirde Rocks

MAP TITLE

Marine Archaeology Study Area

VER	REMARKS	DATE	Drawn	Approved
1	DRAFT	06/11/2024	LR	CH

DRAWING NO

Figure 17-1

SCALE	PAPER SIZE	DATUM	PROJECTION
1:500,000	A4	WGS 84	UTM 29N

17.1.1 Statement of Authority

17.1.1.1 Maritime Archaeology Ltd

This Chapter was prepared by Maritime Archaeology Ltd (MA Ltd); a Chartered Institute for Archaeologists (CIfA) registered organisation. MA Ltd are experienced consultants who work with several offshore projects to identify underwater cultural heritage and to mitigate the impacts to them. MA Ltd are also producing the Archaeological Management Plan (AMP) and Protocol for Archaeological Discoveries (PAD).

All MA Ltd projects have been co-ordinated by the same core team over the last 10 years, providing a remarkably consistent product. Deliverables are managed by Brandon Mason who co-ordinates all phases of assessment and reporting and represents clients at relevant stakeholder meetings and telecoms. Baseline and specialist assessment are delivered by a small and highly experienced team led by Christin Heamagi, senior consultant and technical lead. Senior consultant, Lowri Roberts has written this document. Project steering and representation at examination and public hearings is provided by Project Director, Garry Momber. Quality assurance is consistently delivered by Julie Satchell.

Christin Heamagi has extensive experience working in offshore renewable energy projects and is currently the project Lead for the Dublin Array Offshore Wind Farm. On this project, Christin has facilitated stakeholder engagement and been instrumental in the development of cultural heritage mitigation for the project. During the course of this work, Christin has worked and developed a positive working relationship with the UAU.

Lowri Roberts has seven years' experience in working on offshore renewable energy projects and has recently submitted all relevant documents relating to Marine and Intertidal Archaeology for Outer Dowsing Offshore Wind Farm. She was the lead Marine Archaeologist on Awel y Mor Offshore Wind Farm during previous employment and is currently working on the Celtic Sea Floating Offshore Wind project.

In terms of wider offshore wind experience, MA have delivered EIAs and post-consent work across the UK, with details available on request.

The archaeological assessment of geophysical data that contributes to this Chapter was undertaken by the Archaeological Diving Company Ltd (ADCO) and can be found in the Appendix 17-3 and 17-4.

ADCO offers a professional diving service in freshwater and marine environments throughout Ireland, the UK and Europe. The company was founded in 1999 to address specific growth in the archaeological sector and has since expanded to include civils diving work, geotechnical investigation, and subsea environmental services. ADCO continues to be at the forefront of developments in the industry and is recognised as a leading consultancy in the field of Maritime Archaeology.

The company is managed by experienced directors and their employees comprise dedicated marine professionals drawn from both the scientific community and the Oil and Gas sectors. They believe in the provision of 'intelligent diving' solutions and use their considerable in-house expertise to deliver an unrivalled level of site inspection and reporting, supported by detailed and metrically accurate project drawings. Their extensive portfolio of clients includes civil engineering companies, port authorities, local authorities, state agencies, semi-state bodies and research institutions. Offshore windfarm work incudes Tunes Plateau Offshore Windfarm scheme, Co. Antrim and Codling Bank Offshore Windfarm scheme, Co. Wicklow with further projects to be found on their website.

17.1.1.2 Michael Gibbons

Michael Gibbons provided local information on archaeological heritage in the area surrounding the Project and reviewed this EIAR Chapter.

Michael is a member of the Institute of Archaeologists of Ireland with 40 years of experience as an archaeologist and completed a 5-year term on the Archaeology Committee of the Heritage Council. After graduating from UCG, he worked with the Department of Antiquities in Jerusalem and for the Museum of London City Excavation Programme. In Ireland, he worked on the Donegal Archaeological Survey and Galway Archaeological Survey before taking up a position as Co-Director of the National Sites and Monuments Record, Office of Public Works. The work involved carrying out the first comprehensive archaeological survey of 16 counties over a ten-year period.

He has also directed surveys and research on Croagh Patrick and other pilgrimage landscapes along the west coast including Skellig Michael World Heritage Site. In recent years his work has involved mapping the poorly documented intertidal zone archaeology of the Connacht Coast.

He has written and lectured extensively on the management of National Monuments and World Heritage Sites in Ireland and has sought to raise awareness of the role of ICOMOS and UNESCO Guidelines and Charters in Heritage Management. He has served a term with Comhairle Bhéaloideas Éireann / The Folklore of Ireland Council, to which he was nominated by the Minister for Education

Michael Gibbons works as an independent archaeologist and heritage consultant and works part-time for Notre Dame University He was both a promotor of and project archaeologist on the Marconi Station Heritage Park at Derrigimlagh near Clifden in conjunction the Clifden Chamber Commerce and the Connemara National Park.

Michael is a qualified archaeologist with a BA in Archaeology and History NUIG.

17.1.2 Legislation, Policy, and Guidance

The assessment of likely significant effects on marine archaeology receptors complies with the requirements of the Directive 2011/92/EU as amended by Directive 2014/52/EU; and the European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 (as amended). It has also been made in accordance with relevant legislation, guidance and best practice as listed below:

- National Monuments Acts 1930-2014 (as amended); Act which makes provision for the protection and preservation of national monuments and for the preservation of archaeological objects (to be repealed by section 7 of the Historic and Archaeological Heritage and Miscellaneous Provisions Act 2023 once commenced);
- Merchant Shipping Acts 1894 – 2022 (as amended); Act which sets out the statutory role of the director of the National Museum of Ireland regarding notifications of unclaimed wreck from the assigned Receiver of Wreck and retention on behalf of the State if unclaimed wreck is of archaeological interest;
- Foreshore Acts 1933 – 2023 (as amended); Act to make provision for the granting of leases and licences in respect of foreshore activities;
- Heritage Acts 1995 and 2018 (as amended); Act to promote public interest in and knowledge, appreciation, and protection of the national heritage (will be repealed by the Historic and Archaeological Heritage and Miscellaneous Provisions Act 2023 once commenced);
- Charter on the Protection and Management of Underwater Cultural Heritage 1996; Ratified by the 11th International Council on Monuments and Sites (ICOMOS)

General Assembly in October 1996 to encourage the protection and management of underwater cultural heritage;

- Guidelines on the Information to be Contained in Environmental Impact Assessment Reports 2022, Environmental Protection Agency; guidance outlining the EIA Process and information required for EIA reports in relation to the EU directives. Information is provided on sourcing baseline information for archaeology and appropriate mitigation measures;
- Dumping at Sea Acts 1996 – 2009 (as amended)); Act to control dumping at sea and give effect to the convention for the protection of the marine environment;
- Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous Provisions) Act 1999 (as amended); Act to provide for the establishment of a national inventory of architectural heritage and for related matters (will be repealed by section 7 of the Historic and Archaeological Heritage and Miscellaneous Provisions Act 2023 once commenced);
- Planning and Development Acts 2000 – 2024 (as amended); Act to revise and consolidate the law relating to planning and development;
- Minerals Development Acts 1940 – 1999 (as amended); Act to make further and better provision for the development of minerals and reduce or add to land specified in application to protect areas of archaeological heritage (will be repealed by the Minerals Development Acts 2017 once commenced);
- The Maritime Area Planning Act 2021, as amended, provides for new consenting processes for various marine projects, including offshore renewables;
- Coroners Acts 1962 – 2020 (as amended); sets out the reporting requirements should any human remains be discovered during any of the works;
- Guidelines for ecological impact assessment in the United Kingdom 2006, Institute of Ecology and Environmental Management (IEEM)
- Frameworks and Principles for the Protection of the Archaeological Heritage (Department of Arts, Heritage, Gaeltacht and the Islands (DAHGI), 1999a); outlines the basic principles and approaches for the protection of archaeological heritage in Ireland. It also outlines statutory roles and obligations of stakeholders;
- Policy and Guidelines on Archaeological Excavation (DAGH),1999b;
- Advice Notes on Current Practice (in the preparation of Environmental Impact Statements) Environmental Protection Agency, 2003;
- Data and Information Sources for Offshore Renewable Energy Developments (Department of Communications, Climate Action and Environment (DCCAE) 2016, and Sustainable Energy Authority of Ireland, 2016); supportive documents listing all data and information sources for specialist subjects, including marine archaeology, to be used in the preparation of EIAs;
- Guidance on Environmental Impact Statement (EIS) and Natura Impact Statement (NIS) Preparation for Offshore Renewable Energy Projects (MacCabe Durney Barnes, 2017), outlines stakeholders, required surveys and the process of identifying and assessing impacts on archaeological receptors in Ireland;
- Guidance on Marine Baseline Ecological Assessments and Monitoring Activities for Offshore Renewable Energy Projects, Part 1 (DCCAE, 2018a); a non-technical summary of the baseline data requirements and monitoring that may be necessary to evaluate likely significant effects of offshore renewable energy projects on the marine environment; provides technical guidance for the baseline data requirements and monitoring necessary to evaluate potential environmental impacts of offshore renewable energy projects in the marine area. It also provides an overview of best practice in relation to conducting baseline marine environmental assessments and monitoring programmes to support consent applications for, and operation of, offshore renewable energy projects. The guidance provides specific recommendations for the baseline survey and monitoring of receptors;
- Guidance on Marine Baseline Ecological Assessments and Monitoring Activities for Offshore Renewable Energy Projects, Part 2 (DCCAE, 2018b);

- Advice to the Public on Ireland's Underwater Archaeological Heritage, Department of Housing, Local Government and Heritage, 2022;
- General preliminary requirements for a geophysical survey for archaeological purposes (Underwater Archaeology Unit (UAU), n.d.); a word document outlining the preliminary requirements for archaeological geophysical survey, including side scan sonar, magnetometry and more general requirements;
- Institute of Archaeologists Ireland (IAI) Codes of Conduct; relating to the professional practice of archaeology with the aim of improving archaeological standards throughout the island of Ireland in relation to Professional Conduct; Archaeological Assessment Excavation; Archaeological Monitoring; Treatment of Archaeological Objects; and Treatment of Human Remains;
- Guidance and Toolkit for Impact Assessments in a World Heritage Context, 2022 United Nations Educational, Scientific and Cultural Organisation (UNESCO); seek to encourage the identification, protection and preservation of cultural and natural heritage around the world considered to be of outstanding value to humanity;
- UNESCO Convention Concerning the Protection of the World Cultural and Natural Heritage, 1972. Ratified by Ireland in 1991;
- United Nations Convention on the Law of the Sea 1982 (UNCLOS) (as amended by the 1994 Agreement relating to the Implementation of Part XI of the United Nations Convention on the Law of the Sea of 10 December 1982), an international agreement that establishes a legal framework for all marine and maritime activities;
- European Convention on the Protection of the Archaeological Heritage 1992, (Valetta Convention); signed by Ireland in 1997; and
- Convention Concerning the Protection of the World Cultural and Natural Heritage, 1972; Ratified by Ireland in 1991.

In addition, a number of other guidance documents specific to the consideration of marine archaeology are available from other countries with established offshore renewable energy sectors where comprehensive guidance has been developed. This guidance has been used to inform the assessment of the likely significant effects. Where appropriate, the UK guidance for archaeological assessments has been chosen to supplement the existing Irish guidance. The guidance has been used to inform the assessment of the likely significant effects and includes guidance and industry standard approaches to matters such as:

- Archaeological Written Schemes of Investigation for Offshore Wind Farm Projects (The Crown Estate, 2021); and
- Commercial Renewable Energy Development and the Historic Environment: Historic England Advice Note 15 (Historic England, 2021);
- Deposit Modelling and Archaeology: Guidance for Mapping Buried Deposits, (Historic England, 2020);
- Environmental Archaeology: A guide to the theory and practice of methods from sampling and recovery to post-excavation (Historic England, 2011);
- Historic Guidance for Offshore Renewable Energy Sector, Collaborative Offshore Wind Research into the Environment (COWRIE, 2008);
- England's Historic Seascapes: Demonstrating the Method (SeaZone Solutions Ltd, 2011);
- JNAPC Code of Practice for Seabed Development (Joint Nautical Archaeology Policy Committee, 2006);
- Marine Geophysics Data Acquisition, Processing and Interpretation (English Heritage, 2013).
- National Policy Statement for Renewable Energy Infrastructure (EN-3) (Department of Energy and Climate Change, 2023);
- Offshore Geotechnical Investigations and Historic Environment Analysis: Guidance for the Renewable Energy Sector (Gribble J and Leather S, 2011);

- Protocol for Archaeological Discoveries: Offshore Renewables Projects (The Crown Estate 2014);
- Standard and guidance for historic environment desk-based assessment, Chartered Institute for Archaeologists (CIfA, 2014a);
- Standard and Guidance for Historic Environment Desk-Based Assessment, Chartered Institute for Archaeologists (CIfA, 2014b);
- Standard and Guidance for Commissioning Work or Providing Consultancy Advice on Archaeology and the Historic Environment (CIfA, 2014c);
- The Role of the Human Osteologist in an Archaeological Fieldwork Project (Historic England, 2018);
- UK Marine Policy Statement (Department of State for environment, food and rural affairs, 2011); and
- UNESCO Convention on the Protection of Underwater Cultural Heritage, 2001 (yet to be ratified by Ireland but section 137 of the Historic and Archaeological Heritage and Miscellaneous Provisions Act 2023/2024 (once commenced) will enable this).

17.1.3 Consultation

As part of the EIAR for Sceirde Rocks Offshore Wind Farm, consultation has been undertaken with Xodus as detailed in Table 17-1.

Table 17-1 Summary of consultation relating to marine archaeology

Date	Consultation type	Consultation and key issues raised	Section where comment addressed
01 May 2024	Letter from NMS	Detailed letter outlining requirements for EIAR including the use of key guidance.	Further guidance added to Section 17.1.2

17.2 Assessment Methodology

17.2.1 Study Area

For the purposes of the marine archaeological assessment a Marine Archaeology Study Area has been used which comprises a 1 km buffer around the OAA and OECC, up to the High-Water Mark (HWM), as illustrated in Figure 17-1.

The Marine Archaeology Study Area has been applied to ensure an overlap with the onshore archaeological works (Chapter 25 of this EIAR) and is considered to be industry best practice. Further, the Marine Archaeology Study Area is used to capture recorded losses of ships, especially where historical accounts are not accurate, and wreckage that might be located within the study area and to extend preservation of any known marine archaeology receptors located in proximity to the study area.

The Marine Archaeology Study Area accommodates the potential for previously unknown or unlocated archaeology located within the Offshore Site and ensures that these sites are considered in the proposed mitigation.

17.2.2 Baseline Data

Site-specific surveys and desk-based sources as detailed in Table 17-2 were used to characterise the known and potential marine archaeology receptors within the Marine Archaeology Study Area.

Table 17-2 Sceirde Rocks site specific data

Date source	Summary	Coverage of Sceirde Rocks
ADCO, (2023). Sceirde Rocks Offshore Wind Farm Marine Geophysical Survey Archaeological Interpretation 22R0105 (Appendix 17-3).	Geophysical survey parameters, including side scan sonar, magnetometer, bathymetry, and sub-bottom data collection as well as the archaeological interpretation of the surveys conducted in 2022.	Full coverage of Sceirde Rocks geophysical study area.
ADCO, (2024). Sceirde Rocks OWF Marine Geotech and Geophysical Survey 2023 and 2024, 23R0366ext 23D0088ext Archaeological Interpretation (Appendix 17-4).	Geophysical and Geotechnical survey parameters, including side scan sonar, magnetometer, bathymetry, and sub-bottom data collection as well as the archaeological interpretation of further surveys conducted in 2024.	Full coverage of Sceirde Rocks geophysical study area.
EGS International Ltd, (2023). Fuinneamh Sceirde Teoranta Sceirde Rocks OWF Preliminary Geophysical Survey 2022.	The document summarises the geophysical operations carried out on board the Inshore Vessel, the Ocean Navigator, in the framework of the Sceirde Rocks OWF Preliminary Geophysical Survey 2022.	Full coverage of Sceirde Rocks geophysical study area.
EGS International Ltd, (2023). Fuinneamh Sceirde Teoranta Sceirde Rocks OWF Preliminary Geophysical Survey 2022.	The document summarises the geophysical operations carried out on board the Offshore Vessel, the EGS Ventus, in the framework of the Sceirde Rocks OWF Preliminary Geophysical Survey 2022.	Full coverage of Sceirde Rocks geophysical study area.

The assessments of the site-specific surveys are supported by a baseline assessment to inform the archaeological and environmental context and to identify deposits of archaeological potential using the sources detailed in Table 17-3.

Table 17-3 Sources used for marine archaeology assessment

Date source	Summary	Coverage of Sceirde Rocks
Archaeological Excavations Bulletin	Irish database compiled from the published Excavations Bulletin from the year 1970-2010 and includes additional online-only material from 2011 onwards. The map search was used to find relevant reports.	Ireland wide, including offshore environment - Full coverage of Offshore Site
Heritage Maps Viewer	The Heritage Maps Viewer is run by the Heritage Council (HC). It contains	Ireland wide, including offshore environment -

	compiled heritage data for Ireland. However, it is important to note that the data is still in the process of being uploaded to the database as it is a relatively new website. It was used primarily to access archaeological reports from assessments and excavations in the area.	Full coverage of Offshore Site
Integrated Mapping for the Sustainable Development of Ireland's Marine Resource (INFOMAR) Shipwreck Database	INFOMAR aims to map the physical, chemical, and biological features of Ireland's seabed. The shipwreck data was downloaded in vector form and contained all Irish shipwrecks, their known location and associated information.	Waters around Ireland, data taken from surveys undertaken since 1999 to present - Full coverage of Offshore Site
INFOMAR Geophysical Data	The geophysical data from INFOMAR was assessed in ArcGIS to identify any additional targets or anomalies in the Foreshore Licence area.	Waters around Ireland, data taken from surveys undertaken since 1999 - Full coverage of Offshore Site
National Museum of Ireland (NMI)	National Museum of Ireland Finds database (2010) showing the locations of archaeological discoveries.	Ireland wide - Full coverage of Offshore Site
Sites and Monuments Records (SMR), held by the National Monuments Service (NMS)	The SMR onshore and intertidal data was made available through the online Historic Environment Viewer database.	Ireland wide - Full coverage of Offshore Site
United Kingdom Hydrographic Office (UKHO) via INFOMAR	UKHO wrecks are included in the INFOMAR data and are categorised as: Obstruction; or Wreck. and classified as: LIVE, detected in recent surveys; or DEAD, not detected in recent surveys; or LIFT, removed from the seafloor.	As above INFOMAR database - Full coverage of Offshore Site
Wreck Inventory of Ireland Database (WIID)	Database holding records of over 18,000 known and potential wreck sites in Irish waters.	Ireland wide - Full coverage of Offshore Site
Wrecksite.eu	Database used to find additional information and wreck reports for identified shipwrecks in both the UKHO and INFOMAR datasets.	International - Full coverage of Offshore Site
Geological Survey Ireland & Marine Institute (licensed under a Creative Commons Attribution 4.0 International (CC BY 4.0) licence)	Shapefile was created in 2023. The known locations of wrecks are represented. The coordinates given represent the known approximate center of the record and is not indicative of its geographic extent.	Ireland wide - Full coverage of Offshore Site
Marine Accident investigation Branch, (2001). Report on the investigation of the grounding and total loss of the United Kingdom-	Background and details of the vessel *Arosa*, the crew, the events leading up to the grounding, the grounding, events after the grounding, photographs of the	Coverage of location off Doonguddle rock within the OAA.

registered fishing vessel *Arosa* (m321) on Doonguddle rock off the west coast of Ireland with the loss of 12 crew members 3 October 2000.	wreck, possible reasons for the grounding and the findings.	

17.2.3 Assessment Methodology

The baseline assessment was compiled utilising the data sources detailed in Table 17-2 and Table 17-3, ensuring that the marine archaeological assessment is comprehensive. The assessment has involved a desk-based study of known archaeological resources, and a review of the geophysical site investigations conducted for the Offshore Site.

Known archaeological sites within the Marine Archaeology Study Area, as well as the wider area, were used to inform archaeological potential. The databases used, the Geological Survey Ireland & Marine Institute (licensed under a Creative Commons Attribution 4.0 International (CC BY 4.0) licence)), the Integrated Mapping for Sustainable Development of Ireland's Marine Resource (INFOMAR) and UKHO were cross-referenced to remove duplicate entries. Where relevant, the wrecksite.eu database was used to provide more detail on the known wrecks identified within Marine Archaeology Study Area.

There is potential for previously undiscovered or unrecorded archaeology to be identified through the assessment of the geophysical data, and through other aspects of Project works. Methodologies for the assessment of geophysical and site-survey data has been included below and proposed mitigation measures to avoid impact on known and potential archaeology within the Marine Archaeology Study Area are described in Section 17.5.1.

The assessment was in line with the legislation and guidance as set out in Section 17.1 and likely significant effects on marine archaeology receptors has been based, in accordance with the definitions found in Table 17-8 and Table 17-9 and Chapter 4: EIA Methodology. The Project will be clearly described in Chapter 5: Project Description, the footprint of the development as well as the installation methodologies will be key considerations in outlining risk areas for direct and indirect impact on marine archaeology receptors.

The key guiding principles for the EIAR includes receptor sensitivity, magnitude of impact and significance of effect as outlined in Section 17.5.

17.2.3.1 Methodology for the archaeological assessment of geophysical data

ADCO was appointed by Gavin and Doherty Geosolutions (GDG) for Fuinneamh Sceirde Teoranta to carry out an archaeological assessment of marine geophysical survey data acquired in 2022 for the Sceirde Rocks Offshore Wind Farm, under archaeological consent 22R0105.

The 2022 survey was carried out by EGS International Ltd and was conducted in two stages, with the ECC and the array areas being surveyed separately. The two survey areas overlapped in terms of coverage, and an inshore vessel, *Ocean Navigator*, was used to survey across the shallower areas within the array area, while it and an offshore survey vessel, EGS Ventus, were deployed for the larger survey areas. The 2022 survey was able to reach within c. 1200 m of the shore off Killard townland, Co. Clare with side scan sonar, magnetometry and sub bottom profile survey, and c. 600 m of the shore with multibeam (ADCO, 2023). This potential gap in coverage was covered during the 2023 survey where data was collected within 100 m of the Low Water Mark (ADCO, 2024).

Additional geophysical survey was commissioned in order to ensure complete coverage following the design change of the array area. The 2023 marine geophysical survey was carried out by *Green Rebel*, and included multibeam and seismic survey, and took place within the array area as infill survey of the coverage carried out in the 2022 campaign (ADCO, 2024).

17.2.4 Side Scan Sonar Data

17.2.4.1 2022

Side Scan Sonar (SSS) data was collected using a dual-frequency Edgetech 4205 towfish system. The SSS towfish was towed via an armoured cable through a T-count pulley block, using a winch mounted on the deck of the vessels. The SSS data were recorded by Edgetech Discover software and logged to Edgetech native JSF format. Sensor geodetic position and course made good (CMG) heading derived from the USBL system were provided from QINSy in an NMEA position string and were written directly to the JSF file. GPS time was used to synchronise the USBL system to the online navigation system, allowing USBL navigation and SSS data to be accurately correlated (EGS, 2023).

The SSS towfish altitude was maintained by the online geophysicist/engineer at 10-15 % of the SSS range. It was not possible to constantly maintain the preferred towing altitude due to the dynamic seabed and the presence of fishing gear, when surveying close to these areas the towfish was raised to a safe height, often just below the surface. This was recorded in the acquisition log and data checked by the offline processing team (EGS, 2023).

The JSF files were imported by the geophysical processor into SonarWiz software. Raw navigation and heading data were extracted to be assessed and processed in Oasis Montaj, with the processed result exported and injected to the SSS data in SonarWiz. The SSS data were then bottom tracked to map each ping to the correct geospatial position. An Empirical Gain Normalisation (EGN) table was built for each file from the slant-range corrected data, which was then applied to the dataset to enhance signal quality and balance the backscatter intensity across the mosaic. All processing was applied to both the high-frequency and low frequency SSS data, and the final processed SSS data were reviewed to ensure the data quality was sufficient to meet the survey scope (EGS, 2023).

17.2.4.2 2024

Side-scan sonar (SSS) data were acquired with a deep-towed Edgetech 4205 model. The fish was towed at an average depth of 20.7m at the Landfall site and 22.8m at the OAA, with unique bedrock topography dictating variable cable out lengths behind the vessel; altitude (height above the seabed) occasionally varied as the sensor needed to be rapidly adjusted, resulting in fish highs. During acquisition, the fish operated Low and High frequencies simultaneously (230 and 850 kHz, respectively). Positioning for the SSS data on MV Lady Kathleen was acquired with a Sonardyne Mini Ranger II USBL positioning system. Data acquisition was managed in Edgetech Discovery where range, frequency and file type were controlled. Raw data logging was managed in QINSy where a series of Logfiles were created in addition to *.jsf files storing the raw SSS backscatter data. These *.jsf files include the USBL positioning, vessel position, time, date, cable out and heading information (Green Rebel Ltd, 2024).

The SSS data were positioned with an accuracy of ± 0.2% - 1.3% of the slant range. Overall, the USBL tracked the position of the SSS well, meeting the required specifications. However, isolated, localised deviations were observed (~2 m) in the presence of bedrock outcrops which necessitated USBL range adjustments; minor navigation wobbles and inconsistencies are common with USBL systems and easily influenced by environmental factors. This is typical and can be rectified in post-processing to ensure that geographic accuracy of ± 1m can be attained per project specifications. Minor navigation errors also correlate with rapid change in sensor depth when the cable is retrieved to avoid the fish crashing into a topographic high (anthropogenic and natural). Isolated instances where the presence of hazardous fishing gear needed to be avoided are also apparent in the Array data. However, these were not interpolated or corrected in processing to maintain data integrity (Green Rebel Ltd, 2024).

17.2.5 Echo sounder (multi-beam system) data

17.2.5.1.1 2022

Bathymetric data was acquired using a pole-mounted, dual-head Kongsberg 2040C MBES system (EGS, 2023).

An online MBES navigation log was maintained by the surveyor to track operational progress and act as the main source of online positioning QC monitoring of the DGPS quality and differential correction age. The records in the navigation log included the following (EGS, 2023):

- Swath angle and width at seabed;
- Depth (average);
- Date/time of each SVP;
- Wind, wave height and direction (average and maximum);
- Comments from surveyor on general observations during survey, including data quality;
- Areas which do not meet the stated density requirement will be flagged by the online navigator for infill;
- This will be noted in the comments sections of the MBES QC log;
- Quality Assurance of line approved by EGS; and
- Vessel and survey operations.

Online quality control of MBES and positioning was undertaken in real-time by the online surveyor. Recorded MBES data and the applied positional data were displayed in Kongsberg SIS and QINSy software with alarms setup to alert the surveyor of specific issues with the systems or data quality (EGS, 2023).

MBES data were uploaded at the end of each day's survey operations to EGS's server where it could be downloaded at the office in Bordon. Once downloaded, the data were processed by an MBES processor at the office and the 24hr QA deliverables then uploaded to the one-drive to be available to the Client Rep to review (EGS, 2023).

All navigation data applied to the MBES datasets was post-processed in Applanix POSPac software using Applanix's Single Base system and the nearest Ordnance Survey Ireland RINEX station (Galway). The processed results, containing attitude and navigation, were exported as a 'Smoothed Best Estimate Trajectory' (SBET) file to be applied to the MBES data (EGS, 2023).

The Kongsberg .all files containing the bathymetry were imported into CARIS where the SBETs were applied in conjunction with the VORF ellipsoid separation model, reducing the bathymetry to the required LAT. Preliminary data cleaning took place within CARIS (EGS, 2023).

17.2.5.1.2 2024

Bathymetric and acoustic backscatter data were acquired using a single hull-mounted Reson SeaBat T50-R multibeam echosounder (MBES). The MBES transceiver produces 1,024 beams per ping and can operate from 190 to 420 kHz. During the Sceirde Rocks survey operations, the MBES was typically operated at a frequency of 400 kHz. Opening beam angles were set to optimise hit count to coverage ratio (or adapted for shallow depths). The sonar head was integrated with a real-time sound velocity sensor, a Teledyne Type-30 IMU and integrated Applanix INS (inertial navigation system) and two independent GNSS antennas (Trimble AT1675-540TS).

Data for the Landfall and OAA were acquired in a broadly boustrophedonic, gridded survey design. Survey speed was approximately 4.5 knots. Sound Velocity Profiles were acquired at a minimum of every 12 hours but always whenever clear changes were observed in sound speed recordings (QINSy alarm set to sound velocity changes greater than 2 m/s). A Valeport Swift sound velocity profiler was used for SVP casts and a total of 25 profiles were recorded during acquisition, 4 during the Landfall site survey, 18 during the Array site survey and 3 during tests and calibrations. Data acquisition was managed in QINSy which was also used visualise raw data and save *.db files with raw multibeam data. All data were stored on a dedicated offshore data server.

17.2.6 Magnetic data

17.2.6.1.1 2022

A single Geometrics G882D magnetometer was piggy backed from a Edgetech 4205 side scan via a 10 m soft tow cable reduced to 7 m with a loop to increase the distance of the MAG from the seabed for the *Ocean Navigator*. Due to the difficulties encountered on the EGS *Ventus* in keeping the required separation between the MAG and the seabed while at the same time maintaining the side scan sonar in the optimal range, the 10 m cable was replaced during the survey with a longer, 15 m custom made interface cable allowing the MAG to be further lowered (EGS, 2023).

The MAG was positioned using a combination of the SSS USBL positioning and fixed layback, calculated from the centre of the SSS transducer to the caesium sensor at the back of the MAG. The offset was calculated using Pythagoras from the length of the soft tow and the average difference in the MAG and SSS towing altitude and applied in QINSy. The MAG data were recorded to a logfile in QINSy (EGS, 2023).

The logfiles were imported into Oasis Montaj 9.10 where the navigation was first de-spiked and then smoothed using a non-linear filter. The raw altitude and total field were smoothed with a non-linear filter with a low sample width. Each line was checked to ensure there were no time gaps and that the signal strength, altitude, and total field noise were within acceptable limits. Data were masked out where the total field was affected by drops in signal strength or high altitude (EGS, 2023).

The smoothed total magnetic field was subject to a sequence of four non-linear filters to derive a magnetic background field. This filtering was checked on a line-by-line basis to ensure the filter settings produced an appropriate model of the background field. Manual editing of the background field was performed where required to ensure false anomalies interpreted to be related to man-made objects were fully removed. The magnetic background field was then subtracted from the de-spiked total magnetic field to produce a residual field to highlight man-made objects (EGS, 2023).

17.2.6.1.2 2024

Magnetometer data were acquired using a single Geometrics G882 Magnetometer which was deep towed at a range of 0.34 m to 50.00 m off the seafloor in both the Landfall and Array sites. During acquisition, the fish measures the total magnetic field in nT, with a typical sensitivity of 0.02 nT at a 0.1 sec sample interval. Acquisition parameters for each vessel were identical, except for positioning systems. Magnetometer data onboard the Lady Kathleen was acquired with a Kongsberg uPAP USBL with an accuracy of ± 1.3% of the slant range. Data acquisition was managed in QINSy which created a series of log files with details including USBL positioning, line name, magnetic amplitude, signal strength, altitude, depth, vessel speed. Coverage was attained with a line spacing of 30 m in the Landfall site and approximately 60 m across the Array site.

The USBL system onboard tracked the position of the magnetometer well. However, local scale variations were observed (1–60 m). Navigation wobbles and inconsistencies are common with USBL systems (cf. Li et al., 2018) and are easily influenced by environmental factors. These variations are normal and were rectified in post-processing through the application of smoothing filters. Very occasional dropouts from the USBL, induced by the magnetometer losing connection with the USBL beacon were not present in the data, due to excellent acquisition design. Approximately 190 km of magnetometer survey line length was required. However, it is worth noting that these values are skewed due to local scale variations and spiking adding significant length to many survey lines.

17.2.7 Sub-bottom profiler data

17.2.7.1.1 *2022*

The SBP data were acquired using an Innomar parametric echo-sounder mounted on a bracket on the port-side pole on the vessel, forward of the USBL transceiver. Navigation and motion (heave) compensation, derived from QINSy and POS MV respectively, were applied to the SBP data in real time. Data were recorded in native RAW file format and GPS time was embedded in the RAW files during acquisition from an NMEA position string (EGS, 2023).

Data were recorded and written to SES3 files which the geophysical processor converted to SEGY format using the Innomar SESConvert software. RadExPro software was used for the processing and QC of the SBP datasets following conversion. The SEGY data were input into daily processing workflows and lines that were split on acquisition were merged to create a single file. Greater accuracy SBET positioning and corrections for tide and heave were applied to the data in RadExPro, and the results of these corrections were verified against a sampled MBES profile. Signal processing was applied to enhance the signal-to-noise ratio by filtering noise from the vessel and other acquisition systems, removing artefacts, and applying spherical divergence gains. The processed SEGY files were reviewed to ensure the data quality was sufficient to meet the survey scope (EGS, 2023).

17.2.7.1.2 *2024*

Sub-bottom profiler data were acquired with a hull-mounted Innomar Standard sub-bottom profiler. The primary frequency of 100 kHz was used to determine the bathymetry and the secondary frequency of 7.7kHz was used to determine the sub-seafloor strata. All acquisition was managed via Innomar SESWIN software, which visualised raw sub-bottom profiles in real-time. Online data was quality controlled in SESWIN to ensure acquisition parameters were optimised during the survey operations. Raw data were recorded as *.ses3 files and subsequently converted to SEG-Y file format. The geophysical lines for the Landfall area were surveyed with a proposed main line spacing of 30 m and 500 m for crosslines. SBP was acquired on SSS and MAG survey lines in the extended array site were surveyed with a proposed main line spacing of 60 m. SBP was also acquired on the UHRS survey line scope for the extended array locations were surveyed with a proposed main line spacing of 30 m and 30 m for crosslines. It is worth noting that due to Project timelines that not all surveyed lines adhered to the proposed line spacing and higher priority lines were acquired where possible.

17.2.8 Methodology geophysical data interpretation

The archaeological assessment of geophysical data has been undertaken by ADCO. Following the collection of the survey data as specified above, the raw data was processed and interpreted by ADCO.

Following the assessment by ADCO all anomalies were assigned a classification from the following list:

- Shipwreck
- Fishing Gear
- Debris
- Cable trench
- Boulder
- Rock Outcrop

- Magnetometer contacts

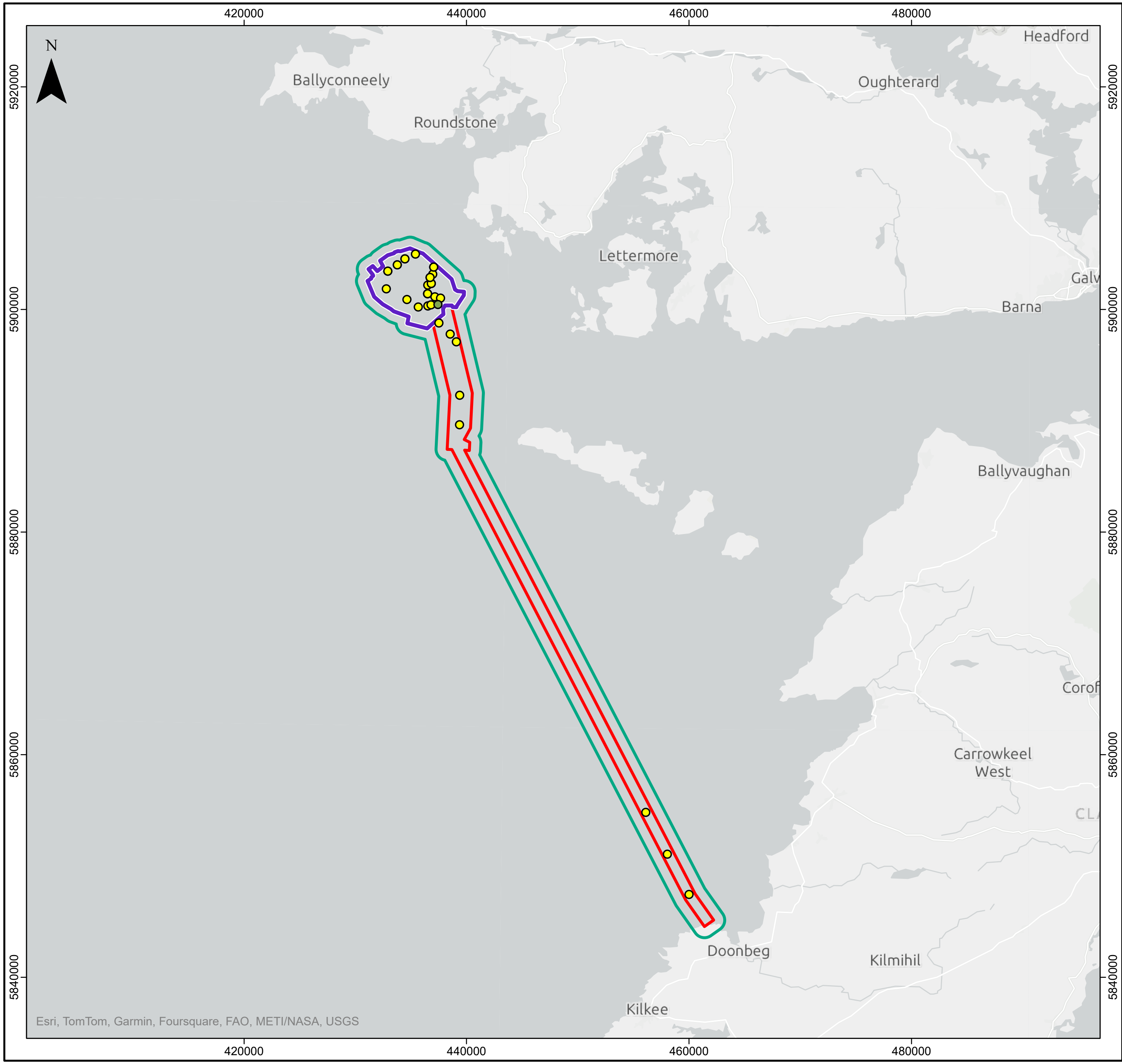
Table 17-4 Number of targets

Anomalies categorization	Number of targets
Shipwreck	0
Fishing gear	0
Debris	31
Cable trench	1
Boulder	369
Rock outcrop	22
Magnetometer contacts	75

17.2.9 Methodology for the archaeological assessment of geotechnical data

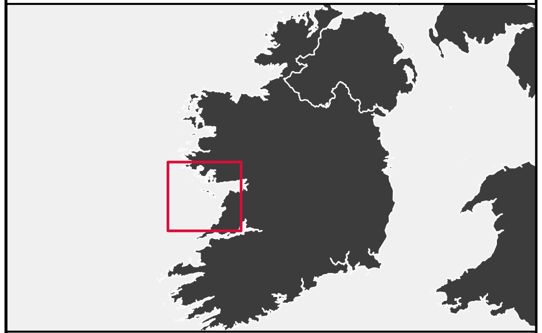
The 2023 geotechnical work was carried out by GEM and comprised Cone Penetration Tests (CPTs) and vibrocores, distributed throughout the OAA and the Offshore Export Cable Corridor (OECC). The CPTs seek to determine the geotechnical properties of sediment and are based on applying a push pressure into the seabed, with no recovery of material and no physical logging. A total of 34 vibrocores were attempted to a maximum depth of the 6 m below mean seabed (msbd) level (Figure 17-2). The vibrocores recovered material, and the report includes both a stratigraphic log and a photographic log of the cores, which were subject to on-site recording and off-site laboratory analysis, providing the opportunity for detailed observations (ADCO, 2024).

The 2024 geotechnical work was carried out by Geoquip aboard their dynamically positioned (DP) vessel *Geoquip Saentis* and comprised 17 boreholes and 2 CPTs (Figure 17-3). The majority were located at proposed WTG sites, with one at the proposed OSS located within the array area in Grid 2; two within the Offshore Export Cable Corridor (OECC), and one at the proposed Landfall where it is intended to excavate a trenchless technology (HDD) exit pit. The boreholes achieved depths of between 5 and 30 m below seabed, and CPTs achieved between 15 and 20 m below seabed (ADCO, 2024).



SCEIRDE ROCKS WINDFARM

Feirm Ghaoithe Charraigeacha Sceirde



LEGEND

- Offshore Array Area
- Offshore Export Cable Corridor
- Study Area
- Offshore Substation (OSS)
- 2023 Vibrocores

0 3 6 nm

0 6 12 km

Data Source: Contains public sector information, licensed under the Creative Commons licence v4.0; the Open Government Licence v3.0.

PROJECT TITLE

Sceirde Rocks

MAP TITLE

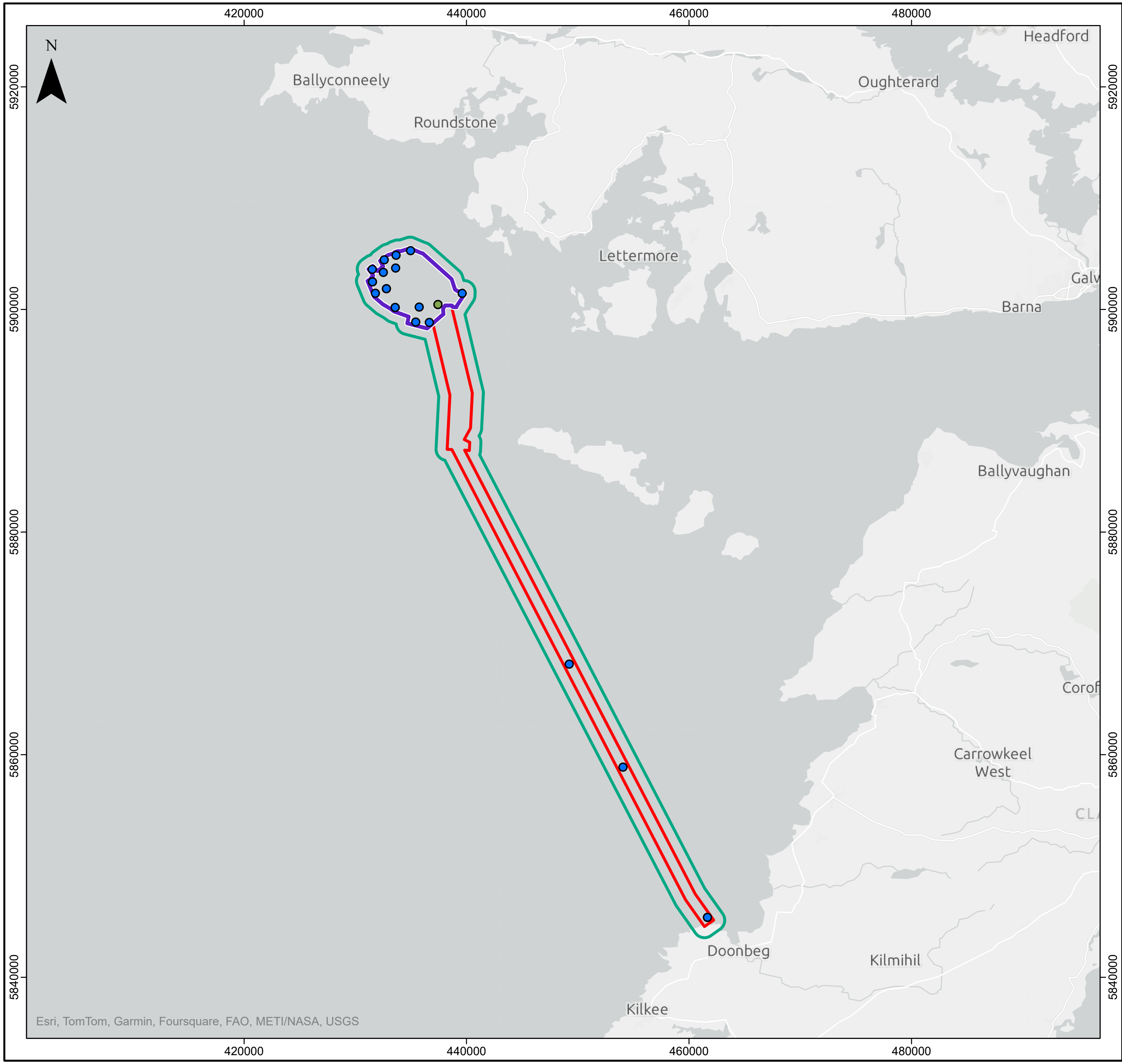
Vibrocores (2023)

VER	REMARKS	DATE	Drawn	Approved
1	DRAFT	06/11/2024	LR	CH

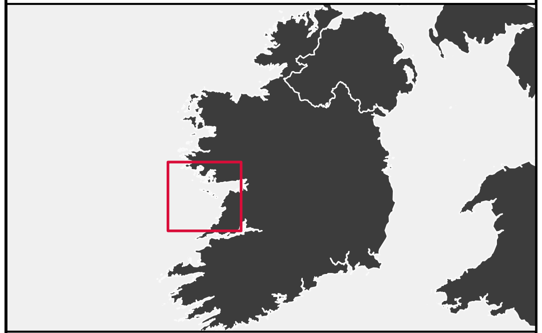
DRAWING NO

Figure 17-2

SCALE	PAPER SIZE	DATUM	PROJECTION
1:500,000	A4	WGS 84	UTM 29N



SCEIRDE ROCKS WINDFARM
Feirm Ghaoithe Charraigeacha Sceirde



LEGEND

- Offshore Array Area
- Offshore Export Cable Corridor
- Study Area
- Offshore Substation (OSS)
- 2024 Boreholes

0 3 6 nm

0 6 12 km

Data Source: Contains public sector information, licensed under the Creative Commons licence v4.0; the Open Government Licence v3.0.

PROJECT TITLE
Sceirde Rocks

MAP TITLE
Boreholes (2024)

VER	REMARKS	DATE	Drawn	Approved
1	DRAFT	06/11/2024	LR	CH

DRAWING NO
Figure 17-3

SCALE	PAPER SIZE	DATUM	PROJECTION
1:500,000	A4	WGS 84	UTM 29N

17.3 Baseline Conditions

The Marine Archaeology Study Area as defined in Section 17.4 encompasses OAA as well as the OECC and a 1 km buffer up to MHWS as illustrated in Figure 17-1. The Marine Archaeology Study Area has been utilised in the characterisation of the receiving baseline summarised below.

The environmental context below provides a detailed characterisation of the receiving baseline, which together with the AMP (Appendix 17-1) and PAD (Appendix 17-2) provides a comprehensive description of the marine archaeological campaigns and methods in place used to identify, protect, and mitigate impact on marine archaeology receptors.

17.3.1 Environmental context

Sceirde Rocks is located off the Connemara coast in County Galway. During the Quaternary, much of Northern Europe experienced extensive icesheet cover during a number of glaciation events. The most recent of these glacial events was in the Last Glacial Maximum (LGM), c. 34,000 BP to 12,000 BP (Clark *et al.* 2012; Chiverrell *et al.* 2013). The primary ice sheet was the British-Irish Ice Sheet (BIIS) which formed across much of Britain and Ireland. The BIIS formed in the northern and upland areas before advancing across both marine and terrestrial landscapes, this created various glacial environments (Scourse *et al.* 2019).

The BIIS extended into the Atlantic Ocean and reached its maximum limits c. 27,000 BP (Clark *et al.*, 2012), and it was drained by several fast-flowing ice streams. A centre of ice accumulation over Connemara's mountainous interior drained via a semi-radial network of flowlines: west-flowing ice discharged onto the Atlantic continental shelf (Peters *et al.*, 2015). Relative to the rest of Ireland, previous chronologic work on the deglaciation of the Connemara ice centre has been scarce until recently.

Inis Mór in the Aran Islands is an extension of the Carboniferous limestone bedrock dominating the Burren landscape south of Galway Bay. Soil cover on Inis Mór is scarce and a site sampled on the south-eastern end of the island showed characterisation by extensive limestone karst mantled with erratic boulders of both local and exotic lithologies (Foreman *et al.*, 2022).

Four granitic boulders from Inis Mór were sampled for cosmogenic nuclide dating to determine deglacial chronology. Cosmogenic nuclide dating can be used to determine rates of icesheet thinning and recession, the ages of moraines, and the age of glacially eroded bedrock surfaces and to date the exposure age of glacially transported rocks. Stoss-and-lee forms seen on these samples and throughout the coastal zone indicate offshore ice flow, as does the abundance of erratics of Galway granite and Lettermullen conglomerate/sandstone mantling the Aran Islands suggesting southerly ice movement from interior Connemara into Galway Bay (Foreman *et al.*, 2022).

Although Inis Mór was the farthest point from the former ice centre accessible along the terrestrial flowline, the LGM ice margin was located farther offshore on the continental shelf. Current estimates are variable, placing the LGM ice margin at the Connemara Fan, ~120 km west of Inis Mór (McCarron *et al.*, 2018), or considerably farther (~250 km) west on the Porcupine Bank (O'Cofaigh *et al.*, 2021). Cosmogenic nuclide dating places deglacial chronology at 17.3 ± 0.2 ka on Inis Mór.

The OECC is within close proximity to Inis Mór and the remaining Aran Islands. They are unique in the fact that bare, karstified limestone comprises the majority of the area of the islands, and they are also localities for the recognition of coastal erosion features. The tephra layers of An Loch Mór on Inish Oirr are also of interest. The islands are relatively undisturbed, and the long palaeoecological record stretching back to the Ice Age is a further topic of geological interest (Meehan et al, 2019).

17.3.2 Maritime activity: baseline review

The following section provides a summary of the broad overview of human activity within the Marine Archaeology Study Area and the context of the wider area. This is used to indicate the potential archaeological site types that may be encountered within the Marine Archaeology Study Area.

Table 17-5 Definition of Archaeological Potential

Archaeological Potential	Archaeological Definition
High	Anomalies considered to map material of archaeological interest such as wreck or aviation crash sites, buried and confirmed palaeolandscapes and their margins. As per EN-1 (March 2023), “there will be archaeological interest in a heritage asset if it holds, or may potentially hold, evidence of past human activity worthy of expert investigation at some point”.
Medium	Anomalies that consist of defined structural outlines or coherent material distributions with strong backscatter, or clearly upstanding objects with shadow, or pronounced scour features; or a combination of these, interpreted as of possible archaeological interest but where further investigation would be required for more detailed interpretation.
Low	Anomalies considered to be of anthropogenic origin but likely related to modern activity with little or no archaeological interest or significance such as modern debris, ropes, chains or fishing gear.

17.3.2.1 Previous Archaeological Investigations

One previous archaeological investigation has been undertaken within the Marine Archaeology Study Area, however nothing of archaeological significance was noted.

On land, approximately 3 km from the Marine Archaeology Study Area, in 1934 the discovery of human remains on Mason Island (Oileán Maisín), Co. Galway, was reported to the National Museum. Long grave slabs formed grave and small pieces of human bone were found. The grave was estimated to measure approximately 2.5 m long by 1.2 m wide (8 ft by 4 ft). No large bones were visible in the grave. There was no local knowledge about graves in the area, but according to locals, a ship had been wrecked nearby some 200 years previously, and some of the ship’s crew had been buried in the area. This could be important as there may be associated wreck remains still within the study area.

Furthermore, the finds database of the National Museum of Ireland (2010) reveals that no archaeological finds were found within the Marine Archaeology Study Area. Three finds were recorded approximately 5 km away from the OECC landfall including a bone point, bone point fragment and conical stone object. Eight findspots have been discovered on the Aran Islands that run parallel with the OECC including an inscribed stone pebble, stone spindle whorl, Palaeolithic flint hand axe, five skeletons (four Adults, one Child and a bone belonging to a sixth), a flint flake, cordoned urn, two stone axe heads and a pottery fragment. One fragment of pottery was recorded approximately 8 km away from the OAA. This reiterates that archaeology has been discovered previously within the broad area of the Offshore Site.

17.3.3 Palaeolithic (800,000-8,000 BCE), Mesolithic (8,000 - 4,000 BCE) and Neolithic (4,000 - 2,500 BCE)

During the Palaeolithic in Ireland there is evidence of mammalian species (Monaghan, 2017) and evidence of human colonisation of Ireland has been found in the Alice and Gwendoline Cave, Co Clare where a brown bear patella containing butchery marks has been dated to 12,810-12,590 cal. BP

(Dowd and Carden, 2016). To date there have been no finds of Palaeolithic remains reported within the marine zone of Irish waters.

During the Mesolithic, the climate was warmer and there is increasing evidence of permanent housing structures in both Britain and Ireland (Waddington and Wicks, 2017). Waterborne travel during the Mesolithic was likely undertaken in logboats or skin / hide boats (as summarised in McGrail, 2001: 172-183). In 2014, after storms and sea surges, two stone axes dating to the Mesolithic were found on the Connemara coast. It is thought that it may have been made in one of a number of “axe factories” in County Clare and that these implements were traded up the coastline (irishtimes.com, 2014a), possibly in log boats.

During the Neolithic, communities seemingly became less mobile than those of the Mesolithic. There are no known Neolithic sites within the Marine Archaeology Study Area. However, there is evidence from the surrounding area, on the Aran islands. There is a history of arable farming on the Aran Islands since its inception in the Neolithic period (O’Connell and Molloy, 2019). Stone-age or Megalithic monuments can be found on the three islands. A wedge tomb dating from 2,500 BCE such as that found at Corrúch in Inis Mór is a typical example. These field monuments attest to long and substantial human activity and settlement since at least the Neolithic (O’Connell and Molloy, 2019). Similarly, intermittent human activity has occurred along the dune system at Dogs Bay approximately 10km from the turbines from the late Neolithic through to the late medieval period highlighting the importance of coastal communities in this area (excavations.ie, 1991).

In 2002, a hollowed-out log boat was found in Barna strand at low tide. The boat was dated to 5,500 years ago and it is assumed that this canoe operated as an inshore coastal craft. The remains of a prehistoric field system (RMP GA093:02301) were recorded by the Archaeological Inventory of Co. Galway, to the north of Barna village. When the field system and log boat evidence are combined, it would appear that the area surrounding Barna may have had an advanced Neolithic society capable of exploiting both the marine and terrestrial resources (Kieran, 2011).

17.3.4 Bronze Age (2,500 - 800 BCE) and Iron Age (800 BCE- AD 400)

The Bronze Age population used routes of communication along the coasts and waterways of the region. Tin was essential in the creation of bronze materials. Ireland does not have much tin and most of the tin that was needed to make the bronze seems to have been imported from England, therefore boats were essential for the movement of this resource across to Ireland. Skin boats and logboats were still used throughout the Bronze Age in Ireland, however, there is evidence that logboats, such as the Lurgan boat (c. 3,900 BP), were adapted and equipped with outriggers to allow for more stability, possibly for open water journeys (Robinson *et al.*, 1999).

Excavations at Dún Aonghasa on Inis Mór in Co Galway indicate that hillfort construction took place in the late Bronze Age and that the period of most intensive activity at that site was in the interval 1000–800 BCE (Cotter, 2003). Evidence of Bronze Age activity on the island indicates that the population were utilising boats in order to be able to access mainland Ireland.

A fragment from an ancient oak trackway was uncovered on the northern shoreline of Galway Bay in 2014 suggesting that the structure was built about 1700 BC. The trackway or possible ceremonial platform would have been built when the sea level was rising and gradually enveloping forests and lagoons (irishtimes.com, 2014b).

The archaeological evidence for Iron Age boats in Ireland is poor. There are also no extant remains of larger sea-going vessels within Irish waters. However, evidence that they did exist in Ireland during this time comes from a gold boat model, known as the Broighter boat, found in 1896 on farmland near Limavady, Northern Ireland (Waddell, 1998). Further, several Iron Age logboats / dugouts have been found in Ireland, but not in coastal or marine contexts, such as the Lees Island 5 logboat, dated to 754-409 BCE, found in Lough Corrib, Co. Galway (Brady, 2014). In total, five logboats have been discovered in Lough Corrib in Co. Galway, ranging from the Early Bronze Age (c.2500 BC) to the 11th century AD. The oldest and largest vessel yet identified of these is a 12m-long dugout, radiocarbon dated to 2500 BC. The craft is so well preserved that a distinctive spine some 2-3cm tall can still be seen, running the length of its floor (Hilts, 2014). Similarly, the Lurgan Canoe in an Early Bronze Age vessel discovered in 1901 in a bog in County Galway, carved from an oak trunk and measuring over 14 m long by 1 m wide (irisharchaeology.ie, 2014).

A smaller plank-built craft was found in 1968 in Lough Lene, Co. Westmeath. The boat has been interpreted as representing a Roman style, which indicates either the presence or knowledge of Mediterranean or northern European boat-building traditions in Ireland in the Iron Age (O'Sullivan and Breen, 2007).

A Roman grey ware jar was dredged up in 1934 by the Cardiff trawler *Murato*, north-west of the Porcupine Bank, 150 miles off the west coast of Ireland in 274 meters of water. This pottery is believed to have come from a Roman wreck which may indicate trade between Ireland and the Mediterranean during this period (Amgueddfa Cymru).

17.3.5 Early Medieval (AD 500 - 1100) and Medieval (1100 - 1550)

During the Medieval Ages, the Port of Galway was ruled by 14 merchant families, 14 of which were Normans, and two were Irish. They were later called the "tribes" of Galway. During the Middle Ages, the Port of Galway was the main Irish port serving trade with France and Spain (irishtourism.com).

Historical sources, such as Adomnan's Life of St. Columba, reference multiple Irish vessel types built and in use in the early medieval period including the early constructions of the currach and a long boat made from pine and oak timbers, but also vessels from other international traders such as the Gaulish barca or Nordic style boats (Wooding, 2002).

Ninth and 10th century Viking graves were discovered in coastal locations such as Arklow, Co. Wicklow, Ballyholm, Co. Down, Eyrephort, Co. Galway. From the 10th century onwards, the Hiberno-Norse developed many ports and harbours in Ireland (O'Sullivan and Breen, 2007).

While no finds of Medieval ship types such as cogs or hulks have been recovered in Irish waters, there are multiple documentary references to their usage (O'Sullivan and Breen, 2007). One of the wrecks found in Lough Corrib in Co. Galway is believed to date to the 11th-century AD, dubbed the 'Carrowmoreknock boat'. This log boat is well preserved, its sides rising almost to full height around over three quarters of the hull, while four of its five seats made from planks are still in place. Inside the boat, three battleaxes, an iron work-axe, two iron spearheads were found (Hilts, 2014).

17.3.6 Post-medieval (1550 onwards)

On 8 August 1588, the English fleet defeated the Spanish Armada at Gravelines. One hundred Armada ships out of the 130 that had left Spain withdrew northwards, still reasonable intact as it sailed between Orkney and Fair Isle with a hope of returning safely to Spain (Douglas, 2009). Sailing directions were drawn up for the return voyage but were not adhered to due to numerous factors including weather (Green, 1906). Out in the Atlantic, the stress of heavy weather took its toll. Somme ships had been so badly damaged by the battle that they could not keep pace. From the 21 August, the main body of the Ardana diminished and small groups broke away as they attempted to stay together (Douglas, 2009). Twenty-four ships were wrecked on the west coast or Ireland, while others reached safe anchorages on that coast, and were among those that returned to Spain (Green, 1906). Concepción de Juanes del

Cano is known to have been wrecked off Galway (elpais.com, 2014) but is not believed to be within the marine archaeology study area.

Smuggling was popular from Galway in the 1730s. The smuggling involved wool, which was being shipped from Roundstone Bay, at that time a very open anchorage situated to the north of the entrance to Galway Bay. The smugglers had the added incentive of a return cargo, normally tea, brandy, and wine. James Brown, a major smuggler, used a substantial ship of 150 tons, the "*Livorne Galare*" of Rhode Island (https://lugnad.ie/smuggling/ accessed November 2023).

Temple Benan on Inis Mór was concentrated on dry stone structures close to the church. The earliest finds these produced were of 17th century date. A few sherds of medieval pottery were found close to the church indicating links with the mainland (https://excavations.ie/report/1985/Galway/0000596/ accessed November 2023).

By the mid-nineteenth century, there were two Irish transatlantic steamship companies in existence, both of which operated out of Galway. The British & Irish Transatlantic Steam Packet company has a short life while the other, the Atlantic Steam Navigation Company also known as the Great Ocean Steam Ship Company which later became the Atlantic Royal Mail Steam Navigation Company (the Galway Line). The Galway Line employed 16 steamers which made a total of 55 return voyages across the Atlantic between 1858 and 1864 (Collins, 1994).

17.3.6.1 Church Sites

One of the earliest monasteries in Ireland was established on Inis Mór of the Aran Islands in the 5th century by St Enda. A native of the east coast of Ireland Enda was granted land on Inis Mór where he established his monastery at Cill Éinne (GA119-020003). The largest monastic island with an area of 31 km^2 is Inis Mór. The remains of an early 8th century church known as Teaghlach Éinne (Enda's Household) can be seen in the graveyard at Cill Éinne (aranislands.ie b).

The 6th century St MacDara's Island Monastery (GA076-0200017-) is of major significance to the local community. St. MacDara is said to be the patron saint of fishermen and sailors, and his feast day (Lá Fhéile Mhic Dara) is celebrated on July 16th every year. According to tradition, a boat race and a pilgrimage are held on this day, and hundreds of people gather on the island to attend mass at the ancient church and to bless the boats (visitgalway.ie a). The St. MacDara's Island Monastery is a small rectangular church that is made of large granite rocks and has an unusually steep roof. It measures about 4.8 by 3.6 meters and has a single doorway on the east side and a small window on the west side. The church is believed to have been built in the 10th or 11th century, but it may have replaced an earlier wooden structure that was founded by St. MacDara in the 6th century (visitgalway.ie a).

There are a number of other notable churches within the area that are of local importance. Mac Dara's Island Monastery and St Endas Monastery at Cill Éinne has already been listed above. Others of note are listed below:

Table 17-6 Notable Church Sites

Site 7	Site Code	Townland	Description	Distance from the OAA (km)
Croaghnakeela Chruch (Cruach na Caoile)	GA076-0050017-	Cruch na Caoile	› Nearest Church site after Dún Aonghasa › Completely Ruin Site › Not regularly visited	3.494

Moyrus Medieval Chruch	GA063-015003	Dooyeher	• Elevated Location • Continues to be used as an active burial ground	7.730
Maumeen Chapel (Máméan)		Derryvealawauma	• It is an activity visited site • It is a pilgrimage spot at a pass through the Maumturk mountains of east Connemara, with pilgrimages occurring three times a year • The church is located at elevations of 800ft	12.373
Inishnee Medieval Church	GA050-011001	Inis Ní Island	• Elevated Viewpoint	12.753
The Seven Churches (Na Seacht dTeampaill)	GA110-010003	Sruthán	• It is an activity visited site	14.787
Trawbaun Medieval Church (An Trá Bhán)	GA090-019—	An Trá Bhán	• Still an active graveyard	17.199

17.3.6.2 Holy Wells

Saint Caillin's Holy Well (Tobar Naomh Cailins) (GA048-0120017-) is located in the townland of Keeraunmore in Ballyconneely. The well is located on a rocky hillslope, overlooking seashore to south, located approximately 17.83km from the nearest turbine. The well is associated with St. Caillin, a local saint and, similar to St. MacDara, has had a long affinity with seafarers. Surrounding the well is a number of penitential stations, one of which is known as Saint Caillin's Holy Bed. The well has been a popular place of pilgrimage for centuries. On 13th November every year on his feast or 'pattern day' a pilgrimage occurs from the main road car park to the holy well site. This well is visited regularly and is of local importance.

Another holy well that should be considered as locally important is Saint Annas Holy Well (GA090-024), located in the townland of Teeranea, Gorumna Island, on Loch Tan, approximately 17km from the closest turbine. The well is associated with Saint Anna and a pilgrimage is held yearly on 26th July. This well is visited regularly and is of local importance.

Other notable holy wells would be Golam Head (Gólam) GA089-014—located in the townland of Golam, as well as the Dinish Holy Well (Daighinis) GA089-007—located in the townland of Furnace, both located approximately 10km from the closest turbine.

17.3.6.3 Fort Sites

Dún Aonghasa fort is a fort on the cliffs on the edge of Inis Mor in the Aran Islands. It was constructed in the Bronze Age, more than 3,500 years ago and made up of a series of stone enclosures covering more than 5.5 hectares and encompassed by a final outer stone ring that would have been used to protect the livestock (Quinn, 2017). The innermost wall is 5 meters thick and originally it would have been as high as 6 meters and taken more than 6,600 tonnes of stone to build (Quinn, 2017). At the edge of the cliff and in the centre of the inner enclosure, there was a rock platform on which it is thought inhabitants of the fort performed ancient rituals (Quinn, 2017). Archaeological evidence suggests that the fort was inhabited as long as 1500-1000BC, but activity here reached peak in about 800BC (Quinn, 2017).

In addition to Dún Aonghasa on Inis Mór, there are other forts in the region of the Offshore Site that are notable and visited regularly, highlighting their local importance. These include Dún Eochla (GA110-138002-), located on Inis Mór, approximately 20km from the Offshore Site.

17.3.6.4 Graveyard Sites

The main graveyard sites in the area that are of local importance are detailed below and would be regularly visited as are still active and in use for burials.

- Bauntragh Cemetry (GA0917-0010017-) located approximately 25km from the Offshore Site. This site dates back to 6000BC.
- Mweenish Graveyard (GA076-014-), located approximately 6.08km from the Offshore Site.

17.3.7 Wrecks, aviation, and documented losses

Multiple datasets were used in the compilation of the baseline assessment.

There are over 18,000 known and potential wreck sites in Irish waters listed in the WIID, however not all of them have been located due to incomplete records from earlier periods. The Aran Islands show 34 records while the wider county of Galway has over 300. Because of the known use of this area prior to official records being kept there is potential for earlier, undocumented wrecks to have occurred in this area.

17.3.8 Known Wrecks

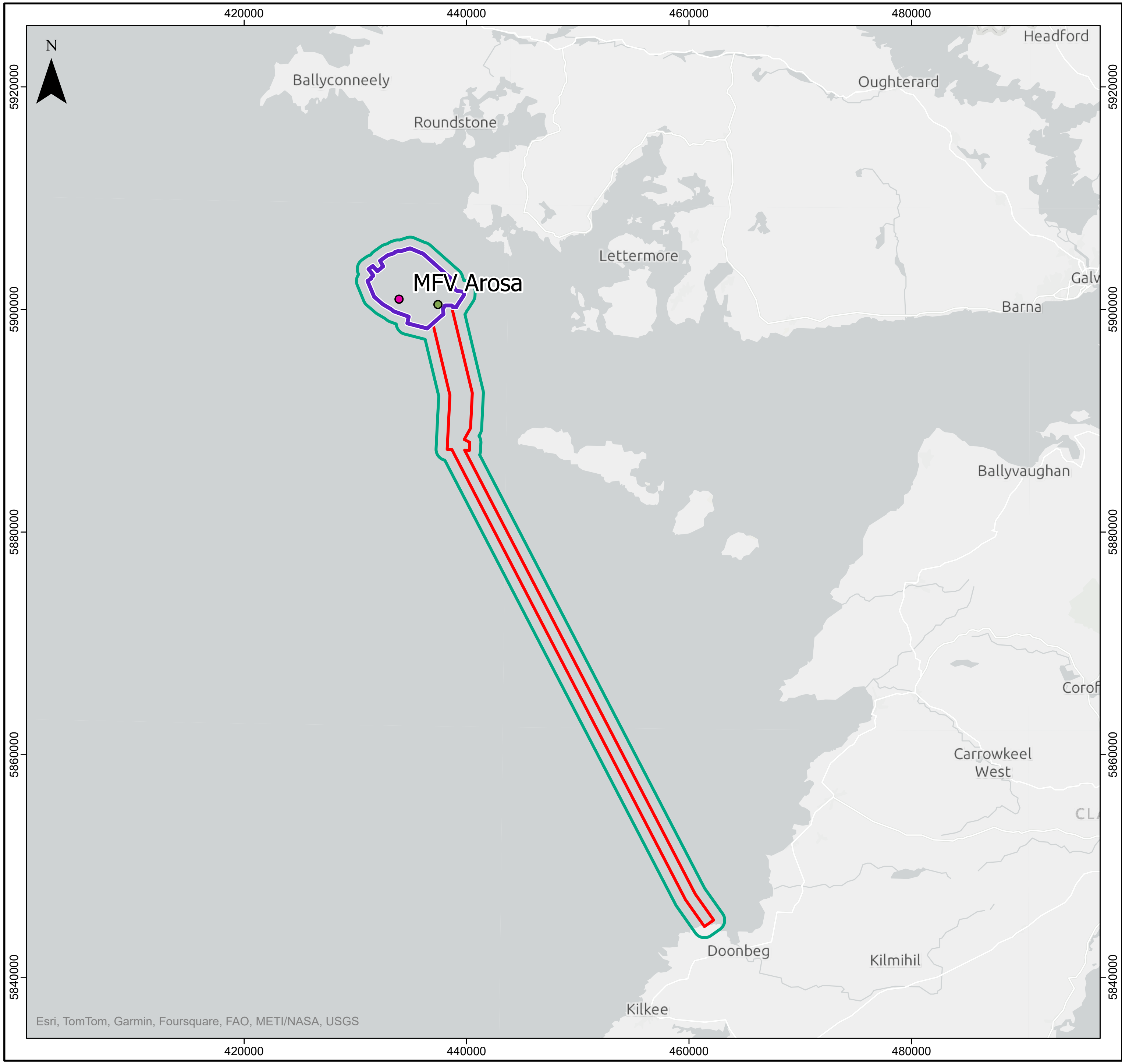
There is one known wreck within the Marine Archaeology Study Area (Figure 17-4). The wreck is that of MFV *Arosa*; (UKHO 58858/WIID W09419) wrecked on 3 October 2000, off Doonguddle rock. *Arosa* was a side trawler of typical Spanish design, built in 1974 in which fishing gear was operated over the starboard side. On 2 October 2000, *Arosa* was fishing off the coast of Ireland, when the vessel ceased fishing and travelled to seek shelter in Galway Bay due to a change in the weather. At the end of the working day, one crew member stayed in the wheelhouse in charge of navigational watch. During the night, *Arosa* struck rocks and became grounded in bad weather conditions. 12 of the 13-crew died in the wrecking and only six bodies have been recovered.

The geophysical survey did not record features at the charted location of *Arosa*'s loss. According to the ADCO, it appears that the charted location in the HSI is incorrect, and that the actual location is 410 m to the west, as reported in the Marine Accident Report (Marine Accident Investigation Branch, 2001), and outside the surveyed area (ADCO, 2023). The location used in this assessment is that of the one presented in the Marine Accident Report (Marine Accident Investigation Branch, 2001).

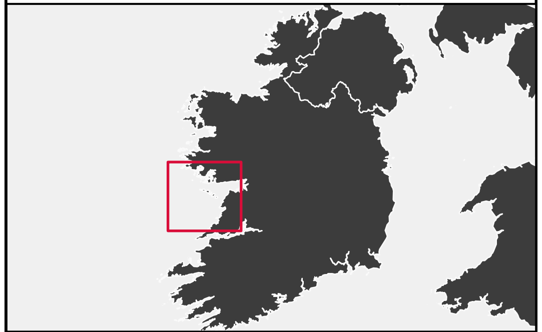
The age of *Arosa* would mean that the vessel would not usually be required to have an Archaeological Exclusion Zone (AEZ) as it would be considered of low archaeological potential; however, the circumstances of the loss of crew means a 100 m AEZ is to be put in place in the event that human remains are within the wreck or in the immediate vicinity.

Human remains are subject to legal requirements under the *Coroners Act* 1962 and should be treated with due decency and respect. In the case of accidental discovery of human remains, it is a legal obligation (Coroner's Act 1962; National Monument Acts 1930- 1994) to notify An Garda Síochána.

Although there is no evidence within the Marine Archaeology Study Area, locally there is knowledge of a shipwreck event occurring in 1832 on the Sceirde Rocks. The Rival Ship was sailing from Greenock in Scotland, to Portugal, and was wrecked on Sceirde Rocks. It was one of the largest losses of life in Irish waters.



SCEIRDE ROCKS WINDFARM
Feirm Ghaoithe Charraigeacha Sceirde



LEGEND

- Offshore Array Area
- Offshore Export Cable Corridor
- Study Area
- Offshore Substation (OSS)
- MFV Arosa

0 3 6 nm

0 6 12 km

Data Source: Contains public sector information, licensed under the Creative Commons licence v4.0; the Open Government Licence v3.0.

PROJECT TITLE
Sceirde Rocks

MAP TITLE
Known Wrecks

VER	REMARKS	DATE	Drawn	Approved
1	DRAFT	06/11/2024	LR	CH

DRAWING NO
Figure 17-4

SCALE	PAPER SIZE	DATUM	PROJECTION
1:500,000	A4	WGS 84	UTM 29N

17.3.9 Unknown Wrecks

No unknown wrecks were found within the Marine Archaeology Study Area.

17.3.10 Unchartered Wrecks

No unchartered wrecks were found within the Marine Archaeology Study Area.

17.3.11 Aviation Archaeology

No aviation remains have been found within the Marine Archaeology Study Area, however historical records confirm that this area has been an active flight path. Research shows that records of at least two aircraft have been lost in Galway Bay; one being an Armstrong Whitworth Whitley in 1941 with the loss of three crew (https://ww2irishaviation.com/p5045.htm https://discovery.nationalarchives.gov.uk/details/r/C16689514 accessed November 2023) and the other was Transocean Air lines Douglas DC-4 in 1949 with the loss of nine passengers (https://lugnad.ie/skymaster/ accessed November 2023).

17.3.12 Submerged Landscapes

The changes in relative sea level (RSL) differ spatially across Ireland, with isostatic response greatest in the northeast. This had led to raised beaches above the present-day sea level in Antrim and Down, and drowned landscapes along the south coast (ADCO, 2023). The process, while continuous, fluctuated, resulting in changes that are not so much incremental as they are episodic. The EMODnet Geology project has collated sources that allow for the mapping of coastline change and discovered that, for the most part it would appear that the Irish coastline has not deviated by more than about 30 km from its contemporary location throughout the past 20,000 years (providing that erosion has not significantly altered the position of cliff-lines at a large scale) (Brook et al., 2012).

Three predicted palaeocoastlines have been recorded that would have existed as Ireland was being occupied by people in early prehistoric times, and, therefore, present the possibility that physical remains of the earliest inhabitants may survive in areas associated with ancient shorelines. The first of these relates to c. 10,000 years BP, when the shoreline is considered to have been 11 km west of the present-day shoreline, corresponding broadly with the -20 m CD contour. In this context, the Sceirde Rocks would have been dry land and presenting an indented shoreline populated with many fissures that follow the bedrock's ridges and troughs. In contrast, because of the much deeper depths closer inshore, the same shoreline in the southern part of the Project area lay approximately 1.5 km offshore of the current shoreline at Killard, Co. Clare. While Britain had human activity much earlier during the Palaeolithic period (0.78–0.99 million years ago), it was not until after 10,000 BP that full settlement of Ireland is considered to have occurred (ADCO, 2023).

By c. 8,000 BP, the coastline close to the array area lay 5 km west of the present-day shore offshore, while it appears to have reached with 1.5 km of the shoreline by c. 6,000 BP, at the start of the Neolithic period (ADCO, 2023). Peat deposits retaining pine stumps located in the present-day intertidal foreshore off Galway have been dated to c. 3000 BC, suggesting that RSL in this part of the Atlantic coast was probably 2-4 m lower than at present, and that the present-day coastline may have been established in the historic period at c. 500 AD, or the Early Medieval period (O'Connell and Molloy, 2017).

There are no known submerged sites within the Project area. The absence of such sites, however, indicates the absence of archaeological research rather than the known absence of evidence. Consequently, the acquisition of new data associated with the current Project offers the opportunity for fresh insight. Seismic data acquired as part of marine geophysical survey may yield some insight, but borehole data derived from geotechnical investigations presents better opportunities to identify strata indicative of submerged landscapes, such as peat layers in the shallower depths. Intertidal archaeological survey also presents the opportunity to record exposed strata where they exist (ADCO, 2023).

17.3.13 Assessment of Geophysical Data

The ADCO was appointed by Gavin and Doherty Geosolutions (GDG) for the Applicant to carry out an archaeological review of marine geophysical survey data acquired in 2022, 2023 and 2024 for the Sceirde Rocks Offshore Wind Farm, under archaeological consent 22R0105, 23R0366ext and 23D0088ext (ADCO, 2023) (ADCO, 2024).

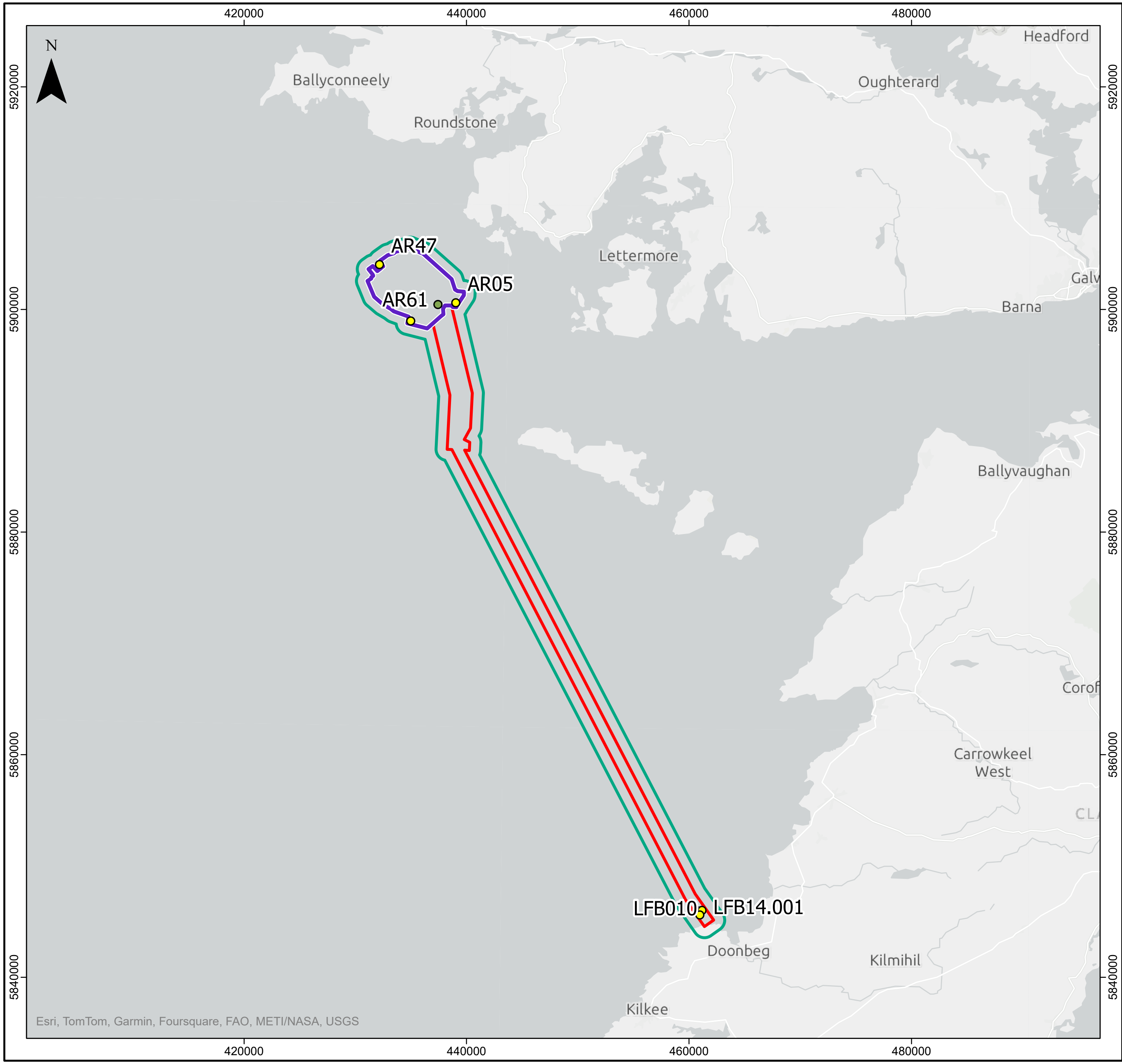
The assessment concluded that a series of contact features was recorded throughout the survey area, the majority of the features appear to be boulders, and while there are some debris items there are no clear signs of *in situ* wreckage on the seabed. The location of W09419 as charted by the HSI appears to be incorrect, and the correct location of the MFV *Arosa* lies on the exposed shoreline of Sceirde Rocks outside the surveyed area but within the OAA (ADCO, 2023).

Six magnetometer contacts were identified from the 2024 geophysical survey (Table 17-7), and it was recommended by ADCO that each contact will have a 50 m AEZ (Figure 17-6) and be avoided (ADCO, 2024). There are as follows:

Table 17-7 Magnetometer contacts identified from the 2024 geophysical survey

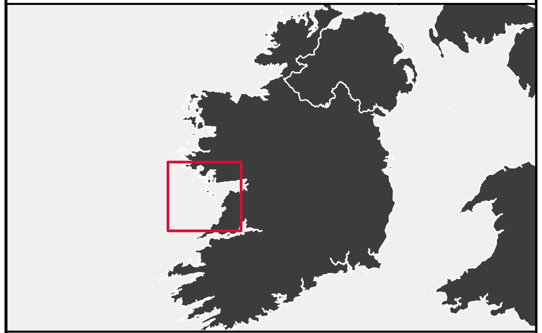
Survey line Reference	DD Latitude	DD Longitude	UTM29N E	UTM29N N	AEZ (m)
AR47	53.28125	-10.01732	432172E	5904040N	50 m
AR05	53.25120	-9.91380	439031E	5900604N	50 m
AR61	53.23603	-9.97416	434981E	5898970N	50 m
LFB14.001	52.76198	-9.57968	460884E	5845950N	50 m
LFB23	52.7625	-9.57556	461162E	5846006N	50 m
LFB010	52.75880	-9.57842	460966E	5845596N	50 m

The 2022 survey was able to reach within 600 m of the shoreline approaching the Landfall area at the southern part of the OECC. This potential gap in coverage was covered during the 2023 survey that was able to reach within 100 m of the shoreline (ADCO, 2024). Future geotechnical campaigns will include archaeological steering in their methodology and sediment samples collected specifically for archaeological assessment. Further details are included in the AMP (Appendix 17-1).



SCEIRDE ROCKS WINDFARM

Feirm Ghaoithe Charraigeacha Sceirde



LEGEND

- Offshore Array Area
- Offshore Export Cable Corridor
- Offshore Substation (OSS)
- Geophysical Anomalies

0 3 6 nm

0 6 12 km

Data Source: Contains public sector information, licensed under the Creative Commons licence v4.0; the Open Government Licence v3.0.

PROJECT TITLE

Sceirde Rocks

MAP TITLE

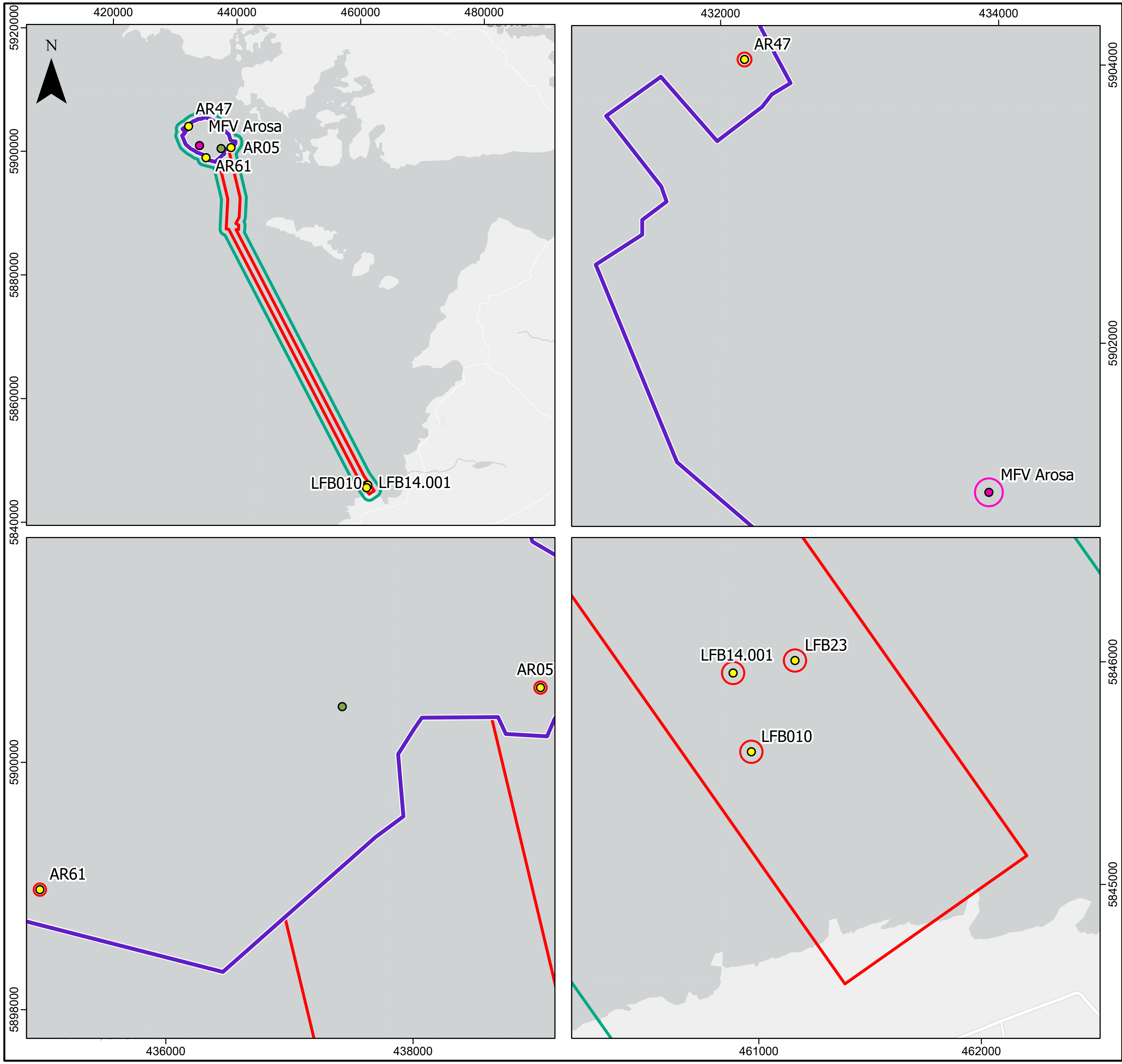
Geophysical Anomalies

VER	REMARKS	DATE	Drawn	Approved
1	DRAFT	06/11/2024	LR	CH

DRAWING NO

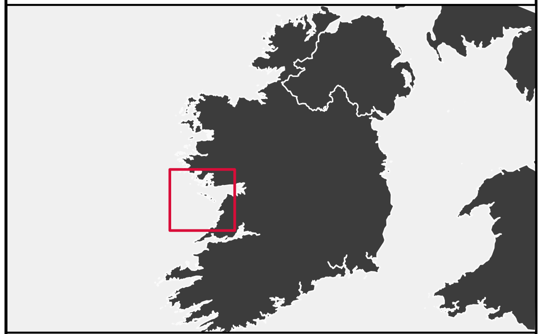
Figure 17-5

SCALE	PAPER SIZE	DATUM	PROJECTION
1:500,000	A4	WGS 84	UTM 29N



SCEIRDE ROCKS WINDFARM

Feirm Ghaoithe Charraigeacha Sceirde



LEGEND

- Offshore Array Area
- Offshore Export Cable Corridor
- Study Area
- Offshore Substation (OSS)
- MFV Arosa
- MFV Arosa AEZ
- Geophysical Anomalies
- Geophysical Anomalies AEZs

0 5.5 11 nm

0 10 20 km

Data Source: Contains public sector information, licensed under the Creative Commons licence v4.0; the Open Government Licence v3.0.

PROJECT TITLE

Sceirde Rocks

MAP TITLE

Recommended Archaeological Exclusion Zones

VER	REMARKS	DATE	Drawn	Approved
1	DRAFT	06/11/2024	LR	CH

DRAWING NO

Figure 17-6

SCALE	PAPER SIZE	DATUM	PROJECTION
1:900,000	A4	WGS 84	UTM 29N

17.3.14 Assessment of Geotechnical Data

The 2023 vibrocore results showed that the stratigraphy recorded consistently revealed covering sand over stiffer sand, with a mixture of sand, cobble and shell at depth, and occasionally silt. There was no record of charcoal or wood/organic remains that may indicate the presence of either cultural layers or submerged landscape elements (ADCO, 2024).

The 2024 borehole results showed that the observations confirmed those of previous GI campaigns, reporting a stratigraphy of covering sand of various thickness over silty clay over bedrock, where bedrock was not already fully exposed on the seabed. The observations at HDD001 encountered seabed at -29 m and reached the target depth of – 48 m. Covering sand extended 3 m in depth and overlay cobble that extends to 8.9 m in depth and sits directly on shale rock, which extends beyond the target depth. There was no record of anthropogenic indicators in the GI logs, such as charcoal, wood/organic or metal remains that may indicate the presence of either cultural layers or submerged landscape elements.

17.4 Receptor Evaluation

The assessment criteria for marine archaeology receptors are consistent with the EIA methodology presented in the EIA Methodology chapter. The criteria for determining the sensitivity of the receiving environment and the identified impacts on the receptors are defined in Table 17-8 and Table 17-9 respectively. For the determination of significance in EIAR terms, the matrix in Table 17-10 has been used which shows how the combined magnitude of impact and the sensitivity of the marine archaeology receptors determines the assessment of significance of effect.

Impacts to marine archaeology receptors can include direct and indirect impacts. Direct impact to archaeological deposits and material (such as wrecks, aircraft, and submerged landscapes) includes disturbance or destruction of these marine archaeology receptors, through physical, chemical, or biological processes.

Indirect impact includes disturbance or destruction of relationships between deposits and material and their wider surroundings and may occur as a result of changes to the prevailing hydrographic regime. The effect of changes to physical processes may also include additional protection to marine archaeology receptors in terms of additional sediment cover or increased deterioration of marine archaeology receptors as a result of additional scour.

17.4.1 Sensitivity of Receptor Criteria

The sensitivity of a receptor is a function of its capacity to accommodate change and reflects its ability to recover if affected. Sensitivity is quantified via a consideration of its context (the receptor's adaptability, tolerance, and recoverability) and value. Table 17-8 sets out the criteria used in defining the sensitivity of the marine archaeology receptors with definitions being based on professional judgement and experience. Four defined levels of sensitivity have been determined (High, Medium, Low or Negligible). Where a receptor could reasonably be assigned more than one level of sensitivity, professional judgement has been used to determine which level is applicable.

Table 17-8 Criteria for establishing the level of marine archaeological receptor sensitivity

Receptor sensitivity	Definition
High	Adaptability: The receptor cannot adapt to an impact and will be substantially or irreversibly changed. Tolerance: The receptor has no or a very low capacity to accommodate the proposed form of change.

	Recoverability: The effect on the receptor is anticipated to be permanent (i.e., over 60 years) and recovery is not anticipated. Value: Unique with regards to period, rarity, level of documentation, group value, condition, vulnerability, diversity, and / or archaeological significance.
Medium	Adaptability: The receptor has a limited capacity to adapt to an impact and may be substantially or irreversibly changed. Tolerance: The receptor has a very low to low capacity to accommodate the proposed form of change. Recoverability: The effect on the receptor is anticipated to be permanent (i.e., over 60 years) and recovery is not anticipated. Value: Regionally rare with regards to period, rarity, level of documentation, group value, condition, vulnerability, diversity, and / or archaeological significance.
Low	Adaptability: The receptor is stable and has a reasonable capacity to sustain substantial or irreversible changes from an impact. Tolerance: Changes to the receptor are assumed to be minor and similar to natural disintegration. Recoverability: Effect on the receptor is anticipated to be permanent (i.e., over 60 years) and recovery is not anticipated. Value: Low or no recognised value with regards to period, rarity, level of documentation, group value, condition, vulnerability, diversity, and / or archaeological significance.
Negligible	Adaptability: The receptor has a high capacity to avoid or adapt to an impact. Tolerance: Changes to the receptor cannot be distinguished from natural disintegration Recoverability: Effect on the receptor is anticipated to be permanent (i.e., over 60 years) and recovery is not anticipated. Value: Very low or no recognised value with regards to period, rarity, level of documentation, group value, condition, vulnerability, diversity, and / or archaeological significance.

17.4.2 Magnitude of Impact Criteria

It is noted here that a distinction is made throughout the assessment between the magnitude, as defined by the extent, duration[1], frequency, probability[2] and consequences of the impact and the resulting significance of the 'effects' upon marine archaeology receptors. The descriptions of magnitude are specific to the assessment of marine archaeology impacts and are considered against the magnitude descriptions presented in Table 17-9. Magnitude of Impact Criteria is derived from guidance published by IEEM, 2006 and adapted on a topic basis using professional judgement and experience. Likely significant effects have been considered in terms of whether they are adverse or beneficial effects.

Where an effect could reasonably be assigned to more than one level of magnitude, professional judgement has been used to determine which level is the most appropriate for the impact. The level has been assigned based on the most appropriate potential consequences of the impact as defined for each level of magnitude (see Table 17-9). For example, an impact may occur constantly throughout the O&M period but is not discernible or measurable in practice, therefore it would be concluded to be of a negligible magnitude despite the frequency of the impact.

[1] Note: this is the duration of the impact and not the time taken for the receptor to recover.
[2] All impacts assessed within this EIAR chapter are considered reasonably likely to occur, and so the probability of the impact has not been a consideration in defining the magnitude of the impact.

For the purposes of the definitions below in table 17-9, near-field has been defined as within the OAA and OECC. Far-field has been defined as extending beyond these limits but within the Marine Archaeology Study Area.

Table 17-9 Magnitude of the Impact

Magnitude	Definition
High	**Extent**: Impact across and beyond the whole receptor. **Duration**: The impact is anticipated to be permanent (i.e., over 60 years). **Frequency**: The impact may occur once or repeatedly throughout all Project phases. **Probability**: The impact can reasonably be expected to occur. **Adverse consequences**: Substantial or irreversible change of archaeological sites, materials or context of archaeological materials or features resulting in significant alteration of archaeological sites, feature, or materials, inhibiting interpretation of characteristics, sub-features, or components. **Beneficial consequences**: Large-scale enhanced understanding of the archaeological resource inversely proportional to the scale of adverse effect, for example benefit through large area geophysical/geotechnical survey data released to public domain.
Medium	**Extent**: Moderate impact on receptor. **Duration**: The impact is anticipated to be permanent (i.e., over 60 years). **Frequency**: The impact may occur once or repeatedly throughout all Project phases. **Probability**: The impact can reasonably be expected to occur. **Adverse consequences**: Moderate changes to archaeological sites, materials or context of archaeological materials or features resulting in clear alteration, inhibiting interpretation of several key characteristics, sub-features, or components. **Beneficial consequences**: Benefit to, or addition of, key characteristics, features or elements, for example site-specific survey and investigation leading to an enhancement of disseminated knowledge; for example, diver/ROV ground-truthing of anomalies, published results.
Low	**Extent**: Minor impact on receptor. **Duration**: The impact is anticipated to be permanent (i.e., over 60 years). **Frequency**: The impact may occur once or repeatedly throughout all Project phases. **Probability**: The impact can reasonably be expected to occur. **Adverse consequences**: Minor changes to archaeological sites, material or contexts of archaeological materials or features resulting in clear alteration, inhibiting interpretation of several key characteristics, sub-features or components. **Beneficial consequences**: Minor benefit to, or addition of, one or more key characteristics, features or elements through enhanced knowledge and understanding of receptors not disseminated or made publicly available.
Negligible	**Extent**: No direct or indirect impact across or beyond the receptor is expected. **Duration**: No duration of impact. **Frequency**: Impact is not expected to occur. **Probability**: The impact is not expected to occur. **Consequences**: Changes that are indistinguishable from natural variation, do not change archaeological sites or materials, and do not affect key characteristics, sub-features, or components or their environment or context.

17.4.3 Defining the Significance of Effect

The significance of the effect on marine archaeology will be determined by correlating the sensitivity of the receptor (Table 17-8) and the magnitude of the impact (Table 17-9). Effects defined as significant, very significant and profound are considered Significant (EPA, 2022). Effects defined as moderate and slight, not significant and imperceptible are considered Not Significant. Assessment of the significance of potential effects is detailed in Table 17-10.

Table 17-10 Significance of Potential Effects

			Existing Environment - Sensitivity			
			High	**Medium**	**Low**	**Negligible**
Description of Impact - Magnitude	Negative impact	**High**	Profound or Very Significant (significant)	Significant	Moderate	Imperceptible
		Medium	Significant	Moderate	Slight	Imperceptible
		Low	Moderate	Slight	Slight	Imperceptible
	Neutral impact	**Negligible**	Not significant	Not significant	Not significant	Imperceptible
	Positive impact	**Low**	Moderate	Slight	Slight	Imperceptible
		Medium	Significant	Moderate	Slight	Imperceptible
		High	Profound or Very Significant (significant)	Significant	Moderate	Imperceptible

17.5 Likely Significant Effects and Associated Mitigation Measures

17.5.1 Mitigation by Design

Mitigation measures that were identified and adopted as part of the evolution of the Project design (embedded into the Project design) and that are relevant to marine archaeology are listed in Table 17-11 and detailed further in the AMP included as Appendix 17-1.

The mitigation commitments are based on guidance outlined in the Framework and Principles for the Protection of Archaeological Heritage (DAHG, 1999a) and the Archaeological Written Schemes of Investigation for Offshore Wind Farm Projects (The Crown Estate, 2021). Various archaeological Codes of Practice from onshore development were also consulted, including the most recent reference, Code of Practice for Archaeology agreed between the Minister for Tourism, Culture, Arts, Gaeltacht, Sports and Media and Transport Infrastructure Ireland (Transport Infrastructure Ireland, 2017).

The mitigation measures outlined in Table 17-11 have been set out to identify the archaeological potential and archaeological significance within the Offshore Site. Continued investigation through survey and the specifications for investigation and reporting set out in the Archaeology Management Plan and PAD documents, respectively, work to embed these mitigation measures for use throughout the life of the Project.

Table 17-11 Embedded mitigation relating to marine archaeology

Embedded Mitigation/Mitigation by Design measure	
All Project Phases	
Cable Routing - described in Chapter 3 - Site Selection and Consideration of Alternatives chapter	Project Design
Committed to trenchless installation methods, i.e., HDD or direct pipe	Project Design
All geophysical surveys, geotechnical surveys, archaeological dive surveys, ROV surveys, hand-held metal detection surveys and intertidal surveys will be licensed under the National Monuments Acts 1930-2014, results will be assessed and reported by a suitably qualified archaeologist.	Project Design
All marine geophysical surveys will be carried out in compliance with the UAU guidance General Requirements for Geophysical Survey for Archaeological Purposes, and the results will be assessed and reported by a suitably qualified archaeologist.	Project Design
As part of the continued survey of the development area, geoarchaeological assessments of deposits of archaeological potential, following an approved method statement will be undertaken, results will be assessed and reported by a suitably qualified archaeologist.	Project Design
Archaeological Exclusion Zones (AEZ) known wrecks and potential receptors, as identified in the archaeological assessment of baseline and geophysical data will be put in place. All activities interfering with the seabed during all Project phases must be micro sited to avoid the AEZs which may be altered, increased, reduced, or removed as more information on the receptor becomes available.	Project Design

Embedded Mitigation/Mitigation by Design measure	
All Project Phases	
General interference with wrecks over 100 years old and archaeological objects underwater is prohibited under Section 3 of the National Monuments (Amendment) Act 1987.	
Implementation and compliance with an Archaeology Management Plan document summarising the responsibilities and commitments of all parties involved in the protection of marine archaeology.	Archaeology Management Plan
The implementation and compliance with a Protocol of Archaeological Discovery (PAD) facilitating dialogue between on-site offshore development contractors, the developer, the archaeological curators, and the retained archaeologist mitigating the impact on unexpected archaeological discoveries.	Protocol of Archaeological Discovery
If any Project activities are necessary within the established AEZs, the Department for Culture Heritage and Gaeltacht (DCHG) will be informed prior to any works being undertaken as a detailed archaeological investigation may be required prior to or during such works. In such case, a full method statement detailing any planned developmental and archaeological works will be submitted to the DCHG before any works commence.	Project Design
Where relevant, and if the impact to marine archaeology receptors is anticipated during intrusive activities or if material will be moved or removed from the seabed a watching brief (undertaken by an appropriately qualified and approved archaeologist) may be required.	Project Design
Monitoring activities, may be undertaken during, and following construction, in those cases a monitoring plan will be developed, all relevant activities will be licensed under the National Monuments Acts 1930-2014 and the results will be assessed and reported by a suitably qualified archaeologist.	Monitoring plan/post construction monitoring plan
Decommissioning	
A Rehabilitation Plan (Appendix 5-18) will be submitted with application. Underwater archaeology mitigations will be reviewed and updated prior to decommissioning activities taking place.	Project Design

17.5.2 Project Design

Table 17-12 Project Design

Likely significant effect	Design	Justification
Construction Phase		
Removal of sediment containing undisturbed archaeological contexts during seabed preparation.	**WTG foundations:** Max base diameter 55 m x 30 (turbines) = 1,650 m^2. 1.5m layer of seabed prep below the base with a maximum diameter of 69.5m = 104.25 m^3 x 30 (turbines) = 3,127.5 m^3. Total dredge volume = 150,000m^3. **OSS foundations:** Max base diameter 55 m x 1 (OSS) =55 m^2. 1.5m layer of seabed prep below the base with a maximum diameter of 69.5m = 104.25 m^3. **IAC:** Width of seabed disturbed by installation per m = 20 m. Total seabed disturbed = 1.9983 km^2. **OEC:** Width of seabed disturbed by installation per m = 20 m. Total seabed disturbed = 1.1527 km^2.	This presents the largest seabed footprint and the greatest disturbed sediment volumes which could lead to direct or indirect impact on known marine archaeology receptors.
Compression of stratigraphic contexts containing archaeological material from combined weight of foundation, transition piece, tower, and WTG.	**WTG:** Quantity of rock per WTG Foundations Requiring Rock Dumping 5995 m^3 x 30 turbines =179,850 m^3. **OSS Foundation:** Quantity of rock per GBS Foundations Requiring Rock Dumping 5995 m^3 x 1 = 5995 m^3.	This presents the largest compression effects which could directly affect known and unknown marine archaeology receptors present within the Marine Archaeology Study Area.
Disturbance of sediment containing potential marine archaeology receptors (material and contexts) during the laying of inter-array	**IAC:** Width of seabed disturbed by installation per m = 20 m. Target minimum burial depth = 1.5 m. **OEC:**	This presents the greatest disturbance of sediment containing potential marine archaeology receptors during cable operations.

cables and export cable laying operations.	Width of seabed disturbed by installation per m = 20 m. Target minimum burial depth = 1.5 m.	
Penetration and compression effects of jack-up vessels and anchoring of construction vessels during WTG, OSS, or cable installation.	**WTG:** Total impact area per location 1456 m² x 30 turbines = 43,680 m² combined area of jack-up vessel legs during installation. **OSS foundations:** Jack up feet total footprint per location = 1456 m².	This presents the greatest penetration and compression effects of jack-up vessels and anchoring of construction vessels during WTG, OSS, or cable installation.
Operation and maintenance Phase		
Scour effects caused by the presence of WTG and substation foundations, causing, or accelerating loss of the receptor.	**WTG foundations:** Max base diameter 55 m x 30 (turbines) = 1,650 m². 1.5m layer of seabed prep below the base with a maximum diameter of 69.5m = 104.25 m³ x 30 (turbines) = 3,127.5 m³. Total dredge volume = 150,000m³. **OSS foundations:** Max base diameter 55 m x 1 (OSS) =55 m². 1.5m layer of seabed prep below the base with a maximum diameter of 69.5m = 104.25 m³. Scour Protection volume (m³) TBC	This presents the greatest disturbed seabed volumes which can result in scour which could lead to indirect impact on known marine archaeology receptors.
The exposure and replacement of inter-array and export cables or the use of cable protection measures (such as remedial cable burial).	**IAC** rock berm quantity footprint Type 1 = 537,285 m². **OEC** rock berm quantity footprint Type 2 = 63,731 m². Cable repair vessels - Expected to be less than 5 unscheduled interventions over life.	This presents the greatest disturbance to the seabed due to cable protection measures.
Penetration and compression effects caused by corrective and preventative operation and maintenance activities (via jack-up vessels).	Jack up feet total footprint (182 m²) x 2 annual interventions = 364 m² combined area of jack-up vessel legs during operation and maintenance.	This presents the greatest penetration and compression effects caused by corrective and preventative operation and maintenance activities (via jack-up vessels or anchors).

Decommissioning		
Draw-down of sediment into voids left by removed WTG foundations leading to loss of sediment, causing, or accelerating loss of the receptor.	All WTGs and GBS foundations to be removed; rock platforms to remain *in situ*	Effects from decommissioning are likely to be similar to the effects from construction.
Penetration and compression effects of jack-up vessels and anchoring of decommissioning vessels.	Combined area of jack-up vessel legs during decommissioning m^2.	This presents the greatest penetration and compression effects of jack-up vessels. and anchoring of decommissioning vessels.

17.5.3 Do Nothing Scenario

If the Project were not to proceed, it is expected that the marine archaeological baseline will remain as detailed above. The opportunity to aid in harnessing the wind energy resource of Ireland, and to aid in strengthening Irelands grid infrastructure would be lost, as would the opportunity to contribute to meeting Government and EU targets for the production and consumption of electricity from offshore renewable resources and the reduction of greenhouse gas emissions.

However, there is a potential to cause adverse direct impact on the marine archaeological baseline or contribute with beneficial impacts, such as large-scale enhanced understanding of the archaeological resource through geophysical and geotechnical survey data release to the public domain, or enhanced knowledge of key characteristics, features or elements, deriving from site-specific survey and investigations.

Generally exposed metal and wooden wrecks and archaeological debris on the seabed would undergo slow degradation and erosion of material. Due to the mobile sediments in the area, shifting sands would cause archaeological anomalies to cyclically become exposed and reburied.

In the case of wrecks and archaeological features that are buried and protected from exposure, the rate of degradation would be slower.

17.5.4 Construction Phase

A description of the significance of effects of the construction phase of the Offshore Site within the Marine Archaeology Study Area is provided below. The assessment considers the likely significant effects for each construction impact (Table 17-13).

17.5.4.1 Removal of sediment containing undisturbed archaeological contexts during seabed preparation

Removal of sediment during seabed preparations (including sand wave clearance) can lead to direct or indirect impact on marine archaeology receptors by impacting and exposing such material to natural, chemical, or biological processes.

Activities which may result in the removal of sediment containing archaeological contexts include jet trenching, mechanical trenching and cutting trenching design options and seabed preparation for cables, turbine foundations and OSS foundations. The volume of sediment anticipated to be removed is detailed in Chapter 5: Project Description.

This assessment should therefore be read in conjunction with the Physical Processes chapter and the Physical Processes technical baseline, which provide a full description of the offshore physical environment assessment (including Project specific modelling of sediment plume dynamics).

If any marine archaeology receptors are subject to increased sedimentation covering and protecting the receptor as a result of the construction phase, the marine heritage receptor might benefit from the conditions which could provide a higher level of preservation *in situ*.

Impacts of sediment removal on Historic Environment may lead to direct impact and total or partial loss of Historic Environment. The findings of the geophysical surveys indicate low levels of archaeological interest, however, there is always a potential for unknown archaeological material to be discovered. If a direct impact occurs, it will generally be local, major, and adverse or irreversible and result in a permanent change to the receptor meaning **high** magnitude of impact as detailed in Table

17-9. As such, the magnitude of sediment removal containing undisturbed archaeological contexts during seabed preparation ahead of construction activities, if they were to occur, would be **high adverse**.

The sensitivity (value) of the Historic Environment potentially impacted by sediment removal activities and identified within the Marine Archaeology Study Area ranges from **negligible** to **high** as defined in Table 17-8. For example, a previously unknown military aircraft crash site would have **high** sensitivity as it could relate to war or contain human remains while an anomaly confirmed through ROV or diver assessment to be modern debris would have **negligible** sensitivity as it holds no historical or archaeological value.

17.5.4.1.1 *Potential Effect*

With regards to activities associated with the construction works, any of the sources of direct impact listed above have the potential to destroy entire receptors as well as damaging a receptor or its relationship with the wider environment. Findings from initial surveys have indicate low levels of archaeological interest, however, there is always a potential for unknown archaeological material to be discovered. Once a receptor is damaged or destroyed, or its context is altered, it is not possible to reinstate lost data. Therefore, without mitigation, the effects on the archaeological receptors would be a **significant negative** effect which is Significant.

17.5.4.1.2 *Mitigation*

As per the embedded mitigation/mitigation by design outlined in Table 17-11 locations on the seabed of potential and confirmed Historic Environment receptors are informed by the archaeological assessment of geophysical and geotechnical data and AEZs will be put in place, ensuring mitigation by avoidance.

Mitigation by avoidance aims to ensure that there is no direct, indirect or permanent impact on Historic Environment within the Marine Archaeology Study Area meaning a negligible magnitude of impact as defined in Table 17-13.

Where avoidance is not possible or in case of not yet located Historic Environment further mitigation and archaeological works are detailed in the AMP.

17.5.4.1.3 *Residual Effect*

Following the application of appropriate mitigation, the magnitude would be reduced to **low** to **negligible adverse** which is not significant in EIAR terms. Due to the short-term nature of the works and with consideration given to the embedded mitigation measures/mitigation by design identified in Section 17.5.1, significant effects are not anticipated during the construction of the Offshore Site. Therefore, the residual effect is considered to be a likely, short-term, **not significant negative effect** which is Not Significant.

In some cases, the application of appropriate mitigation, such as an archaeological investigation of seabed anomalies prior to impact or the implementation of a PAD could lead to effects of **minor** to **moderate beneficial** significance, which is Not Significant. For example, discovering a wreck of interest and being able to share it with the wider public would be a **moderate beneficial** effect.

17.5.4.2 Compression of stratigraphic contexts containing archaeological material from combined weight of foundation, transition piece, tower, and WTG

Compression of stratigraphic contexts containing archaeological material from the combined weight of foundation, transition piece, tower, and WTG can lead to direct impact on marine archaeology receptors.

Activities which may result in the compression of stratigraphic contexts containing archaeological material include the installation and continued presence of turbine foundations and turbines, the OSS, and rock protection utilised in the non-buried cable design option. The area anticipated to be impacted by these activities is detailed in Chapter 5: Project Description.

Impacts of compression during installation activities on Historic Environment may lead to direct impact and total or partial loss of Historic Environment. The findings of the geophysical surveys indicate low levels of archaeological interest, however, there is always a potential for unknown archaeological material to be discovered. If a direct impact occurs from a foundation with long-term presence, will be **high adverse** as detailed in Table 17-9. Compression effects from works undertaken on archaeological receptors such as soft wooden shipwrecks would also be **high adverse.**

The sensitivity (value) of the Historic Environment potentially impacted by sediment removal activities and identified within the Marine Archaeology Study Area ranges from **negligible** to **high** as defined in Table 17-8. For example, an unknown medieval wooden shipwreck would have **high** sensitivity while an anomaly confirmed through ROV or diver assessment to be modern debris would have **negligible** sensitivity.

17.5.4.2.1 *Potential Effect*

With regards to activities associated with compression of foundations, any of the sources of direct impact listed above have the potential to destroy entire receptors as well as damaging a receptor or its relationship with the wider environment. Once a receptor is damaged or destroyed, or its context is altered, it is not possible to reinstate lost data. Therefore, without mitigation, the effects on the archaeological receptors would be a **significant negative** effect which is Significant.

17.5.4.2.2 *Mitigation*

As per the embedded mitigation/mitigation by design outlined in Table 17-11 locations on the seabed of potential and confirmed Historic Environment receptors are informed by the archaeological assessment of geophysical and geotechnical data and AEZs will be put in place, ensuring mitigation by avoidance.

Mitigation by avoidance aims to ensure that there is no direct, indirect or permanent impact on Historic Environment within the Marine Archaeology Study Area meaning a negligible magnitude of impact as defined in Table 17-13.

17.5.4.2.3 *Residual Effect*

Where avoidance is not possible or in case of not yet located Historic Environment further mitigation and archaeological works are detailed in the AMP. Following the application of appropriate mitigation, the magnitude would be reduced to **low** to **negligible adverse** which is not significant in EIAR terms. Due to the short-term nature of the works and with consideration given to the embedded mitigation measures/mitigation by design identified in Section 17.5.1, significant effects are not anticipated during the construction of the Offshore Site. Therefore, the residual effect is considered to be a likely, short-term, **not significant negative effect** which is Not Significant.

In some cases, the application of appropriate mitigation, such as an archaeological investigation of seabed anomalies prior to impact or the implementation of a PAD could lead to effects of **minor** to **moderate beneficial** significance, which is Not Significant. For example, discovering a wreck of interest and being able to share it with the wider public would be a **moderate beneficial** effect.

17.5.4.3 Disturbance of sediment containing potential marine archaeology receptors (material and contexts) during the laying of inter-array cables and offshore export cable laying operations

Disturbance of sediment containing potential marine archaeology receptors (material and contexts) during the laying of inter-array cables and export cable laying operations can lead to direct or indirect impact on marine archaeology receptors by impacting and exposing such material to natural, chemical, or biological processes.

Activities which may result in the disturbance of sediment containing archaeological receptors include cable laying activities within the OECC and array area through trenching and reburial design options. The volume of sediment anticipated to be disturbed is detailed in Chapter 5: Project Description.

This assessment should therefore be read in conjunction with the Physical Process Chapter and the Physical Processes Technical Baseline which provide a full description of the offshore physical environment assessment (including Project specific modelling of sediment plume dynamics).

If any marine archaeology receptors are subject to increased sedimentation covering and protecting the receptor as a result of the construction phase, the marine heritage receptor might benefit from the conditions which could provide a higher level of preservation *in situ*.

Impacts of disturbance of sediment containing potential marine archaeology receptors on Historic Environment may lead to direct impact and total or partial loss of Historic Environment. The findings of the geophysical surveys indicate low levels of archaeological interest, however, there is always a potential for unknown archaeological material to be discovered. If a direct impact occurs, it will generally be local, major, and adverse or irreversible and result in a permanent change to the receptor meaning **high** magnitude of impact as detailed in Table 17-9. As such, the magnitude of sediment removal containing undisturbed archaeological contexts during seabed preparation ahead of construction activities, if they were to occur, would be **high adverse**.

The sensitivity (value) of the Historic Environment potentially impacted by sediment removal activities and identified within the Marine Archaeology Study Area ranges from **negligible** to **high** as defined in Table 17-8. For example, an unknown medieval wooden shipwreck would have **high** sensitivity while an anomaly confirmed through ROV or diver assessment to be modern debris would have **negligible** sensitivity.

17.5.4.3.1 *Potential Effect*

With regards to activities associated with disturbance of sediment containing potential marine archaeology receptors, any of the sources of direct impact listed above have the potential to destroy entire receptors as well as damaging a receptor or its relationship with the wider environment. Once a receptor is damaged or destroyed, or its context is altered, it is not possible to reinstate lost data. Therefore, without mitigation, the effects on the archaeological receptors would be a **significant negative** effect which is Significant.

17.5.4.3.2 *Mitigation*

As per the embedded mitigation/mitigation by design outlined in Table 17-11 locations on the seabed of potential and confirmed Historic Environment receptors are informed by the archaeological assessment of geophysical and geotechnical data and AEZs will be put in place, ensuring mitigation by avoidance.

Mitigation by avoidance aims to ensure that there is no direct, indirect or permanent impact on Historic Environment within the Marine Archaeology Study Area meaning a negligible magnitude of impact as defined in Table 17-9.

17.5.4.3.3 *Residual Effect*

Where avoidance is not possible or in case of not yet located Historic Environment further mitigation and archaeological works are detailed in the AMP. Following the application of appropriate mitigation, the magnitude would be reduced to **low** to **negligible adverse** which is not significant in EIAR terms. Due to the short-term nature of the works and with consideration given to the embedded mitigation measures/mitigation by design identified in Section 17.5.1, significant effects are not anticipated during the construction of the Offshore Site. Therefore, the residual effect is considered to be a likely, short-term, **not significant negative effect** which is Not Significant.

In some cases, the application of appropriate mitigation, such as an archaeological investigation of seabed anomalies prior to impact or the implementation of a PAD could lead to effects of **minor** to **moderate beneficial** significance, which is Not Significant. For example, discovering a wreck of interest and being able to share it with the wider public would be a **moderate beneficial** effect.

17.5.4.4 Penetration and compression effects of jack-up vessels and anchoring of construction vessels during WTG, OSS, or cable installation

Penetration and compression effects of jack-up vessels and anchoring of construction vessels during WTG, OSS, or cable installation can lead to direct impact on marine archaeology receptors.

Activities which may result in penetration and compression effects leading to impact on archaeological receptors include anchoring of jack-up and construction vessels. The volume of sediment anticipated to be impacted is detailed in the Chapter 5 of this EIAR.

Penetration and compression effects as a result of vessel operations on Historic Environment may lead to direct impact and total or partial loss of Historic Environment. If a direct impact occurs, it will generally be local, major, and adverse or irreversible and result in a permanent change to the receptor meaning **high adverse** impact of magnitude as detailed in Table 17-13.

The sensitivity (value) of the Historic Environment potentially impacted as a result of vessel operations within the Marine Archaeology Study Area ranges from **negligible** to **high** as defined in Table 17-8. For example, an unknown medieval wooden shipwreck would have **high** sensitivity while an anomaly confirmed through ROV or diver assessment to be modern debris would have **negligible** sensitivity.

17.5.4.4.1 *Potential Effect*

Without mitigation, the effects on the **high** sensitivity archaeological receptors would be a **significant negative** effect which is Significant.

17.5.4.4.2 *Mitigation*

As per the embedded mitigation/mitigation by design outlined in Table 17-11 locations on the seabed of potential and confirmed Historic Environment receptors are informed by the archaeological assessment of geophysical and geotechnical data and AEZs will be put in place, ensuring mitigation by avoidance.

Mitigation by avoidance aims to ensure that there is no direct, indirect or permanent impact on Historic Environment within the Marine Archaeology Study Area meaning a negligible magnitude of impact as defined in Table 17-9.

17.5.4.4.3 *Residual Effect*

Where avoidance is not possible or in case of not yet located Historic Environment further mitigation and archaeological works are detailed in the AMP. Following the application of appropriate mitigation, the magnitude would be reduced to **low** to **negligible adverse** which is not significant in EIAR terms. Due to the short-term nature of the works and with consideration given to the embedded mitigation measures/mitigation by design identified in Section 17.5.1, significant effects are not anticipated during the construction of the Offshore Site. Therefore, the residual effect is considered to be a likely, short-term, **not significant negative effect** which is Not Significant.

In some cases, the application of appropriate mitigation, such as an archaeological investigation of seabed anomalies prior to impact or the implementation of a PAD could lead to effects of **minor** to **moderate beneficial** significance, which is Not Significant. For example, discovering a wreck of interest and being able to share it with the wider public would be a **moderate beneficial** effect.

17.5.5 Operation and Maintenance Phase

17.5.5.1 Scour effects caused by the presence of WTG and substation foundations, causing, or accelerating loss of the receptor

Scour effects, the removal of sediment around a foundation due to tidal movement, caused by the presence of WTG and substation foundations, can lead to direct or indirect impact on marine archaeology receptors by impacting and exposing such material to natural, chemical, or biological processes.

Activities which may result in impacts caused by scour effects include the presence of WTG and OSS foundations. The volume of sediment anticipated to be impacted is detailed in Chapter 5: Project Description.

This assessment should therefore be read in conjunction with the Physical Process Chapter and the Physical Processes Technical Baseline which provide a full description of the offshore physical environment assessment (including Project specific modelling of sediment plume dynamics).

If any marine archaeology receptors are subject to increased sedimentation which covers and protects the receptor as a result of the operation and maintenance phase, the marine archaeology receptors might benefit from the conditions which could provide a higher level of preservation *in situ*.

Magnitude of indirect impact on Historic Environment of sediment disturbance as a result of scour may lead to exposure of those Historic Environment to natural, chemical or biological processes and indirectly cause or accelerate their loss. If an indirect impact occurs, it will generally be local, major, and adverse or irreversible and result in a permanent change to the receptor meaning **high adverse** magnitude of impact as detailed in Table 17-9.

The sensitivity (value) of the Historic Environment potentially impacted as a result of scour within the Marine Archaeology Study Area ranges from **negligible** to **high** as defined in Table 17-8. For example, an unknown medieval wooden shipwreck would have **high** sensitivity while an anomaly confirmed through ROV or diver assessment to be modern debris would have **negligible** sensitivity.

17.5.5.1.1 *Potential Effect*

Without mitigation, the effects on the **high** sensitivity archaeological receptors would be a **significant negative** effect which is Significant.

17.5.5.1.2 *Mitigation*

As per the embedded mitigation/mitigation by design outlined in Table 17-11 locations on the seabed of potential and confirmed Historic Environment receptors are informed by the archaeological assessment of geophysical and geotechnical data and AEZs will be put in place, ensuring mitigation by avoidance.

Mitigation by avoidance aims to ensure that there is no direct, indirect or permanent impact on Historic Environment within the Marine Archaeology Study Area meaning a negligible magnitude of impact as defined in Table 17-9.

17.5.5.1.3 *Residual Effect*

Where avoidance is not possible or in case of not yet located Historic Environment further mitigation and archaeological works are detailed in the AMP in Appendix 17-1. Following the application of appropriate mitigation, the magnitude would be reduced to **low** to **negligible adverse** which is not significant in EIAR terms. Due to the short-term nature of the works and with consideration given to the embedded mitigation measures/mitigation by design identified in Section 17.5.1, significant effects are not anticipated during the construction of the Offshore Site. Therefore, the residual effect is considered to be a likely, short-term, **not significant negative effect** which is Not Significant.

In some cases, the application of appropriate mitigation, such as an archaeological investigation of seabed anomalies prior to impact or the implementation of a PAD could lead to effects of **minor** to **moderate beneficial** significance, which is Not Significant. For example, discovering a wreck of interest and being able to share it with the wider public would be a **moderate beneficial** effect.

17.5.5.2 Exposure and replacement of inter-array and offshore export cable activities or the use of cable protection measures (such as remedial cable burial)

Replacement of inter-array and export cable activities or the use of cable protection measures can lead to indirect or direct impact on marine archaeology receptors.

Activities which may result in the removal of sediment containing archaeological contexts include trenching and seabed preparation for cables, turbine foundations and OSS foundations. The volume of sediment anticipated to be removed is detailed in Chapter 5: Project Description.

Magnitude of indirect impact on Historic Environment of sediment disturbance as a result of exposure and replacement of cables may lead to direct impact and total or partial loss of Historic Environment. If an indirect impact occurs, it will generally be local, major, and adverse or irreversible and result in a permanent change to the receptor meaning **high adverse** magnitude of impact as detailed in Table 17-13.

The sensitivity (value) of the Historic Environment potentially impacted as a result of exposure and replacement of cables in the Marine Archaeology Study Area ranges from **negligible** to **high** as defined in Table 17-8. For example, an unknown medieval wooden shipwreck would have **high** sensitivity while an anomaly confirmed through ROV or diver assessment to be modern debris would have **negligible** sensitivity.

17.5.5.2.1 *Potential Effect*

Without mitigation, the effects on the **high** sensitivity archaeological receptors would be a **significant negative effect** which is Significant.

17.5.5.2.2 *Mitigation*

As per the embedded mitigation/mitigation by design outlined in Table 17-11 locations on the seabed of potential and confirmed Historic Environment receptors are informed by the archaeological assessment of geophysical and geotechnical data and AEZs will be put in place, ensuring mitigation by avoidance.

Mitigation by avoidance aims to ensure that there is no direct, indirect or permanent impact on Historic Environment within the Marine Archaeology Study Area meaning a negligible magnitude of impact as defined in Table 17-9.

17.5.5.2.3 *Residual Effect*

Where avoidance is not possible or in case of not yet located Historic Environment further mitigation and archaeological works are detailed in the AMP. Following the application of appropriate mitigation, the magnitude would be reduced to **low** to **negligible adverse** which is not significant in EIAR terms. Due to the short-term nature of the works and with consideration given to the embedded mitigation measures/mitigation by design identified in Section 17.5.1, significant effects are not anticipated during the construction of the Offshore Site. Therefore, the residual effect is considered to be a likely, short-term, **not significant negative effect** which is Not Significant.

In some cases, the application of appropriate mitigation, such as an archaeological investigation of seabed anomalies prior to impact or the implementation of a PAD could lead to effects of **minor** to **moderate beneficial** significance, which is Not Significant. For example, discovering a wreck of interest and being able to share it with the wider public would be a **moderate beneficial effect** which is Not Significant.

17.5.5.3 Penetration and compression effects caused by corrective and preventative operation and maintenance activities (via jack-up vessels or anchors)

Penetration and compression effects of jack-up barges and anchoring of operation and maintenance vessels can lead to direct or indirect impact on marine archaeology receptors.

Activities which may result in penetration and compression effects leading to impact on archaeological receptors include anchoring of maintenance vessels and jack-up vessels. The volume of sediment anticipated to be impacted is detailed in Chapter 5: Project Description.

Penetration and compression effects as a result of vessel operations on Historic Environment may lead to direct impact and total or partial loss of Historic Environment. If a direct impact occurs, it will generally be local, major, and adverse or irreversible and result in a permanent change to the receptor meaning **high adverse** impact of magnitude as detailed in Table 17-9.

The sensitivity (value) of the Historic Environment potentially impacted as a result of vessel operations and identified within the Marine Archaeology Study Area ranges from **negligible** to **high** as defined in Table 17-8. For example, an unknown medieval wooden shipwreck would have **high** sensitivity while an anomaly confirmed through ROV or diver assessment to be modern debris would have **negligible** sensitivity.

17.5.5.3.1 Potential Effect

Without mitigation, the effects on the **high** sensitivity archaeological receptors would be a **significant negative effect** which is Significant.

17.5.5.3.2 Mitigation

As per the embedded mitigation/mitigation by design outlined in Table 17-11 locations on the seabed of potential and confirmed Historic Environment receptors are informed by the archaeological assessment of geophysical and geotechnical data and AEZs will be put in place, ensuring mitigation by avoidance.

Mitigation by avoidance aims to ensure that there is no direct, indirect or permanent impact on Historic Environment within the Marine Archaeology Study Area meaning a negligible magnitude of impact as defined in Table 17-9.

17.5.5.3.3 Residual Effect

Where avoidance is not possible or in case of not yet located Historic Environment further mitigation and archaeological works are detailed in the AMP. Following the application of appropriate mitigation, the magnitude would be reduced to **low** to **negligible adverse** which is not significant in EIAR terms. Due to the short-term nature of the works and with consideration given to the embedded mitigation measures/mitigation by design identified in Section 17.5.1, significant effects are not anticipated during the construction of the Offshore Site. Therefore, the residual effect is considered to be a likely, short-term, **not significant negative effect** which is Not Significant.

In some cases, the application of appropriate mitigation, such as an archaeological investigation of seabed anomalies prior to impact or the implementation of a PAD could lead to effects of **minor** to **moderate beneficial** significance, which is Not Significant. For example, discovering a wreck of interest and being able to share it with the wider public would be a **moderate beneficial** effect.

17.5.5.4 Assessment of Setting

Setting is the surroundings in which a heritage asset is experienced. Its extent is not fixed and may change as the asset and its surroundings evolve. Elements of a setting may make a positive or negative contribution to the significance of an asset, may affect the ability to appreciate that significance or may be neutral.

If the assessment determines that where the contribution that setting makes to the significance of a historic asset is not changed and the asset does not lose significance as a result, both the setting and the asset are considered to be preserved (in respect of their heritage interests).

For the purposes of this assessment, indirect effects are primarily visual intrusion or change in setting which may affect the heritage significance of a heritage asset or the ability to appreciate and understand that significance.

Assets were selected for assessment following discussions with consultees (MKO); based on their professional judgement and local knowledge. The selection is informed by consideration of distance, elevation, function and designation status of an asset.

Assessment of settings is primarily associated with designated historic assets or non-designated historic assets of equivalent heritage significance. The assessment has been applied with reference to desk-based research and the Zone of Theoretical Visibility (ZTV) map as seen in the Landscape and Visual Impact Assessment (LVIA).

In order to better understand the potential effect, a clear statement of the asset's overall significance is required, as well as the contribution that setting makes to that heritage significance. It is the final effect on the overall heritage significance of an asset that is being assessed, not simply the degree to which the contribution made by its setting is changed.

Extensive change, for example the intrusion to the key view or sightline to the setting of a scheduled monument, listed building or other feature registered as nationally important, which may lead to a major reduction in the contribution of that setting to the significance of the historic asset itself, and hence a loss of overall significance for that asset.

Minor change in setting, for example above historic skylines of monuments, listed buildings, sites and other features, which may lead to a small reduction in the contribution setting makes to the significance of a historic asset, with an appreciable loss in the asset's overall significance.

There are 1303 recorded monuments within 60km of the turbines. These include barrows, cairns, churches, burial grounds, forts, ritual sites, enclosures and various other classifications of monument. Based on the ZTV, there are 90 recorded monuments within 10km of the turbines. There are no UNESCO world heritage sites within 10km of the turbines.

The closest national monument sits within 5 km of the closest turbines; MacDara's island monastery (Figure 17-7). Other monuments of note which could be affected by the development are listed below.

17.5.5.4.1 MacDara's Island Monastery (GA076-0200017-)

The church is remarkable for its simplicity and elegance, as well as its preservation. It is one of the few examples of an early Christian oratory that has survived intact in Ireland, and it has been designated as a National Monument by the Irish government. The church contains interesting features, such as a stone altar, a holy well, a sundial, and several carved crosses (visitgalway.ie a), detailed in Section 17.3.2.

The setting of St. MacDara's Island Monastery adds to the monument being known not only as a historical and religious site, but also a scenic and peaceful destination that offers views of the Atlantic Ocean and the surrounding islands (visitgalway.ie a). The fact that the monastery is a pilgrimage destination also adds to its setting as a lone monument on a remote island.

Potential Effect

MacDara's Island Monastery is visible on VP 29, located in Volume 2C of this EIAR. The number of turbines visible from the monastery will be 25-30 and is likely to extensively change the setting of the monument and its surrounding associated features as it is a stark contrast between modern infrastructure and the ancient monastery. Without mitigation, the effects on the monument would be significant which is **Significant**.

Mitigation

No mitigation measures are proposed. It is noted that natural screening, boundaries, buildings and vegetation will potentially screen visual effects.

Residual Effect

Since no mitigation measures are being proposed the residual impact will be Significant which is a **Significant Effect.**

17.5.5.4.2 *Dún Aonghasa Fort, Inis Mór (GA110-039----)*

The setting of the fort on the cliff edge overlooking the Atlantic Ocean lends an understanding of why the location was chosen for the building of the monument. The advantage of the viewpoint means that the inhabitants would be able to see marine activity from miles away and adequately prepare. It also means that the community living within the walls of the fort could not be unexpectedly visited and can help visitors immerse themselves in the atmosphere.

This monument lies approximately 17 km away from the OAA with the number of turbines visible zero. The fort is 8km away from the OEC which will not be visible. The effect on the setting will therefore be temporary while the cable is being laid by a vessel.

Potential Effect

Without mitigation, the effects on the monument once the Project is Operational would be an imperceptible effect which is **Not Significant**.

Mitigation

No mitigation measures are proposed. It is noted that natural screening, boundaries, buildings and vegetation will potentially screen visual effects while the cables are being laid.

Residual Effect

Once the Project is Operational, the residual impact to this monument will be an imperceptible effect which is **Not Significant**.

17.5.5.4.3 *Maumeen Chapel (GA038-003002-)*

Maumeen Chapel (GA038-003002-) is visible on VP 27, located in Volume 2C of this EIAR. Maumeen is a significant pilgrimage site in the Maumturk mountains in the Connemara region of Galway. The name means “the pass of the birds” in Gaelic and refers to the natural gap between the mountains to the surrounding landscape. Maumeen has been a place of worship for centuries, dating back to the pre-Christian era when it was associated with the Celtic harvest festival of Lughnasa. Today, it is dedicated to St. Patrick, who is said to have visited and blessed the site in the fifth century (visitgalway.ie b).

The setting of Maumeen Chapel adds to the monument being known not only as a historical and religious site, but also a destination known for its views of the wider landscape.

Potential Effect

This monument lies approximately 31 km away from the OAA with 25-30 turbines visible. The OAA is likely to change the setting of the monument and its surrounding associated features as it is an area known for its views of the wider landscape used as a pilgrimage destination. Without mitigation, the effects on the monument once the Project is operational would be a moderate negative effect (which is **Not Significant**) due to the distance of the monument from the OAA.

Mitigation

No mitigation measures are proposed. It is noted that natural screening, boundaries, buildings and vegetation will potentially screen visual effects.

Residual Effect

Since no mitigation measures are being proposed the residual impact will be a moderate negative effect which is **Not Significant**.

17.5.5.4.4 *Bauntragh Cemetery (GA0917-001002-)*

Magnitude of Impact

Bauntragh Cemetry (GA0917-001002-) is visible on VP 4, located in Volume 2A of this EIAR. The graveyard is located next to the site of an ancient church and understood to be a former St Colmcilles monastic settlement that looks out over the Atlantic Ocean and Aran Islands.

Potential Effect

This graveyard lies approximately 25 km away from the OAA with 25-30 turbines visible. The OAA is not likely to change the setting of the monument as only the tips of the turbines will be visible and will not detract from the view of the wider landscape. This will have a not significant negative effect which is **Not Significant**.

Mitigation

No mitigation measures are proposed. It is noted that natural screening, boundaries, buildings and vegetation will potentially screen visual effects.

Residual Effect

Since no mitigation measures are being proposed the residual impact will be a not significant negative effect which is **Not Significant**.

17.5.5.4.5 *The Seven Churches (GA110-010003)*

Magnitude of Impact

The Seven Churches (GA110-010003) is visible on VP 31, located in Volume 2C of this EIAR. The Seven Churches or Dísert Bhreacáin as it is also known was one of the biggest monastic foundations and centres of pilgrimage along the west coast of Ireland. Teampall Bhreacáin (St Brecan's Church) is a large multi period church c. 8th-13th century. It contains fine masonry with an arch, nave and chancel. Teampall an Phoill (the Church of the Hollow) is a 15th century church smaller and simpler in style. The remains of a number of penitential beds and fragments of decorated crosses are also to be found on site. There are also a number of cross inscribed stones and graves in the south east corner of the site. One of these has the words 'V11 ROMANI' The Seven Romans written on it (aranislands.ie a).

Potential Effect

This monument lies approximately 15 km away from the OAA with 13-18 turbines visible. The OAA is likely to change the setting across part of the monument and its surrounding associated features as the area is spread out to include several features and was previously used as a pilgrimage destination. Since no mitigation measures are being proposed there will be a not significant to moderate effect (which is **Not Significant**) as the site varies across an undulating landscape.

Mitigation

No mitigation measures are proposed. It is noted that natural screening, boundaries, buildings and vegetation will potentially screen visual effects.

Residual Effect

Since no mitigation measures are being proposed the residual impact will range from a not significant to moderate effect which is **Not Significant**.

17.5.5.4.6 *Inishnee Medieval Church (GA050-011001)*

Magnitude of Impact

Inishnee Medieval Church (GA050-011001) is visible on VP 32, located in Volume 2C of this EIAR. This is a small poorly preserved medieval church measuring 10m by 3.7m. The structure lies in the southwest corner of a large rectangular graveyard close to the east shore of Inishnee island. Apart from the flat-headed doorway and aumbry in the south wall, no architectural features survive. Traces of an internal division exist at the east end. A subcircular burial area (GA050-011002-) to the northeast of church is defined by a low wall of irregular boulders.

Potential Effect

This monument lies approximately 13 km away from the OAA with 1-6 turbines visible. The OAA is not likely to change the setting of the monument due to a small number of turbines being visible. Since no mitigation measures are being proposed there will be a not significant negative effect which is **Not Significant**.

Mitigation

No mitigation measures are proposed. It is noted that natural screening, boundaries, buildings and vegetation will potentially screen visual effects.

Residual Effect

Since no mitigation measures are being proposed the residual impact will be a not significant negative effect which is **Not Significant**.

17.5.5.4.7 *Moyrus Medieval Church (GA063-015001)*

Magnitude of Impact

Moyrus Medieval Church (GA063-015001) is visible on VP 33, located in Volume 2C of this EIAR. The remains of the church is thought to date from the 13th century and sits in the same location of an earlier monastic settlement from the 7th century.

Potential Effect

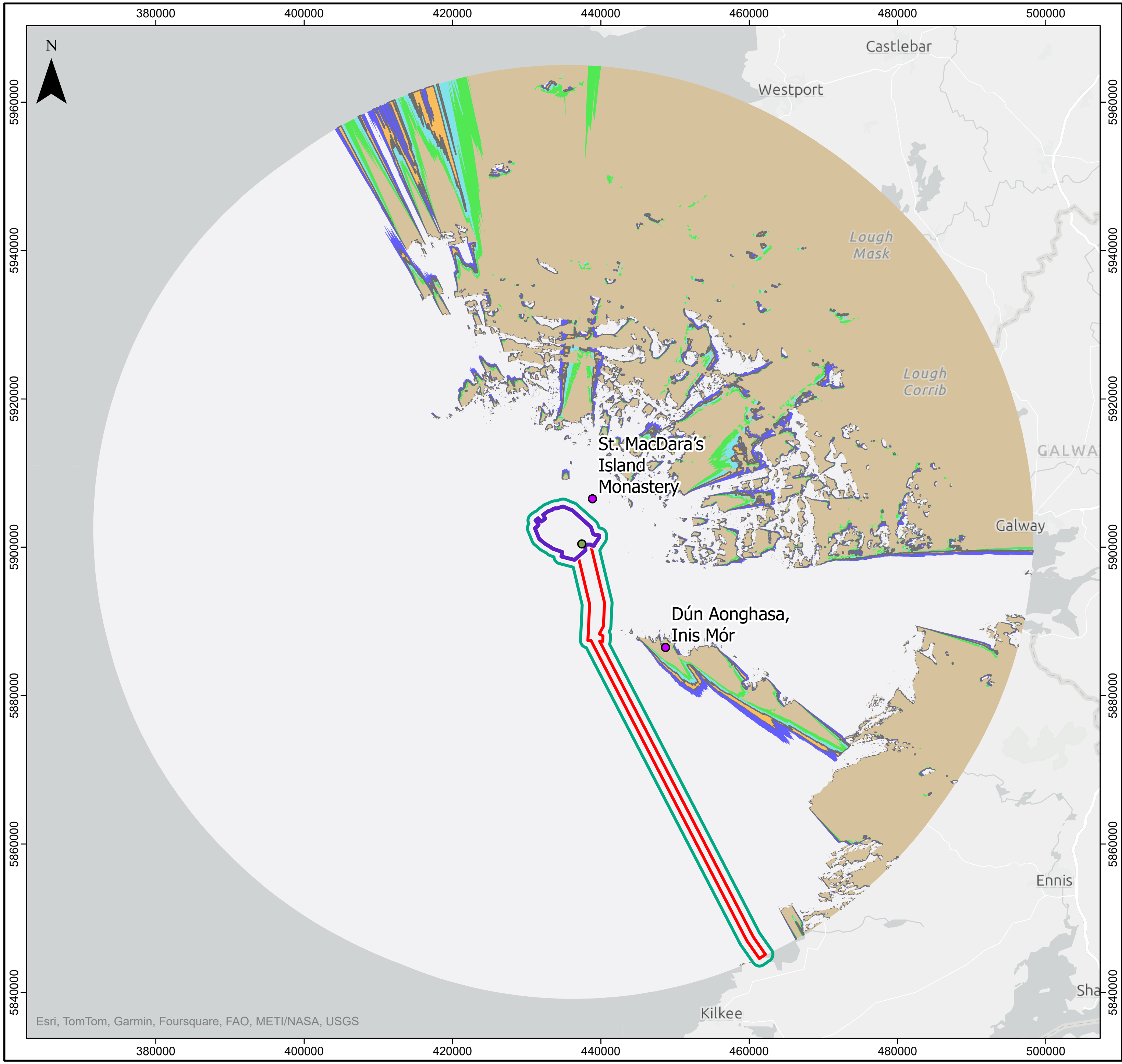
This monument lies approximately 8 km away from the OAA with 7-12 turbines visible. The OAA is not likely to change the setting of the monument as only half the turbines will be visible and will not detract from the view of the wider landscape. Since no mitigation measures are being proposed there will be a **not significant negative effect** which is Not Significant.

Mitigation

No mitigation measures are proposed. It is noted that natural screening, boundaries, buildings and vegetation will potentially screen visual effects.

Residual Effect

Since no mitigation measures are being proposed the residual impact will be a **not significant negative effect** which is Not Significant.



SCEIRDE ROCKS WINDFARM
Feirm Ghaoithe Charraigeacha Sceirde

LEGEND

- Offshore Array Area
- Offshore Export Cable Corridor
- Study Area
- Offshore Substation (OSS)
- Galway Historical Monumnets

Number of turbines visible

- 0
- 1 - 6
- 7 - 12
- 13 - 18
- 19 - 24
- 25 - 30

0 5 10 nm
0 9.5 19 km

Data Source: Contains public sector information, licensed under the Creative Commons licence v4.0; the Open Government Licence v3.0.

PROJECT TITLE
Sceirde Rocks

MAP TITLE
Assessment of Setting

VER	REMARKS	DATE	Drawn	Approved
1	DRAFT	06/11/2024	LR	CH

DRAWING NO
Figure 17-7

SCALE	PAPER SIZE	DATUM	PROJECTION
1:750,000	A4	WGS 84	UTM 29N

17.5.6 Decommissioning Phase

17.5.6.1 Draw-down of sediment into voids left by removed WTG foundations leading to loss of sediment, causing, or accelerating loss of the receptor.

Draw-down of sediment into voids left by removed WTG can lead to indirect or direct impact on marine archaeology receptors causing or accelerating loss of the receptor.

Activities which may result in draw-down of sediment leading to impact on archaeological receptors includes the removal of WTG and OSS foundations. This disturbance of sediment may lead to the damage or loss of archaeological receptors The volume of sediment anticipated to be impacted is detailed in Chapter 5: Project Description.

Table 17-9 presents the Project Design associated with the assumed removal activities for likely significant effects which, for the decommissioning process, states that all foundations (and structures resting on them) are to be removed while rock beds to be left *in situ*. By removing structures, it is expected that the foundations will leave voids across the whole Marine Archaeology Study Area.

The details of the proposed decommissioning process will be included within the Rehabilitation Plan which will be submitted with the application and updated throughout the lifetime of the Project to account for changing best practice (Appendix 5-18)

Magnitude of indirect impact on Historic Environment of sediment disturbance as a result of draw-down of sediment may lead to exposure of those Historic Environment to natural, chemical or biological processes and indirectly cause or accelerate their loss. If an indirect impact occurs, it will generally be local, major, and adverse or irreversible and result in a permanent change to the receptor meaning **high adverse** magnitude of impact as detailed in Table 17-13.

The sensitivity (value) of the Historic Environment potentially impacted as a result of draw-down of sediment within the Marine Archaeology Study Area ranges from **negligible** to **high** as defined in Table 17-8. For example, an unknown medieval wooden shipwreck would have **high** sensitivity while an anomaly confirmed through ROV or diver assessment to be modern debris would have **negligible** sensitivity.

17.5.6.1.1 *Potential Effect*

Without mitigation, the effects on the **high** sensitivity archaeological receptors would be a **significant negative** effect which is Significant.

17.5.6.1.2 *Mitigation*

As per the embedded mitigation/mitigation by design outlined in Table 17-11 locations on the seabed of potential and confirmed Historic Environment receptors are informed by the archaeological assessment of geophysical and geotechnical data and AEZs will be put in place, ensuring mitigation by avoidance.

Mitigation by avoidance aims to ensure that there is no direct, indirect or permanent impact on Historic Environment within the Marine Archaeology Study Area meaning a negligible magnitude of impact as defined in Table 17-13.

17.5.6.1.3 *Residual Effect*

Where avoidance is not possible or in case of not yet located Historic Environment further mitigation and archaeological works are detailed in the AMP. Following the application of appropriate mitigation, the magnitude would be reduced to **low** to **negligible adverse** which is not significant in EIAR terms. Due to the short-term nature of the works and with consideration given to the embedded mitigation measures/mitigation by design identified in Section 17.5.1, significant effects are not anticipated during the decommissioning of the Offshore Site. Therefore, the residual effect is considered to be a likely, short-term, **not significant negative effect** which is Not Significant**.**

In some cases, the application of appropriate mitigation, such as an archaeological investigation of seabed anomalies prior to impact or the implementation of a PAD could lead to effects of **minor** to **moderate beneficial** significance, which is Not Significant. For example, discovering a wreck of interest and being able to share it with the wider public would be a **moderate beneficial** effect.

17.5.6.2 Penetration and compression effects of jack-up vessels and anchoring of decommissioning vessels.

Penetration and compression effects of jack-up barges and anchoring of decommissioning vessels can lead to direct or indirect impact on marine archaeology receptors.

Table 17-9 presents the Project Design associated with the decommissioning activities assessed for likely significant effects. The Project Design has assumed the same quantitative requirements for seabed preparation, as it forms a proxy for disturbance. However, as seabed preparation works would not be required, the magnitude of this impact will be lower than during the construction phase.

Penetration and compression effects as a result of vessel operations on Historic Environment may lead to direct impact and total or partial loss of Historic Environment. If a direct impact occurs, it will generally be local, major, and adverse or irreversible and result in a permanent change to the receptor meaning **high adverse** impact of magnitude as detailed in Table 17-13.

The sensitivity (value) of the Historic Environment potentially impacted as a result of vessel operations and identified within the Marine Archaeology Study Area ranges from **negligible** to **high** as defined in Table 17-8. For example, an unknown medieval wooden shipwreck would have **high** sensitivity while an anomaly confirmed through ROV or diver assessment to be modern debris would have **negligible** sensitivity.

17.5.6.2.1 *Proposed Effect*

Without mitigation, the effects on the **high** sensitivity archaeological receptors would be a **significant negative** effect which is Significant.

17.5.6.2.2 *Mitigation*

As per the embedded mitigation/mitigation by design outlined in Table 17-11 locations on the seabed of potential and confirmed Historic Environment receptors are informed by the archaeological assessment of geophysical and geotechnical data and AEZs will be put in place, ensuring mitigation by avoidance.

Mitigation by avoidance aims to ensure that there is no direct, indirect or permanent impact on Historic Environment within the Marine Archaeology Study Area meaning a negligible magnitude of impact as defined in Table 17-13.

17.5.6.2.3 Residual Effect

Where avoidance is not possible or in case of not yet located Historic Environment further mitigation and archaeological works are detailed in the AMP. Following the application of appropriate mitigation, the magnitude would be reduced to **low** to **negligible adverse**. Due to the short-term nature of the works and with consideration given to the embedded mitigation measures/mitigation by design identified in Section 17.5.1, significant effects are not anticipated during the decommissioning of the Offshore Site. Therefore, the residual effect is considered to be a likely, short-term, **not significant negative effect** which is Not Significant.

In some cases, the application of appropriate mitigation, such as an archaeological investigation of seabed anomalies prior to impact or the implementation of a PAD could lead to effects of **minor** to **moderate beneficial** significance, which is Not Significant. For example, discovering a wreck of interest and being able to share it with the wider public would be a **moderate beneficial** effect.

17.5.7 Summary

Table 17-13 presents a summary of the assessment of significant effect on offshore archaeology and cultural heritage.

Table 17-13 Summary of effects for Offshore Archaeology and Cultural Heritage

Impact	Receptor	Magnitude	Sensitivity	Significance Prior to Mitigation	Mitigation	Residual Effect
Construction Phase						
Removal of sediment containing undisturbed archaeological contexts during seabed preparation.	Marine archaeology receptors	High	Negligible to High	Significant negative; Significant	As per Table 17-11 Embedded mitigation/ mitigation by design relating to marine archaeology	Not significant negative or moderate beneficial; Not Significant
Compression of stratigraphic contexts containing archaeological material from combined weight of foundation, transition piece, tower, and WTG.	Marine archaeology receptors	High	Negligible to High	Significant negative; Significant	As per Table 17-11 Embedded mitigation/ mitigation by design relating to marine archaeology	Not significant negative or moderate beneficial; Not Significant
Disturbance of sediment containing potential marine	Marine archaeology receptors	High	Negligible to High	Significant negative; Significant	As per Table 17-11 Embedded mitigation/	Not significant negative or moderate beneficial;

archaeology receptors (material and contexts) during the laying of inter-array cables and export cable laying operations.					mitigation by design relating to marine archaeology	Not Significant
Penetration and compression effects of jack-up vessels and anchoring of construction vessels during WTG, OSS, or cable installation.	Marine archaeology receptors	High	Negligible to High	Significant negative; Significant	As per Table 17-11 Embedded mitigation/ mitigation by design relating to marine archaeology	Not significant negative or moderate beneficial; Not Significant
Operation and Maintenance						
Scour effects caused by the presence of WTG and substation foundations, causing, or accelerating loss of the receptor.	Marine archaeology receptors	High	Negligible to High	Significant negative; Significant	As per Table 17-11 Embedded mitigation/ mitigation by design relating to marine archaeology	Not significant negative or moderate beneficial; Not Significant
The exposure and replacement of inter-array and export cables or the use of cable protection measures (such as remedial cable burial).	Marine archaeology receptors	High	Negligible to High	Significant negative; Significant	As per Table 17-11 Embedded mitigation/ mitigation by design relating to marine archaeology	Not significant negative or moderate beneficial; Not Significant
Penetration and compression effects caused by corrective and preventative operation and maintenance activities (via jack-up vessels).	Marine archaeology receptors	High	Negligible to High	Significant negative; Significant	As per Table 17-11 Embedded mitigation/ mitigation by design relating to marine archaeology	Not significant negative or moderate beneficial; Not Significant

Decommissioning						
Draw-down of sediment into voids left by removed WTG foundations leading to loss of sediment, causing, or accelerating loss of the receptor.	Marine archaeology receptors	High	Negligible to High	Significant negative; Significant	As per Table 17-11 Embedded mitigation/ mitigation by design relating to marine archaeology	Low to negligible negative; Not Significant
Penetration and compression effects of jack-up vessels and anchoring of decommissioning vessels.	Marine archaeology receptors	High	Negligible to High	Significant negative; Significant	As per Table 17-11 Embedded mitigation/ mitigation by design relating to marine archaeology	Low to negligible adverse; Not Significant

Table 17-14 presents a summary of the assessment of setting on onshore historic monuments in the vicinity of the Offshore Site.

Table 17-14 Summary of effects on the setting of onshore monuments

Monument	Distance from OAA	Significance Prior to Mitigation	Mitigation	Residual Effect
MacDara's Island Monastery	<5 km	Significant; Significant	No mitigation	Significant; Significant
Dún Aonghasa	17 km	Imperceptible; Not Significant	No mitigation	Imperceptible; Not Significant
Maumeen Chapel	31 km	Moderate; Not Significant	No mitigation	Moderate; Not Significant
Bauntragh Cemetery	25 km	Not significant; Not Significant	No mitigation	Not significant; Not Significant
The Seven Churches	15 km	Not significant; Not Significant	No mitigation	Not significant; Not Significant
Inishnee Medieval Church	13 km	Not significant; Not Significant	No mitigation	Not significant; Not Significant
Moyrus Medieval Church	8 km	Not significant; Not Significant	No mitigation	Not significant; Not Significant

17.6 Cumulative Effects

The Projects and plans selected as relevant to the assessment of impacts to marine and intertidal archaeology are based upon an initial screening exercise undertaken on a long list. Each project, plan or activity has been considered and scoped in or out on the basis of effect-receptor pathway, data confidence and the temporal and spatial scales involved within Cumulative Study Area (CSA).

For offshore archaeology and cultural heritage, cumulative impacts may occur with other planned projects and developments within the Marine Archaeology Study Area.

A ZoI of 50km from the Marine Archaeology Study Area has been applied for the cumulative impacts assessment (CIA) to ensure direct and indirect cumulative effects can be appropriately identified and assessed. The 50km ZoI follows best practise as seen by other recent offshore developments.

17.6.1 Project Scoping

A longlist of reasonably foreseeable proposals has been identified and reduced to a shortlist for assessment in this chapter based on a consideration of:

Stage 1: Identification of whether a spatial overlap between the effects of the Offshore Site may exist which could potentially result in significant effects;

Stage 2: This list was then further refined to whether there may be a temporal overlap between the potential effects of the projects. A potential temporal overlap is defined as:

- Proposed but not yet constructed (either pre- or post-consent);
- Only partially constructed at the time that baseline characterisation was undertaken;
- Recently completed, during the development of the baseline characterisation, and the full extent of the impacts arising from the development(s) may not be reflected in the baseline; and / or
- May have consent or licences to undertake further work, such as maintenance dredging or notable maintenance works which may arise in additional effects.

Stage 3: Defining the degree of certainty and data confidence was then considered to identify an appropriate tier for each of the projects.

Projects which are built and operational, and no more works or licenced activities are permitted or anticipated, are classified as part of the baseline conditions (i.e., within the characterised receiving environment) for the purposes of assessment.

17.6.2 Cumulative Effects Assessment

Potential effects from the Project have the potential to interact with those from other projects (developments), plans and activities, resulting in cumulative effects on Marine and Intertidal Archaeology. The general approach to the cumulative effects assessment (CEA) is described in Chapter 4: EIA Methodology and further detail is provided below.

It is important to note that there are no projects/developments of an equivalent scale or type to the Project within 50 km. To date, there has been generally few large-scale construction projects on the west coast of Ireland. Therefore, many of the relevant developments represent short-term, localised activities which are not typically associated with any long-term infrastructure presence.

There are 2 operational developments associated with Cables and Subsea cables within the ZoI and therefore considered as part of the baseline. One of these has spatial overlap with the OCC but does not come in to contact with areas of known archaeology or geophysical potential. Potential additional projects which may have overlap are at preliminary stages. The construction of these developments can cause both direct and indirect impacts from penetration and compression, as well as disturbance of seabed sediments and cumulative sediment changes during all the Offshore Site phases. The long term or permanent presence of subsea cables and pipelines may also result in the loss or accumulation of sediment over time. In addition, maintenance operations of subsea cables and pipelines, if undertaken, may alter or destabilise Historic Environment or archaeological sites and contexts, including paleoenvironmental information and exposing such material to natural, chemical, or biological processes, and causing or accelerating loss of the same. All developments will have to undergo EIA before becoming operational and suitable mitigation measures will have to be implemented. Therefore, any cumulative effects from Cables and Subsea cables would be slight to imperceptible.

The Project is the only Relevant Project / Phase 1 offshore renewable development in the region with a Maritime Area Consent (MAC), the only offshore wind development in the region which was successful in Offshore Renewable Electricity Support Scheme (ORESS) 1 and the only offshore wind development in the region, which is permitted to make development permission application.

There were a number of planned offshore renewable developments (at various levels of inception) proposed to be developed off the western coast of Ireland before the State's policy changed to a plan-led regime. Current policy is such that none of these projects are permitted to seek a MAC or make a development permission application. However, whether any of them may progress in the future is entirely dependent on future policy decisions. Several foreshore licence applications have been made, primarily in relation to environmental surveys in support of these renewables developments. In this context, we do not have sufficient information to consider these renewables developments, or associated foreshore licences for survey works any further in the cumulative effects assessment.

There is one applied Outfall Development within the ZoI, however as information on this development is very limited, it has been screened out of the assessment. Cumulative sediment changes from outfall development related activities such as the installation of a cofferdam, during all Offshore Site phases and activities could result in either the loss or accumulation of sediment. This disturbance could alter or destabilise Historic Environment within the Marine Archaeology Study Area, including paleoenvironmental material and expose such material to natural, chemical, or biological processes, causing or accelerating loss of the same. No direct or indirect cumulative effects on Historic Environment within the Marine Archaeology Study Area are expected and they do not have spatially overlapping boundaries.

There are two operational scientific research developments within the ZoI and therefore considered as part of the baseline. The Scientific research category covers a variety of works from grab samples for infauna, bathymetric, geophysical, geotechnical and environmental marine survey works and the development of sub-surface acoustic monitoring buoy. None of the activities are considered to cause disturbance that could alter or destabilise Historic Environment within the Marine Archaeology Study Area, therefore, no direct or indirect cumulative impacts on Historic Environment within the Marine Archaeology Study Area are expected and they do not have spatially overlapping boundaries.

There is one Seaweed Harvesting site within the ZoI currently in the consultation phase, however as information on this development is very limited, it has been screened out of the assessment. None of the activities are considered to cause disturbance that could alter or destabilise Historic Environment within the Marine Archaeology Study Area, therefore, no direct or indirect cumulative impacts on Historic Environment within the Marine Archaeology Study Area are expected and they do not have spatially overlapping boundaries.

17.6.2.1 Cumulative Assessment Summary

There are no projects/developments of an equivalent scale or type to the Project within 50 km. For future developments, the embedded mitigation/mitigation by design, outlined in Table 17-11 aims to avoid and mitigate direct, indirect, and permanent effects on Historic Environment (known or unlocated) within the Marine Archaeology Study Area and ensure that archaeological input is of paramount importance throughout the life of the Project.

Considering the magnitude of the cumulative effects during all phases of the Project and the other outlined developments as well as receptor sensitivity (value) (Table 17-8) within the significance of effect matrix Table 17-10 on Historic Environment potentially affected by the cumulative effects, the magnitude of impact is assessed as negligible and the sensitivity (value) of the receptor as negligible to high. The significance has therefore been assessed as a **not significant to slight effect** which is Not Significant.

17.7 Conclusion

The assessed geophysical data and desk-based assessment of the Marine Archaeology Study Area has revealed that only one wreck is present, which is that of MFV *Arosa*. The age of *Arosa* would mean that the vessel would not usually be required to have an Archaeological Exclusion Zone (AEZ) as it would be deemed to be of low archaeological potential; however, the circumstances of the loss of crew means a 100 m AEZ is to be put in place in the event that human remains are within the wreck or in the immediate vicinity. The location used in this assessment is that of the one presented in the Marine Accident Report (Marine Accident Investigation Branch, 2001).

No other features of archaeological potential were identified, however there is always a chance that archaeology may be encountered during works. To account for this, embedded mitigation/ mitigation by design is set out in order to assure that no impact occurs to marine archaeological receptors.

Mitigation has been put in place for all stages of the Project. As mitigation will be followed, it has been assessed that no negative significant effects are likely during the life cycle of the Project. Dissemination of information of archaeology is discovered, for example, a wreck of interest that is investigated and shared with the wider public would be a moderate beneficial impact as a result of the Project, which is Not Significant.

With respect to the effects of the Offshore Site on the setting of onshore archaeological monuments, the proximity of St MacDara's Monastery means that the Project will have a Significant Effect. All other monuments would experience lesser, Not Significant effects.

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NON – TECHNICAL SUMMARY

This section of the Environmental Impact Assessment Report (EIAR) sets out the approach to the characterisation of known and potential underwater cultural heritage, including shipwrecks, across the project and within the wider context of the Irish Sea. Specifically, this chapter considers the likely significant effects of Sceirde Rock Wind farm during its construction, operation and maintenance (O&M), and decommissioning phases associated with the array area and Offshore ECC.

There is one known wreck within the Marine Archaeology Study Area. The wreck is that of MFV *Arosa*; wrecked on 3 October 2000, off Doonguddle rock. During the night, *Arosa* struck rocks and became grounded in bad weather conditions. 12 of the 13 crew died in the wrecking and only six bodies have been recovered.

The age of *Arosa* would mean that the vessel would not usually be required to have an Archaeological Exclusion Zone (AEZ); however, the circumstances of the loss of crew means a 100 m AEZ is to be put in place in the event that human remains are within the wreck or in the immediate vicinity.

Archaeological Diving Company Ltd (ADCO was appointed by Gavin and Doherty Geosolutions (GDG) for Fuinneamh Sceirde Teoranta to carry out an archaeological review of marine geophysical survey data acquired in 2022 for the Sceirde Rocks Offshore Wind Farm, under archaeological consent 22R0105.

The assessment concluded that a series of contact features was recorded throughout the survey area, the majority of the features appear to be boulders, and while there are some debris items there are no defined items of archaeological interest or potential. The location of W09419 as charted by the HSI appears to be incorrect, and the correct location of the MFV *Arosa* lies on the exposed shoreline of Sceirde Rocks outside the surveyed area. The potential for identifying palaeocoastlines and submerged landscapes is perhaps better anticipated in the present instance from borehole data that would be subject to future geotechnical investigation work.

No other features of archaeological potential were identified, however there is always a chance that archaeology may be encountered during works. To account for this, embedded mitigation/ mitigation by design is set out in order to assure that no impact occurs to marine archaeological receptors.

GLOSSARY OF PROJECT TERMS

Term	Definition
Archaeological Exclusion Zone (AEZ)	A spatially defined zone around a known marine archaeological and cultural heritage receptor that will be avoided during intrusive works. The avoidance of AEZs must also consider that the use of anchors and lines, which could impact upstanding features, are adequately considered in the planning of operations.
Archaeological Interest	Refers to a site, find or anomaly of anthropogenic origin that has the potential to contribute to our knowledge and understanding of the past.
Archaeological Potential	Refers to the likelihood a site, find or anomaly is considered to map material of archaeological interest such as wreck or aviation crash sites, buried and confirmed palaeolandscapes and their margins, and the potential that such evidence would reveal a greater understanding of the past through expert investigation.
Archaeological Significance	Refers to the potential of a site or find to contribute to our knowledge and understanding of the past.
Array area	The area offshore within the EIAR Boundary within which the wind turbine generators (WTG), offshore platforms and inter-array cables will be located.
Baseline	The status of the environment at the time of assessment without the development in place.
Before Present	Time scale referring to years before 1950.
Bronze Age	Archaeological period lasting from 2500BC-500BC. This period follows on from the Neolithic and is characterised by the increasing use of bronze work. It is subdivided into the Early, Middle and Late Bronze Age.
Decommissioning	The period during which a development and its associated processes are removed from active operation.
Effect	Term used to express the consequence of an impact. The significance of an effect is determined by correlating the magnitude of an impact with the sensitivity (value) of a receptor, in accordance with defined significance criteria.
Environmental Impact Assessment Report (EIAR)	A report of the effects, if any, which the proposed project, if carried out, would have on the environment. It is prepared by the developer to inform the EIA process.
Geophysical	Relating to the physical properties of the earth.
Heritage	The historic environment and especially valued assets and qualities such as historic buildings and cultural traditions.
Historic Environment	Physical resources such as shipwrecks, remains of aircraft, archaeological sites, archaeological finds, and material including pre-historic deposits as well as archival documents and oral accounts recognised as historical/archaeological or cultural significance. These are recorded in the DAHG Historic Environment Viewer.
Historic Environment receptor	A distinct part of the environment on which effects could occur and can be the subject of specific assessments. Examples of Historic Environment receptors include wrecks.
Historic Landscape Characterisation	Maps and describes historic cultural influences within an area looking beyond individual heritage assets and interpreting the patterns and connections within a landscape, spatially and through time.
Historic Seascape Characterisation	Maps and describes historic cultural influences which shape seascape perceptions across marine areas, coastal land and adjacent marine environments and provides and interpretation of cultural, historical and archaeological links.
Impact	An impact on the receiving environment is defined as any change to its baseline condition, either adverse or beneficial.

Intertidal	An area where the ocean meets the land between high and low tides. Specifically, the area between mean the High Water Mark and Low Water Mark.
Iron Age	The archaeological period lasting from 500BC-400AD. This period follows on from the Bronze Age and is characterised by the use of iron for making tools and monuments such as hillforts and oppida.
Landfall	The location at the land-sea interface where the offshore export cable will come ashore.
Last Glacial Maximum	Most recent time during the last glacial period that the ice sheets were at their greatest extents, approximately 26,500 – 19,000 BP.
Magnetometer	A device used to measure direction, strength, or relative change of magnetic field at a particular location.
Marine Archaeology Study Area	Defined as the EIAR array area and ECC areas up to MHWS and surrounded by a 1 km buffer.
Medieval	Archaeological period lasting from c. 400-1500 CE. The Medieval period or Middle Ages begins with the Norman invasion and ends with the dissolution of the monasteries and can be split into the Early and Late Medieval.
Mesolithic	Archaeological period lasting from 8000BC-4000BC. The Middle Stone Age, falling between the Palaeolithic and the Neolithic; marks the beginning of a move from a fisher-hunter-gatherer society towards food producing society.
Mitigation	Mitigation measures, or commitments, are commitments made by the Project to reduce and/or eliminate the potential for significant effects to arise as a result of the Project. Mitigation measures can be embedded (part of the project design) or secondarily added to reduce impacts in the case of potentially significant effects.
Multi-beam Echo Sounder (MBES)	A type of sonar survey is used to map the seabed by emitting acoustic waves in a fan shape beneath its transceiver. The time it takes for the sounds waves to reflect off the seabed and return to the receiver is used to calculate the water depth and produce a visualisation of depths and shapes of underwater terrain.
Nanotesla	Measurement describing the magnetic field (flux) of ferrous materials as measured by a magnetometer. (One nanotesla equals 10^{-9} tesla).
Neolithic	Archaeological period lasting from 4000BC-2500BC. This period follows from the Palaeolithic and the Mesolithic and is itself succeeded by the Bronze Age. This period is characterised by the practice of a farming economy and extensive monumental constructions.
Offshore Export Cable Corridor (ECC)	The Offshore Export Cable Corridor (Offshore ECC) is the area within the EIAR Boundary within which the export cable running from the array to landfall will be situated.
Offshore 220Kv Electrical Substation (OSS)	Platforms located within the array area which house electrical equipment and control and instrumentation systems. They also provide access facilities for work boats and helicopters.
Palaeolithic	Archaeological period lasting from 52,000 – 12,000 BP. The period is defined by the practice of hunting and gathering and the use of knapped flint tools. This period is usually divided up into the Lower, Middle and Upper Palaeolithic.
Post-Medieval	Archaeological period lasting from AD 1540 – 1901. Begins with the dissolution of the monasteries (AD 1536 – 1541) and ends with the death of Queen Victoria (AD 1901). A more specific period is used where known.
Pre-construction and post-construction	The phases of the Project before and after construction takes place.

Protocol for Archaeological Discoveries	A document detailing how unexpected archaeological discoveries should be reported during the lifetime of the Project.
Receptor	A distinct part of the environment on which effects could occur and can be the subject of specific assessments. Examples of receptors include species (or groups) of animals or plants, people (often categorised further such as 'residential' or those using areas for amenity or recreation), watercourses etc.
Seascape	Landscapes with views of the coast or seas, and coasts and adjacent marine environments with cultural, historical and archaeological links with each other.
Setting of a heritage asset	The surroundings in which a heritage asset is experienced. Its extent is not fixed and may change as the asset and its surroundings evolve. Elements of a setting may make a positive or negative contribution to the significance of an asset, may affect the ability to appreciate that significance or may be neutral.
Side Scan Sonar	A sonar system that provides high-resolution seafloor morphology from both sides of the vessel track to produce an image of the seafloor.
Study area	Area(s) within which environmental impact may occur – to be defined on a receptor-by-receptor basis by the relevant technical specialist.
Sub-bottom Profiler	An acoustic system used to determine physical properties of the seafloor and to image and characterise geological information a few meters below the seafloor.
Subsea	Subsea comprises everything existing or occurring below the surface of the sea.
United Kingdom Hydrographic Office database	Database of known wrecks and obstruction held and maintained by the United Kingdom Hydrographic Office (UKHO).
Ultra-High Resolution Seismic	An acoustic system used to image submerged buried features in shallow water.
Wind turbine generator (WTG)	All the components of a wind turbine, including the tower, nacelle, and rotor.
Wreck Inventory of Ireland Database (WIID)	Database holding records of over 18,000 known and potential wreck sites in Irish waters.

ACRONYMS AND ABBREVIATIONS

Term	Definition
AEZ	Archaeological Exclusion Zone
AMP	Archaeological Management Plan
BCE	Before Common Era
BIIS	British-Irish Ice Sheet
BP	Before Present
CD	Chart Datum
CIfA	Chartered Institute of Archaeologists
DECC	Department of the Environment, Climate and Communications, previously known as DCCAE
DTCAGSM	Department of Tourism, Culture, Arts, Gaeltacht, Sports and Media, previously known as DCHG
ECC	Export Cable Corridor
EIA	Environmental Impact Assessment

EIAR	Environmental Impact Assessment Report
EPA	Environmental Protection Agency
IAI	Institute of Archaeologists of Ireland
INFOMAR	Integrated Mapping for the Sustainable Development of Ireland's Marine Resource
LGM	Last Glacial Maximum
MA	Maritime Archaeology Limited
MBES	Multibeam Echo Sounder
HWM	High Water Mark
NMI	National Museum of Ireland
NMS	National Monument Service
nT	Nano Tesla
PAD	Protocol for Archaeological Discoveries
SSS	Side Scan Sonar
UAU	Underwater Archaeology Unit
UHR / 2DUHR	Ultra-High Resolution Seismic Survey / 2-Dimensional Ultra-High Resolution Seismic Survey
UK	United Kingdom
UKHO	United Kingdom Hydrographic Office
WIID	Wreck Inventory of Ireland Database
WTG	Wind Turbine Generator
CSA	Cumulative Study Area