Cenos Offshore Windfarm Limited

Cenos EIA

EIAR Chapter 16 – Marine Archaeology

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ABBREVIATIONS AND ACRONYMS

ACRONYM	DEFINITION
AD	Anno Domini
AEZ	Archaeological Exclusion Zone
BC	Before Christ
BGS	British Geological Survey
BP	(years) Before Present
CCS	Carbon Capture and Storage
CEA	Cumulative Effects Assessment
CEMP	Construction Environmental Management Plan
DoL	Depth of Lowering
EIC	Export / Import Cable
EICC	Export / Import Cable Corridor
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
FTU	Floating Turbine Unit
HDD	Horizontal Directional Drilling
HEPS	Historic Environment Policy for Scotland
HER	Historic Environment Record
HES	Historic Environment Scotland
HMPA	Historic Marine Protected Area
IAC	Inter-Array Cable
km	Kilometre
MBES	Multibeam Bathymetry
MCHA	Marine Cultural Heritage and Archaeology
MD-LOT	Marine Directorate Licensing Operations Team
MHWS	Mean High Water Springs
MIS	Marine Isotope Stage
MLWS	Mean Low Water Springs
MMO	Marine Management Organisation
MPA	Marine Protected Area
NM	Nautical Mile
nT	Nano Tesla

ACRONYM	DEFINITION
OSCP	Offshore Substation & Converter Platform
OSP	Offshore Substation Platform
OWF	Offshore Windfarm
PAD	Protocol for Archaeological Discovery
PLGR	Pre-Lay Grapnel Run
RSL	Relative Sea Level
ROV	Remotely Operated Vehicle
SBP	Sub-bottom Profiler
SM	Scheduled Monument
SSC	Suspended Sediment Concentration
SSS	Sidescan Sonar
TAEZ	Temporary Archaeological Exclusion Zone
UKHO	United Kingdom Hydrographic Office
UNCLOS	United Nation Convention on the Law of the Sea
UNESCO	United Nations Educational, Scientific and Cultural Organisation
UXO	Unexploded Ordnance
WGS84	World Geodetic System 1984
WSI	Written Scheme of Investigation
WTG	Wind Turbine Generator
ZOI	Zone of Influence

GLOSSARY

TERM	DEFINITION
2023 Scoping Opinion	Scoping Opinion received in June 2023, superseded by the 2024 Scoping Opinion.
2023 Scoping Report	Environmental Impact Assessment (EIA) Scoping Report submitted in 2023, superseded by the 2024 Scoping Report.
2024 Scoping Opinion	Scoping Opinion received in September 2024, superseding the 2023 Scoping Opinion.
2024 Scoping Report	EIA Scoping Report submitted in April 2024, superseding the 2023 Scoping Report.
Area of Opportunity	The area in which the limits of electricity transmission via High Voltage Alternating Current (HVAC) cables can reach oil and gas assets for decarbonisation. This area is based on assets within a 100 kilometre (km) radius of the Array Area.
Array Area	The area within which the Wind Turbine Generators (WTGs), floating substructures, moorings and anchors, Offshore Substation Converter Platforms (OSCPs) and Inter-Array Cables (IAC) will be present.
Cenos Offshore Windfarm ('the Project')	'The Project' is the term used to describe Cenos Offshore Windfarm. The Project is a floating offshore windfarm located in the North Sea, with a generating capacity of up to 1,350 Megawatts (MW). The Project which defines the Red Line Boundary (RLB) for the Section 36 Consent and Marine Licence Applications (MLA), includes all offshore components seaward of Mean High Water Springs (MHWS) (WTGs, OSCPs, cables, floating substructures moorings and anchors and all other associated infrastructure). The Project is the focus of this Environmental Impact Assessment Report (EIAR).

TERM	DEFINITION
Cenos Offshore Windfarm Ltd. (The Applicant)	The Applicant for the Section 36 Consent and associated marine licences.
Cumulative Assessment	The consideration of potential impacts that could occur cumulatively with other relevant projects, plans, and activities that could result in a cumulative effect on receptors.
Developer	Cenos Offshore Windfarm Ltd., a Joint Venture between Flotation Energy and Vårgrønn As (Vårgrønn).
Environmental Impact Assessment (EIA)	The statutory process of evaluating the likely significant environmental effects of a proposed project or development. Assessment of the potential impact of the proposed Project on the physical, biological and human environment during construction, operation and maintenance and decommissioning.
Environmental Impact Assessment Regulations	This term is used to refer to the Environmental Impact Assessment Regulations which are of relevance to the Project. This includes the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017, the Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017 (as amended); and the Marine Works (Environmental Impact Assessment) Regulations 2007.
Environmental Impact Assessment Report	A report documenting the findings of the EIA for the Project in accordance with relevant EIA Regulations.
Export/Import Cable	High voltage cable used to export/import power between the OSCPs and Landfall.
Export/Import Cable Bundle (EICB)	Comprising two Export/Import Cables and one fibre-optic cable bundled in a single trench.
Export/Import Cable Corridor (EICC)	The area within which the Export/Import Cable Route will be planned and the Export/Import Cable will be laid, from the perimeter of the Array Area to MHWS.

TERM	DEFINITION
Export/Import Cable Route	The area within the Export/Import Export Corridor (EICC) within which the Export/Import Cable Bundle (EICB) is laid, from the perimeter of the array area to MHWS.
Floating Turbine Unit (FTU)	The equipment associated with electricity generation comprising the WTG, the floating substructure which supports the WTG, mooring system and the dynamic section of the IAC.
Flotation Energy	Joint venture partner in Cenos Offshore Windfarm Ltd.
Habitats Regulations	The Habitats Directive (Directive 92/43/ECC) and the Wild Birds Directive (Directive 2009/147/EC) were transposed into Scottish Law by the Conservation (Natural Habitats &c) Regulations 1994 ('Habitats Regulations') (up to 12 NM); by the Conservation of Offshore Marine Habitats and Species Regulations 2017 ('Offshore Marine Regulations') (beyond 12 NM); the Conservation of Habitats and Species Regulations 2017 (of relevance to consents under Section 36 of the Electricity Act 1989); the Offshore Petroleum Activities (Conservation of Habitats) Regulations 2001; and the Wildlife and Countryside Act 1981. The Habitats Regulations set out the stages of the Habitats Regulations Appraisal (HRA) process required to assess the potential impacts of a proposed project on European Sites (Special Areas of Conservation, Special Protection Areas, candidate SACs and SPAs and Ramsar Sites).
Habitats Regulations Appraisal	The assessment of the impacts of implementing a plan or policy on a European Site, the purpose being to consider the impacts of a project against conservation objectives of the site and to ascertain whether it would adversely affect the integrity of the site.
High Voltage Alternating Current (HVAC)	Refers to high voltage electricity in Alternating Current (AC) form which is produced by the WTGs and flows through the IAC system to the OSCPs. HVAC may also

TERM	DEFINITION
	be used for onward power transmission from the OSCPs to assets or to shore over shorter distances.
High Voltage Direct Current (HVDC)	Refers to high voltage electricity in Direct Current (DC) form which is converted from HVAC to HVDC at the OSCPs and transmitted to shore over longer distances.
Horizontal Directional Drilling (HDD)	An engineering technique for laying cables that avoids open trenches by drilling between two locations beneath the ground's surface.
Innovation & Targeted Oil and Gas (INTOG)	In November 2022, the Crown Estate Scotland (CES) announced the Innovation & Targeted Oil and Gas (INTOG) Leasing Round, to help enable this sector-wide commitment to decarbonisation. INTOG allowed developers to apply for seabed rights to develop offshore windfarms for the purpose of providing low carbon electricity to power oil and gas installations and help to decarbonise the sector. Cenos is an INTOG project and in November 2023 secured an Exclusivity Agreement as part of the INTOG leasing round.
Inter-Array Cable (IAC)	The cables which connect the WTGs to the OSCPs. WTGs may be connected with IACs into a hub or in series as a 'string' or a 'loop' such that power from the connected WTGs is gathered to the OSCPs via a single cable.
Joint Venture	The commercial partnership between Flotation Energy and Vårgrønn, the shareholders which hold the Exclusivity Agreement with CES to develop the Cenos site as an INTOG project.
Landfall	The area where the Export/Import Cable from the Array Area will be brought ashore. The interface between the offshore and onshore environments.

TERM	DEFINITION
Marine Licence	Licence required for certain activities in the marine environment and granted under the Marine and Coastal Access Act 2009 and/or the Marine (Scotland) Act 2010.
Marine Protected Area (MPA)	Marine sites protected at the national level under the Marine (Scotland) Act 2010 out to 12 NM, and the Marine and Coastal Access Act 2009 between 12-200 NM. In Scotland MPAs are areas of sea and seabed defined so as to protect habitats, wildlife, geology, underseas landforms, historic shipwrecks and to demonstrate sustainable management of the sea.
Marine Protected Area (MPA) Assessment	A three-step process for determining whether there is a significant risk that a proposed development could hinder the achievement of the conservation objectives of an MPA.
Mean High Water Springs (MHWS)	The height of Mean High Water Springs is the average throughout the year, of two successive high waters, during a 24-hour period in each month when the range of the tide is at its greatest.
Mean Low Water Springs (MLWS)	The height of Mean Low Water Springs is the average throughout a year of the heights of two successive low waters during periods of 24 hours (approximately once a fortnight).
Mitigation Measures	Measures considered within the topic-specific chapters in order to avoid impacts or reduce them to acceptable levels. • Primary mitigation - measures that are an inherent part of the design of the Project which reduce or avoid the likelihood or magnitude of an adverse environmental effect, including location or design; • Secondary mitigation – additional measures implemented to further reduce environmental effects to 'not significant' levels (where appropriate) and do not form part of the fundamental design of the Project; and • Tertiary mitigation – measures that are implemented in accordance with industry standard practice or to meet legislative requirements and are

TERM	DEFINITION
	independent of the EIA (i.e. they would be implemented regardless of the findings of the EIA). Primary and tertiary mitigation are referred to as embedded mitigation. Secondary mitigation is referred to as additional mitigation.
Mooring System	Comprising the mooring lines and anchors, the mooring system connects the floating substructure to the seabed, provides station-keeping capability for the floating substructure and contributes to the stability of the floating substructure and WTG.
Nature Conservation Marine Protected Area (NCMPA)	MPA designated by Scottish Ministers in the interests of nature conservation under the Marine (Scotland) Act 2010.
Offshore Substation Converter Platforms (OSCPs)	An offshore platform on a fixed jacket substructure, containing electrical equipment to aggregate the power from the WTGs and convert power between HVAC and HVDC for export/import via the export/import cable to/from the shore. The OSCPs will also act as power distribution stations for the Oil & Gas platforms.
Onward Development	Transmission projects which are anticipated to be brought forward for development by 3rd party oil and gas operators to enable electrification of assets via electricity generated by the Project. All Onward Development will subject to separate marine licensing and permitting requirements.
Onward Development Area	The area within which oil and gas assets would have the potential to be electrified by the Project.
Onward Development Connections	Oil and gas assets located in the waters surrounding the Array Area will be electrified via transmission infrastructure which will connect to the Project's OSCPs. These transmission cables are referred to as Onward Development Connections.
Project Area	The area that encompasses both the Array Area and EICC.

TERM	DEFINITION
Project Design Envelope	A description of the range of possible elements that make up the Project design options under consideration and that are assessed as part of the EIA for the Project.
Study Area	Receptor specific area where potential impacts from the Project could occur.
Transboundary Assessment	The consideration of impacts from the Project which have the potential to have a significant effect on another European Economic Area (EEA) state's environment. Where there is a potential for a transboundary effect, as a result of the Project, these are assessed within the relevant EIA chapter.
Transmission Infrastructure	The infrastructure responsible for moving electricity from generating stations to substations, load areas, assets and the electrical grid, comprising the OSCPs, and associated substructure, and the Export/Import Cable.
Vårgrønn As (Vårgrønn)	Joint venture partner in Cenos Offshore Windfarm Ltd.
Wind Turbine Generator (WTG)	The equipment associated with electricity generation from available wind resource, comprising the surface components located above the supporting substructure (e.g., tower, nacelle, hub, blades, and any necessary power transformation equipment, generators, and switchgears).
Worst-Case Scenario	The worst-case scenario based on the Project Design Envelope which varies by receptor and/or impact pathway identified.

16 MARINE ARCHAEOLOGY

16.1 Introduction

This chapter of the Environmental Impact Assessment Report (EIAR) presents the Marine Archaeology receptors of relevance to the Project and assesses the potential impacts from the construction, operation and maintenance and decommissioning of the Project on these receptors. Where required, mitigation is proposed, and the residual impacts and their significance are assessed. Potential cumulative, transboundary and whole project impacts are also considered.

The Marine Archaeology Chapter was produced by MSDS Marine & MSDS Heritage Ltd. and contains information on the policy, legislation and guidance context, as well as a methodology for the assessment. The Chapter presents the baseline for offshore archaeology and maritime heritage within the Project Area and a defined Study Area surrounding this.

Table 16-1 below provides a list of all the supporting studies which relate to and should be read in conjunction with the Marine Archaeology impact assessment.

Table 16-1 Supporting studies

SUPPORTING STUDIES	LOCATION
Marine Archaeology Baseline Report	EIA Vol.4, Appendix 28 – Marine Archaeology Baseline Report
NorthConnect UK Environmental Impact Assessment Report Volume 2	https://northconnect.no/uploads/downloads/Britain/HVDC-Cable-Infrastructure-UK-EIAR-Volume-2-Main-Document.pdf
NorthConnect Interconnector Converter Station and High Voltage Alternating Current Cable Route Environmental Statement Volume 2	https://northconnect.no/uploads/downloads/Britain/northconnect-es-volume-2-main-document.pdf

The impact assessment presented herein draws upon information presented within other impact assessments within this EIAR, including:

- EIAR Vol. 3, Chapter 8: Marine Geology, Oceanography and Coastal Processes – which assesses the impacts of marine physical processes which have the potential to interact with Marine Archaeology receptors; and
- EIAR Vol. 3, Chapter 17: Infrastructure and Other Users – which identifies where impacts may have previously affected Marine Archaeology receptors.

Where information is used to inform the impact assessment, reference to the relevant EIAR chapter is given.

The following specialists have contributed to the assessment:

- Mark James – MSDS Marine; and
- Tony Brown – MSDS Marine.

16.2 Legislation, policy and guidance

The wider marine planning, legislation, policy and guidance is discussed in EIAR Vol. 2, Chapter 3: Policy and Legislative Context. The following legislation, policy and guidance are relevant to the assessment of impacts from the Project on Marine Archaeology receptors.

16.2.1 Legislation

This Section outlines key legislature and how they have been considered within the context of the Project. The primary legislative documents consulted are listed below, with further detail provided where required.

- The World Heritage Convention (1972);
- Ancient Monuments and Archaeological Areas Act (1979);
- United Nations Convention on the Law of the Sea (1982);
- Protection of Military Remains Act (1986);
- Merchant Shipping Act (1995);
- International Council of Monuments and Sites Charter on the Protection and Management of Underwater Cultural Heritage (1996) (the Sofia Charter);
- Planning (Listed buildings and Conservation Areas) (Scotland) Act (1997);
- European Convention on the Protection of Archaeological Heritage (Revised) (1992) (the Valletta Convention) – ratified in the UK in 2000;
- UNESCO Convention on the Protection of the Underwater Cultural Heritage (2001);
- Environmental Assessment (Scotland) Act (2005);
- European Landscape Convention (2000) – adopted in the UK in March 2007;
- The Marine Works (Environmental Impact Assessment) Regulations (2007);
- Marine and Coastal Access Act (2009);
- Marine (Scotland) Act (2010);
- Historic Environment Scotland Act (2014); and
- The Marine Works (Environmental Impact Assessment (Amendment) Regulations (2017).

16.2.1.1 The World Heritage Convention (1972)

The Convention defines the concepts of nature conservation and the preservation of cultural properties, recognising the way in which people interact with nature and the need for balance between nature and culture. Signatories are required to preserve World Heritage Sites defined by the Convention and to identify and preserve national heritage through suitable planning programmes and measures.

As a signatory to the Convention (as part of the United Kingdom of Great Britain and Northern Ireland), Scotland has agreed to abide by the stipulations of the Convention, and these are reflected in the careful consideration of the management of the historic environment undertaken by the Project.

16.2.1.2 Ancient Monuments and Archaeological Areas Act (1979)

Enshrines the protection and preservation of remains with high archaeological or historical interest. Operations or activities with the potential to disturb or damage the remains within the boundaries of the protected area may be permitted following the granting of Scheduled Monument Consent from the Secretary of State but any unlicenced operations that may disturb the site are illegal.

16.2.1.3 United Nations Convention on the Law of the Sea (1982)

The Convention establishes rules governing the use of the oceans and outlines both the traditional legal framework and introduces new additions. Provisions relating to the marine historic environment state how remains should be treated and that ownership of remains lay with the state of origin.

As a signatory to the Convention (as part of the United Kingdom of Great Britain and Northern Ireland), Scotland has agreed to abide by the stipulations of the Convention and these are reflected in the careful consideration of the management of the marine historic environment undertaken by the Project.

16.2.1.4 Protection of Military Remains Act (1986)

Provides protection for the wreckage of military aircraft and certain military wrecks. Designations can be either as a Controlled Site or Protected Place where access may be permitted but any operations that may disturb the site are illegal, unless licenced by the Ministry of Defence. All military aircraft are automatically protected under this legislation, however, vessels must be designated individually.

16.2.1.5 Merchant Shipping Act (1995)

The Act stipulates that the 'Receiver of Wreck' administers and is responsible for processing incoming reports of wreck and cargo.

16.2.1.6 International Council of Monuments and Sites Charter on the Protection and Management of Underwater Cultural Heritage (1996) (the Sofia Charter)

The Sofia Charter is intended to encourage the protection and management of underwater cultural heritage in inland and inshore waters, shallow seas and deep oceans. The Sofia Charter should be read as a supplement to the International Council on Monuments and Sites Charter for the Protection and Management of Archaeological Heritage (1990), which defines "*...archaeological heritage...*" as that part of the material heritage in respect of which archaeological methods provide primary information, comprising all vestiges of human existence and consisting of places relating to all manifestations of human activity, abandoned structures and remains of all kinds, together with all the portable cultural material associated with them.

The Project promotes the key principles of the Charter by endeavouring to protect and learn from the historic environment through the establishment of a detailed baseline and embedded mitigation measures.

16.2.1.7 Planning (Listed buildings and Conservation Areas) (Scotland) Act (1997)

The Act consolidates enactments relating to special controls in respect of buildings and areas of special architectural or historic interest within Scottish Law.

16.2.1.8 European Convention on the Protection of Archaeological Heritage (Revised) (1992) (the Valletta Convention)

The Convention sets out conservation and enhancement of archaeological heritage, both terrestrial and marine, as a goal of planning policy and sets guidelines for the funding of physical investigation and research, publication of research findings, public access and awareness and constitutes an institutional framework for pan-European cooperation on archaeological heritage.

The Project follows the key principles of the Convention, using embedded mitigation measures to preserve the historic environment and making the results of the baseline and impact assessments available in the public domain.

16.2.1.9 UNESCO Convention on the Protection of the Underwater Cultural Heritage (2001)

The Convention provides a framework on how to better identify, research and protect underwater heritage while ensuring its preservation and sustainability. The Convention has informed the embedded mitigation strategies of the Project.

16.2.1.10 Environmental Assessment (Scotland) Act (2005)

The Act provides for the assessment of the environmental effects of certain plans and programmes, including the conditions requiring environmental assessment, assignation of responsibilities and procedure. The Project's EIAR, including this Chapter, is fundamentally underpinned by the Environmental Assessment (Scotland) Act (2005) (see EIAR Vol. 2, Chapter 7: EIA Methodology).

16.2.1.11 European Landscape Convention (2000)

The Convention introduced a Europe-wide concept centring on the quality of landscape protection, management and planning and covering the entire territory, not just outstanding landscapes. Through its approach and broader scope, it complements the Council of Europe's and UNESCO's heritage conventions. This Chapter has derived its definition of "seascape" from the Convention, also used by the UK Marine Policy Statement (2011).

16.2.1.12 Marine and Coastal Access Act (2009)

The Marine and Coastal Access Act (2009) forms key legislature underpinning the activities of the Marine Directorate, who are responsible for overseeing balanced and considerate marine development in Scottish waters. As one of the stakeholders, the Marine Directorate – Licensing Operations Team (MD-LOT) has been consulted throughout the 2023 and 2024 Scoping Opinions and its key requirements are adhered to by the Project. The Act also sets out powers to designate Marine Protection Areas (MPAs), including Historic MPAs.

16.2.1.13 Marine (Scotland) Act (2010)

The Act provides definition and means to apply the designation of Historic Marine Protected Areas (HMPA) in respect of historically significant areas within the marine zone, including wrecks formerly protected under the Protection of Wrecks Act (1973). The Marine (Scotland) Act (2010) supersedes the Protection of Wrecks Act (1973) in Scottish waters.

16.2.1.14 Historic Environment Scotland Act (2014)

The Act establishes Historic Environment Scotland (HES) as a regulatory body, outlines its functions, responsibilities, procedures and powers and makes minor amendments to the law relating to the historic environment. HES, as one

of the stakeholders, has been consulted throughout the 2023 and 2024 Scoping Opinions and its key requirements are adhered to by the Project.

16.2.2 Policy

This Section outlines key policy documents and how they have been considered within the context of the Project. The primary Policy documents consulted are listed below, with further detail provided where required.

- National and Regional Policy Requirements from the UK Marine Policy Statement (2011, updated 2020);
- Scotland's Fourth National Planning Framework (NPF4);
- Planning Advice Note 2 / 2011: Planning and Archaeology;
- Scottish Planning Policy (2014);
- Our Past, Our Future: The Strategy for Scotland's Historic Environment (2023);
- Scotland's National Marine Plan (2015); and
- Historic Environment Policy for Scotland (2019).

16.2.2.1 UK Marine Policy Statement (2011)

The UK Marine Policy Statement (2011, updated 2020) sets out high-level objectives for the marine space, including achieving a sustainable marine economy, and identifies a wide range of relevant marine uses. The Policy requires use of the marine environment and its resources to maximise sustainable activity, prosperity and opportunities for all.

The Marine Policy Statement (2011) represents one of the key documents underpinning the principle of sustainable development in the UK, informing consideration of marine archaeology in marine development and driving the purpose of this EIAR.

16.2.2.2 Scotland's Fourth National Planning Framework

Lays out a long-term spatial strategy with a comprehensive set of national planning policies to form part of the statutory development plan for Scotland. Revised draft policies of relevance to marine archaeology include:

- Policy 1: Tackling the Climate and Nature Crisis – "*When considering all development proposals significant weight will be given to the global climate and nature crises*"; and
- Policy 7: Historic Assets and Places.

Policy 7 includes several elements of relevance to marine archaeology within the context of the Project:

- *a) Development proposals with a potentially significant impact on historic assets or places will be accompanied by an assessment which is based on an understanding of the cultural significance of the historic asset and/or place. The assessment should identify the likely visual or physical impact of any proposals for change, including cumulative effects and provide a sound basis for managing the impacts of change. Proposals should also be informed by national policy and guidance on managing change in the historic environment, and information held within Historic Environment Records;*

- *d) Development proposals in or affecting conservation areas will only be supported where the character and appearance of the conservation area and its setting is preserved or enhanced. Relevant considerations include the: i. architectural and historic character of the area; ii. existing density, built form and layout; and iii. context and siting, quality of design and suitable materials;*
- *h) Development proposals affecting scheduled monuments will only be supported where: i. direct impacts on the scheduled monument are avoided; ii. significant adverse impacts on the integrity of the setting of a scheduled monument are avoided; or iii. exceptional circumstances have been demonstrated to justify the impact on a scheduled monument and its setting and impacts on the monument or its setting have been minimised;*
- *k) Development proposals at the coast edge or that extend offshore will only be supported where proposals do not significantly hinder the preservation objectives of Historic Marine Protected Areas;*
- *n) Enabling development for historic environment assets or places that would otherwise be unacceptable in planning terms, will only be supported when it has been demonstrated that the enabling development proposed is: i. essential to secure the future of an historic environment asset or place which is at risk of serious deterioration or loss; and ii. the minimum necessary to secure the restoration, adaptation and long-term future of the historic environment asset or place. The beneficial outcomes for the historic environment asset or place should be secured early in the phasing of the development, and will be ensured through the use of conditions and/or legal agreements; and*
- *o) Non-designated historic environment assets, places and their setting should be protected and preserved in situ wherever feasible. Where there is potential for non-designated buried archaeological remains to exist below a site, developers will provide an evaluation of the archaeological resource at an early stage so that planning authorities can assess impacts. Historic buildings may also have archaeological significance which is not understood and may require assessment. Where impacts cannot be avoided they should be minimised. Where it has been demonstrated that avoidance or retention is not possible, excavation, recording, analysis, archiving, publication and activities to provide public benefit may be required through the use of conditions or legal/planning obligations. When new archaeological discoveries are made during the course of development works, they must be reported to the planning authority to enable agreement on appropriate inspection, recording and mitigation measures.*

Additional elements of Policy 7 relate more widely to cultural heritage but are not specifically relevant to the scope of the Project and have therefore been omitted from the above list.

16.2.2.3 Planning Advice Note 2 / 2011: Planning and Archaeology

The Note is intended to inform the day-to-day work of local authority advisory services and other organisations that have a role in the handling of archaeological matters within the planning process. The Planning Advice Note 2 / 2011 outlines that all developments, whether on land or under water, should prioritise preservation *in situ* of archaeological remains, or adequate mitigation where this is not possible.

As such, the Note has played a key role in underpinning the embedded mitigation of the Project, in relation to marine archaeology.

16.2.2.4 Scottish Planning Policy (2014)

The Policy discusses how proposals for energy infrastructure development should take account of spatial frameworks for windfarms, where relevant. Considerations will vary relative to the scale but are likely to include:

- Net economic impacts;
- Scale of contribution to renewable energy generation;
- Effect on greenhouse gas emissions; and
- Impacts on historic environment.

Due to the nature of the Project, the Scottish Planning Policy (2014) underpins the requirement for consideration of impacts to the historic environment, including marine archaeology.

16.2.2.5 Our Past, Our Future: The Strategy for Scotland's Historic Environment (2023)

Our Past, Our Future: The Strategy for Scotland's Historic Environment (2023) replaced the former Historic Environment Strategy: Our Place in Time (2014). The new strategy is a high level document which sets out Historic Environment Scotland's (HES') key priorities for the historic environment, under their mission to 'Sustain and enhance the benefits of Scotland's historic environment for people and communities now and into the future'. Under this mission are priorities and principles. The three priorities are:

- Delivering the transition to net zero;
- Empowering resilient and inclusive communities and places; and
- Building a wellbeing economy.

These are underpinned by a series of principles, which include the drive to 'protect and promote our historic environment'. Through this principle in particular the chapter adheres to Our Past, Our Future: The Strategy for Scotland's Historic Environment (2023).

16.2.2.6 Scotland's National Marine Plan (2015)

The Plan provides a comprehensive overarching framework for all marine activity in Scottish waters. General Planning Principal (GEN) 6 relates to the historic environment:

"*Development and use of the marine environment should protect and, where appropriate, enhance heritage assets in a manner proportionate to their significance.*"

A key element of this Chapter concerns the assignation of a level of significance to Marine Archaeology receptors and appropriate mitigation measures to protect them.

The NMP was reviewed in 2018 and 2021 and an announcement was made in October 2022 on the development of the NMP2.

16.2.2.7 Historic Environment Policy for Scotland (2019)

The Historic Environment Policy for Scotland (2019) is designed to support and enable good decision-making regarding changes to the historic environment, setting out a series of principles and policies for recognition, care and sustainable management.

The Policy represents one of the key documents underpinning the principle of heritage preservation in Scotland, informing consideration of archaeology and heritage throughout the development process and driving the purpose of this Chapter.

16.2.3 Guidance

This sub-section outlines the wider industry guidance relating to marine archaeology. The below list has been curated to reflect the guidance cited by the 2024 Scoping Report and results of the baseline assessment. Whilst thematic guidance may not be applicable at the time of writing, this may become so later in the Project's lifetime with new archaeological discoveries. The primary guidance documents consulted are listed below, with further detail provided where required:

- Military Aircraft Crash Sites (English Heritage, 2002);
- Code of Practice for Seabed Development (Joint Nautical Archaeology Policy Committee, 2006);
- Historic Environment Guidance for the Offshore Renewable Energy Sector (Wessex Archaeology, 2007);
- Aircraft Crash Sites at Sea (Wessex Archaeology, 2008);
- Guidance for Assessment of Cumulative Impacts on the Historic Environment from Offshore Renewable Energy (COWRIE, 2008);
- Offshore Geotechnical Investigations and Historic Environment Analysis: Guidance for the Renewable Energy Sector (COWRIE, 2011);
- Assessing Boats and Ships 1860-1950 (Wessex Archaeology, 2011);
- Marine Geophysics Data Acquisition, Processing and Interpretation, Guidance Notes (English Heritage, 2013);
- Protocol for Archaeological Discoveries (PAD) (The Crown Estate, 2014);
- Historic Environment Scotland's (HES) Managing Change in the Historic Environment series;
- Scottish Government Planning Advice Notes, in particular 2 / 2011: Planning and Archaeology; Planning Advice Note; 1 / 2013: Environmental Impact Assessment (amended 2017); and Planning Circular 1 / 2017: Environmental Impact Assessment Regulations (2017);
- NatureScot and HES EIA Handbook (2018);
- HES Circular – Regulations and Procedures (2019);
- HES Designation Policy and Selection Guidance (2019);
- HES Our Place in Time Series – A Guide to Climate Change Impacts on Scotland's Historic Environment (2019);
- Standard and guidance for historic environment desk-based assessment (Chartered Institute for Archaeologists (CIfA), 2020);
- Archaeological Written Schemes of Investigating: Offshore Renewables Projects (The Crown Estate, 2021);
- Historic Marine Protected Areas (2021);
- Key Agencies Group National and Major Developments: An Agency Joint Statement on Pre-application Engagement (no date);
- Aberdeenshire Council Archaeology Service Strategy (2020-23);
- Our Past, Our Future (HES, 2023); and
- Scottish Archaeological Research Framework (no date).

16.2.3.1 Military Aircraft Crash Sites (English Heritage, 2002)

Guidance document relating to the identification and management of aircraft crash sites.

16.2.3.2 Code of Practice for Seabed Development (Joint Nautical Archaeology Policy Committee, 2006)

The Code provides guidance to developers relating to risk management and legislative implications of developing within the marine environment in the UK. It also outlines the responsibility of developers in protecting the UK's marine heritage.

16.2.3.3 Historic Environment Guidance for the Offshore Renewable Energy Sector (Wessex Archaeology, 2007)

A generic guidance note on the survey, and appraisal and monitoring of the historic environment during the development of offshore renewable energy projects in the UK. The guidance is applicable to the marine environment and the coastal environment adjacent to any development, encompassing the inter-tidal area, coastal margin and those areas further inland likely to be affected by offshore renewable energy developments.

16.2.3.4 Aircraft Crash Sites at Sea (Wessex Archaeology, 2008)

Guidance regarding the management and understanding of sites that include aviation remains within marine environments.

16.2.3.5 Guidance for Assessment of Cumulative Impacts on the Historic Environment from Offshore Renewable Energy (COWRIE, 2008)

A guidance note on the assessment of cumulative effects on the historic environment during the development of offshore renewable energy projects in the UK. The guidance is applicable to the marine environment and the coastal environment adjacent to any development, encompassing the inter-tidal area, coastal margin and those areas further inland likely to be affected by offshore renewable energy developments.

16.2.3.6 Offshore Geotechnical Investigations and Historic Environment Analysis: Guidance for the Renewable Energy Sector (COWRIE, 2011)

A guidance note on the aims of offshore geotechnical investigations and the resulting analysis undertaken during the development of offshore renewable energy projects in the UK. The guidance is applicable to the marine environment and the coastal environment adjacent to any development, encompassing the inter-tidal area, coastal margin and those areas further inland likely to be affected by offshore renewable energy developments.

16.2.3.7 Assessing Boats and Ships 1860-1950 (Wessex Archaeology, 2011)

Guidance on the assessment of shipwrecks from the mid-19th to mid-20th centuries.

16.2.3.8 Marine Geophysics Data Acquisition, Processing and Interpretation, Guidance Notes (English Heritage, 2013)

Guidance on the archaeological requirements for the acquisition, processing and interpretation of geophysical and hydrological data. Under review at the time of writing.

16.2.3.9 Protocol for Archaeological Discoveries (PAD) (The Crown Estate, 2014)

Guidance document relating to the reporting procedure of archaeological discoveries in the offshore environment.

16.2.3.10 HES Managing Change in the Historic Environment series

A series of guidance notes setting out key considerations when proposed development may affect a change to the historic environment, including historic buildings, scheduled monuments and historic landscapes.

16.2.3.11 Scottish Government Planning Advice Notes

A series of guidance notes providing good practice advice and other relevant information pertaining to a range of topics, including the historic environment. Of particular interest to this Chapter are notes: 2 / 2011: Planning and Archaeology; Planning Advice Note; 1 / 2013: Environmental Impact Assessment (amended 2017); and Planning Circular 1 / 2017: Environmental Impact Assessment Regulations (2017).

16.2.3.12 NatureScot and HES EIA Handbook (2018)

Document providing practical guidance and information relating to the EIA process, focussing on the management of natural and cultural heritage issues.

16.2.3.13 HES Circular – Regulations and Procedures (2019)

Document detailing the requirements of the secondary legislation relating to primary legislation laid out in:

- Ancient Monuments and Archaeological Areas Act (1979);
- Planning (Listed Buildings and Conservation Areas) (Scotland) Act (1997);
- Environmental Assessment (Scotland) Act (2005); and
- Marine (Scotland) Act (2010).

16.2.3.14 HES Designation Policy and Selection Guidance (2019)

Sets out the policy and selection guidance used by HES when designating historic sites and places at the national level.

16.2.3.15 HES Our Place in Time Series – A Guide to Climate Change Impacts on Scotland's Historic Environment (2019)

Guidance document intended to be used to identify and share climate change adaptation solutions, identifying the risks and hazards of climate change to the historic environment and suggesting responsive actions and measures to enhance resilience.

16.2.3.16 Standard and guidance for historic environment desk-based assessment (Chartered Institute for Archaeologists (CIfA), 2020)

A generic guidance note on the assessment of the historic environment during the development projects in the UK. The Code of Conduct guides the practices and standards for archaeological assessment both onshore and offshore.

16.2.3.16.1 Archaeological Written Schemes of Investigating: Offshore Renewables Projects (The Crown Estate, 2021)

Guidance on the range of archaeological methodologies that may be required as part of the initial investigation stages or the mitigation phase of offshore projects.

16.2.3.17 HES Historic Marine Protected Areas (2021)

Online document explaining what HMPAs are and HES' role in advising the Scottish Government in designating these areas.

16.2.3.18 Key Agencies Group National and Major Developments: An Agency Joint Statement on Pre-application Engagement (no date)

Statement setting out the principles governing the Key Agencies' commitment to effective and timely pre-application engagement with planning authorities and developers in relation to developments of national and major significance.

16.2.3.19 Aberdeenshire Council Archaeology Service Strategy (2020-23)

Strategic document aimed at helping manage and deliver key priorities of the Archaeology Service.

16.2.3.20 Our Past, Our Future (HES, 2023)

Sets out a national mission to sustain and enhance the benefits of Scotland's historic environment, for people and communities now and into the future.

16.2.3.21 Scottish Archaeological Research Framework

Provides a review of research into themes and periods of Scotland's history, identifying the current state of research, critical information sources, gaps in current knowledge and proposing approaches and methodologies to address these issues.

Themes of relevance to the Project include 'Marine and Maritime' and 'Palaeolithic and Mesolithic'.

16.3 Scoping and consultation

Stakeholder consultation has been ongoing throughout the EIA process and has played an important part in ensuring baseline characterisation and impact assessment are appropriate with respect to the Project and the requirements of regulators and their advisors.

The 2024 Scoping Report was submitted to MD-LOT in April 2024, relevant stakeholders were consulted. The Scoping Opinion was received in September 2024. The 2024 Scoping Report and Scoping Opinion supersedes the 2023 Scoping Report and Scoping Opinion for the Project. Relevant comments from the Scoping Opinion and other consultation specific to Marine Archaeology are provided in Table 16-2 below, which provides a high-level response on how these comments have been addressed within the EIAR. The stakeholders specific to Marine Archaeology comprise HES and Aberdeenshire Council's Archaeology Service.

The scope of HES' interest, as iterated in the 2024 Scoping Opinion, covers Scotland's designated heritage assets, including:

- World Heritage Sites;
- Scheduled Monuments and their settings;
- Category A Listed Buildings and their settings;
- Inventory Gardens and Designed Landscapes;
- Inventory Battlefields; and
- HMPAs.

The interest of Aberdeenshire Council's Archaeology Service covers the historic environment of Aberdeenshire, down to MLWS. In response to the 2024 Scoping Report, the interest in the Project was explicitly defined as the intertidal zone between MHWS and MLWS.

Further consultation has been undertaken throughout the pre-application phase. The list below summarises the consultation activities carried out relevant to Marine Archaeology:

- Stakeholder engagement – meeting with HES on 17th October 2024 to provide:
  - Project update;
  - Outline methodologies for baseline assessment and EIA in relation to Marine Archaeology;
  - High data coverage and any data gaps; and
  - Address previous HES comments provided through the Scoping Response; and
- Follow-up from stakeholder engagement meeting relating to the de-scoping of impacts to the Scheduled Monument of Boddam Castle (final HES response received by email on 10th December 2024).

Table 16-2 Comments from the Scoping Opinion relevant to Marine Archaeology.

CONSULTEE	COMMENT	RESPONSE
Aberdeenshire Council	Q1: Do you agree with the approach to characterising impacts to marine archaeological discoveries? A1: Yes.	Noted. Characterisation of impacts is detailed within Sections 16.5.1 and 16.5.2.
Aberdeenshire Council	Q2: Do you agree that direct impacts to onshore cultural heritage as a result of changes to their setting and impacts arising from decommissioning should be scoped out? A2: Yes.	Noted. Impacts scoped out of assessment for Marine Archaeology are detailed within Section 16.5.2.
Aberdeenshire Council	Q3: Do you agree that transboundary effects for marine archaeology, cultural heritage and geomorphology should be scoped out? A3: Yes (note this comment relates to marine archaeology and cultural heritage only).	Noted, however, subsequent review of data highlighted a potential for transboundary impacts, therefore acknowledgment was made. Transboundary impacts for Marine Archaeology are detailed within Section 16.9.
Aberdeenshire Council	Q4: Do you agree that the geophysical surveys listed in Table 15-4 and detailed in Table 5A-2 of appendix 5A is sufficient inform the baseline? A4: Assuming that this refers to Table 1-2 of appendix 5A, not table 5A-2, then yes, fine.	Noted. Surveys used for the Marine Archaeology assessment are detailed within Section 16.4.3.
Aberdeenshire Council	Q5: Do you agree that the potential impacts and receptors resulting from the project have been identified for marine archaeology, cultural heritage and geomorphology? A5: Yes (note this comment relates to marine archaeology and cultural heritage only).	Noted. Characterisation of impacts and receptors is detailed within Sections 16.6 to 16.9.
Aberdeenshire Council	Q6: Do you think any additional data sources or guidance needs to be considered? A6: Local Authority Historic Environment Record (HER) data is missing from the current list data sources, but should be included.	Aberdeenshire HER data acquired and assessed as part of Vol. 4, Appendix 28: Marine Archaeology Baseline Report. Results fed through to Section 16.4.
Aberdeenshire Council	Q7: Do you have any additional specific requirements for the assessment methodology? A7: No.	Noted. Assessment methodology for Marine Archaeology is presented within Section 16.5.
Historic Environment Scotland	We did not agree with the applicant's approach to scope out a marine survey as part of the project, and we recommended that mitigation should be embedded into the scheme, rather than applied only if discoveries were made during works. We also	Other data desk-based data was acquired which, in addition to the NorthConnect project data, was cumulatively used to inform up-to-date assessment of

CONSULTEE	COMMENT	RESPONSE
	provided further advice on the applicant's approach to formulating an appropriate Written Scheme of Investigation (WSI) and Protocol for Archaeological Discoveries (PAD), and the application of appropriate buffer zones.	Marine Archaeology. A verification survey undertaken between MHWS and 12 NM was used to update the NorthConnect results. HES approved this approach during consultation. Details of the coverage, composition and accumulation of various data and their efficacy can be found in Section 16.4 and in Vol. 4, Appendix 28: Marine Archaeology Baseline Report. Embedded mitigation has been enhanced on the basis of the baseline results. A suite of industry-standard mitigation strategies has been established, including provision of WSI/PAD, exclusion zones and archaeological involvement in future surveys (list not exhaustive). Further detail for embedded mitigation can be found in Section 16.5.4 and throughout Vol. 4, Appendix 27: Written Scheme of Investigation and PAD.
Historic Environment Scotland	We recommend that mitigation include a Written Scheme of Investigation (WSI) and Protocol for Archaeological Discoveries (PAD) embedded in the project. Archaeological Exclusion Zones (AEZs) should be established where appropriate.	A suite of industry-standard mitigation strategies has been established, including provision of WSI/PAD, exclusion zones and archaeological involvement in future surveys (list not exhaustive). Embedded mitigation is applicable throughout all phases of the Project, unless amended through agreement with stakeholders. Further detail for embedded mitigation can be found in Section 16.5.4 and throughout Vol. 4, Appendix 27: Written Scheme of Investigation and PAD.
Historic Environment Scotland	As part of the revised proposal considered in this Scoping, the applicant now proposes to utilise infrastructure associated with the consented NorthConnect project (MS	Noted (see Section 16.1 for NorthConnect project integration overview).

CONSULTEE	COMMENT	RESPONSE
	Reference: 06771). We responded to the marine licence application in October 2018 noting that we did not object to the proposed subsea cable.	
Historic Environment Scotland	The scheduled monument SM3252 Boddam Castle extends into the intertidal zone of the study area for the proposals. Further information regarding the potential impacts on the monument and its consideration in the scoping assessment is included below. In terms of onshore cultural heritage assets, Table 15-6 shows consideration of setting impacts and appropriate conclusions are drawn. However, potential indirect impacts to onshore cultural heritage assets are not considered in the Scoping Report. As noted above, the scheduled monument SM3252 Boddam Castle extends into the intertidal zone and lies within the study area. This is a ruinous structure which could be vulnerable to impact by vibration. Works at landfall as outlined above have the potential to have an indirect impact on this monument and we recommend it is included in assessment for all development phases.	Data reviewed to inform the baseline assessment indicate that the curtilage of the Scheduled Monument entirely lay above MHWS. During the stakeholder meeting with HES on 17th October 2024, agreement for the de-scoping of Boddam Castle from the Marine Archaeology scope was sought on the basis that this asset lay within the onshore sector and was assessed by the onshore archaeology impact assessment (acquired from the NorthConnect project – NorthConnect, 2018). Further relevant information was subsequently provided to HES on the 9th December 2024, including the distance between the SM and Project activities causing vibration, the nature of those activities and consideration by technical experts. Following review of the available data, HES have agreed to scope out impacts to Boddam Castle through vibration arising from the Project on the 10th December 2024.
Historic Environment Scotland	Although the general approach and consideration of relevant legislation and guidance proposed for the Desk-based Assessment is appropriate, we recommend that reference is made to additional sources.	Appropriate legislation, policy and guidance have been adhered to throughout the baseline and impact assessments. The final list has been enhanced following Scoping. Further detail can be found in Section 16.2 and Vol. 4, Appendix 28: Marine Archaeology Baseline Report.

CONSULTEE	COMMENT	RESPONSE
Historic Environment Scotland	In addition to Canmore offshore data, UKHO, HES and local HER data, we recommend the follow sources are included in the assessment: Marine Environmental Data Information Network at http://www.oceannet.org/; Strategic Environmental Assessments for offshore at http://www.offshoresea. org.uk/site/scripts/seaarchive .php. Additional relevant information may be found on specialist websites such as https://www.uboat.net/.	All recommended further sources were consulted and relevant data included in Sections 7.0 to 11.0 of Vol. 4, Appendix 28: Marine Archaeology Baseline Report. The results of the baseline assessment are set out within Section 16.4.
Historic Environment Scotland	We note that the applicant is working collaboratively with NorthConnect Ltd and only one set of infrastructure will be required within 12 Nautical Miles (NM) of the coast. The relevant area has previously been assessed by NorthConnect Ltd as part of the NorthConnect project, and the applicant therefore proposes to scope this area out of the assessment. We do not agree with this approach. We note that works proposed as part of the Cenos development exceed those already consented for NorthConnect, for example the Horizontal Deep Drilling and boreholes outlined in Section 3.5.5.8 Landfall. An assessment should be made for all areas where new works relating to the present development are proposed. Although it is appropriate to use existing data for this assessment, any changes to baseline information since the assessment by NorthConnect should also be considered.	The full proposed area of the Project and Study Area have been subjected to a review of relevant and up-to-date data as the basis of the baseline assessment. This included a review of the geophysical data collected as part of the NorthConnect project between MHWS and 12 NM and the results of the verification survey undertaken by the Project (Section 16.4).
Historic Environment Scotland	Table 1-5 in the Appendices indicates that multibeam echosounder and dual swathe bathymetry and backscatter survey were planned for March 2024, with the aim of providing comparisons with existing information to re-validate the data. Marine physical processes include a cycle of burial and exposure which may necessitate additional survey should notable changes have occurred. Desk-based sources should also be assessed for updates and additions.	Verification survey and other desk-based sources have been consulted to inform Vol.4, Appendix 28: Marine Archaeology Baseline Report. Vol. 2, Chapter 8: Marine Geology, Oceanography and Coastal Processes was consulted to inform possible changes to the Marine Archaeology baseline. An up-to-date assessment of the Marine Archaeology baseline was conducted for Vol. 4, Appendix 28: Marine Archaeology Baseline Report, using the most recent datasets from desk-based

CONSULTEE	COMMENT	RESPONSE
		sources, Project-acquired geophysical data and the results of verification survey from MHWS to 12 NM, in addition to the NorthConnect data. The results of the baseline assessment are set out within Section 16.4.
Historic Environment Scotland	Table 15-6 further summarises potential significant effects for marine cultural heritage and archaeology. Direct and indirect impacts are scoped in as appropriate for Construction and Operation & Maintenance phases. At Decommissioning stage, overview comments in Table 15-6 state that 'it is possible that best practice measures, such as Protocol for Archaeological Discovery (PAD) or WSI will be required to ensure that very minor additional disturbance can be more fully mitigated'. However, outcome of scoping indicates no effect at Decommissioning phase. For clarity, we recommend potential significant impacts are scoped in at all phases.	All identified potential significant effects are scoped in for all phases of the Project (Section 16.6).
Historic Environment Scotland	The proposed mitigation provided is not sufficient for our interests. We welcome that impacts on marine archaeology and submerged landscapes will be avoided where feasible. However, more information is required to clarify the approach proposed and mechanisms to be employed to deliver these mitigations. In addition, no mitigation is proposed for archaeological discoveries.	A suite of industry-standard mitigation strategies has been established, including provision of WSI/PAD, exclusion zones and archaeological involvement in future surveys (list not exhaustive). Embedded mitigation is applicable throughout all phases of the Project, unless amended through agreement with stakeholders. Further detail for embedded mitigation can be found in Section 16.5.4 and throughout Vol. 4, Appendix 27: Written Scheme of Investigation and PAD. Unknown/unidentified archaeological remains have been identified as a Marine Archaeology receptor and assessed for impacts, accordingly. The likelihood for and potential character of hitherto unidentified remains has

CONSULTEE	COMMENT	RESPONSE
		been examined in Sections 7.0 to 13.0 of Vol. 4, Appendix 28: Marine Archaeology Baseline Report with a summary presented by Section 14.0. The impact assessment for potential archaeological remains is presented within Sections 16.6 to 16.9 of this Chapter.
Historic Environment Scotland	We recommend that mitigation include a Written Scheme of Investigation (WSI) and Protocol for Archaeological Discoveries (PAD) embedded in the project. Archaeological Exclusion Zones (AEZs) should be established where appropriate.	Detailed embedded mitigation measures are presented in Section 16.5.4, including AEZs and the implementation of a WSI and PAD.
Historic Environment Scotland	Post-scoping engagement: presentation of Project's responses to HES' 2024 Scoping Opinion.	Generally accepted by HES without further comment. Exceptions detailed below.
Historic Environment Scotland	Post-scoping engagement: the Scheduled Monument of Boddam Castle has been found to lie beyond the scope of the Project. Request that HES agree to descope from the Marine Archaeology assessment.	Following review of the available data, HES have agreed to scope out impacts to Boddam Castle (see above in Table 16-2 for further detail).
Historic Environment Scotland	Post-scoping engagement: HES asked if any further surveys will be undertaken within the Nearshore EICC.	Verification survey of the Nearshore EICC was undertaken in 2024 (Section 16.4.3).
Historic Environment Scotland	Post-scoping engagement: HES recommend careful consideration of previous projects and their differing stages of progression.	Detailed cumulative effects assessment is presented in Section 16.7.

16.4 Baseline characterisation

This Section outlines the current baseline for Marine Archaeology within the Study Area. The baseline assessment is informed by the results of EIAR Vol. 4, Appendix 28: Marine Archaeology Baseline Report. The Marine Archaeology Baseline Report was itself informed by a range of desk-based sources, survey data acquired for the Project and survey reports prepared for the NorthConnect project (MMT, 2018). The sources consulted are presented in further detail in Section 16.4.2.

16.4.1 Study Area

The Marine Archaeology Study Area is defined by a buffer of 5 km as measured from the Project boundary. This buffer size was opted for at Scoping as it is considered large enough to accommodate all Project seabed impacts and likely to also include the extent of potential indirect impacts to Marine Archaeology assets / receptors. On review of EIAR Vol. 2, Chapter 8: Marine Geology, Oceanography and Coastal Processes, the existing 5 km Study Area was found to sufficiently accommodate all potential indirect impacts arising from the Project.

The Marine Archaeology temporal scope is defined as the entire lifetime of the Project including construction, operation and maintenance and decommissioning.

This Chapter, and EIAR Vol. 4, Appendix 28: Marine Archaeology Baseline Report, consider the EICC in two parts to better examine, describe and assess those parts of the EICC surveyed for different projects. Therefore, the "nearshore EICC" relates specifically to the part of the EICC from MHWS to 12 NM surveyed for the NorthConnect project and the reports and processed data which were subject to archaeological assessment by the Project. The nearshore EICC was also surveyed to validate the NorthConnect data by the Project. The "offshore EICC" relates to the remainder of the EICC, beyond 12 NM, surveyed specifically for the Project.

16.4.2 Data sources

The existing data sets and literature with relevant coverage to the Project, which have been used to inform the baseline characterisation for Marine Archaeology are outlined in Table 16-3. Project specific data obtained and used to inform this topic assessment are presented in Section 16.4.3.

Table 16-3 Summary of key datasets and reports

TITLE	SOURCE	YEAR	AUTHOR	COVERAGE OF DATA
Designated heritage assets	Historic Environment Scotland (https://portal.historicenvironment.scot/apex/f?p=PORTAL:downloads:::::DATASET:ALL)	August 2024	HES	Scotland and Scottish waters up to UK EEZ

TITLE	SOURCE	YEAR	AUTHOR	COVERAGE OF DATA
Wrecks and Obstructions	United Kingdom Hydrographic Office (https://datahub.admiralty.co.uk/portal/apps/sites/#/marine-data-portal/search?tags=GlobalWrecks)	August 2024	UKHO	Worldwide (except Antarctica)
Non-designated heritage assets	Canmore (https://canmore.org.uk/content/data-downloads)	August 2024	Canmore	Scotland and Scottish waters up to UK EEZ
	Aberdeenshire Historic Environment Record (https://online.aberdeenshire.gov.uk/smrpub/)	September 2024	Aberdeenshire HER	Aberdeenshire down to MLWS
Marine geology, geotechnical data and publicly accessible shipwrecks	Marine Environmental Data and Information Network (https://portal.medin.org.uk/portal/start.php)	August 2024	MEDIN	British territorial waters and UK EEZ
Offshore geology and geotechnical data	British Geological Survey (BGS) GeoIndex Offshore (https://mapapps2.bgs.ac.uk/geoindex_offshore/home.html?_ga=2.134597047.712401882.1687954764-1795206005.1687954764)	August 2024	BGS	British territorial waters and UK EEZ
The geology of the central North Sea. United Kingdom offshore regional report	BGS TextViewer (https://webapps.bgs.ac.uk/Memoirs/docs/B01846.html)	1994	Gatliff *et al.*	Scottish coast (MHWS) to limit of British EEZ (west to east); 55°N to 58°N (south to north; reaches only 57°30'N to the west of 0°).
EMODnet Geology Map viewer	European Marine Observation and Data Network (EMODnet) (https://www.emodnet-	September 2024	EMODnet	Most of Europe's coastline, with greater detail in the North Sea,

TITLE	SOURCE	YEAR	AUTHOR	COVERAGE OF DATA
	geology.eu/map-viewer/?p=submerged_landscapes)			Western Approaches, the Aegean Sea, Adriatic Sea and northwest Black Sea. Also, data for northwest coast of Russia and parts of the Egyptian and Tunisian coastlines.
The palaeogeography of Northwest Europe during the last 20,000 years	Journal of Maps (https://www.tandfonline.com/doi/abs/10.4113/jom.2011.1160)	2011	Brooks *et al.*	British waters up to UK EEZ (extending into neighbouring EEZs)
Relative sea-level changes and crustal movements in Britain and Ireland since the Last Glacial Maximum	Quaternary Science Reviews (https://www.sciencedirect.com/science/article/abs/pii/S0277379118300040)	2018	Shennan *et al.*	Britain, British territorial waters and UK EEZ
Export Cable Corridor Geophysical Results Report	Rovco Ltd.	2024	Rovco Ltd.	Offshore EICC
Offshore Wind Farm Geophysical Results Report	Rovco Ltd.	2024	Rovco Ltd.	Array Area
NorthConnect Archaeological Report	NorthConnect	2018	MMT	Nearshore EICC
NorthConnect Geotechnical Report	NorthConnect	2018	MMT	Nearshore EICC

TITLE	SOURCE	YEAR	AUTHOR	COVERAGE OF DATA
NorthConnect Final Survey Report	NorthConnect	2018	MMT	Nearshore EICC

16.4.3 Project site-specific surveys

Project-specific geophysical surveys were conducted in 2023 in two blocks:

- Array Area (Rovco Ltd, 2024a); and
- EICC – extending seaward from 12 NM into and overlapping part of the Array Area (Rovco Ltd, 2024b).

The geophysical survey within the Array Area and offshore EICC acquired Magnetometer, Multibeam Bathymetry (MBES), Sidescan Sonar (SSS), Parametric Sub-bottom Profiler (SBP) and two-dimensional (2D) and three dimensional (3D) seismic survey data. The results and interpretations were reviewed, and the raw data analysed to inform EIAR Vol. 4, Appendix 28: Marine Archaeology Baseline Report.

In addition, archaeological, geotechnical and geophysical survey reports (MMT, 2018a, 2018b and 2018c, respectively) prepared for the NorthConnect project were reviewed, covering the nearshore EICC. The geophysical survey within the nearshore EICC acquired Magnetometer, MBES, SSS, and SBP data. The results and interpretations were reviewed to inform the baseline assessment. Noting that only the processed data and interpretations were available.

In 2024, a verification survey was undertaken within the nearshore EICC, comprising the acquisition of MBES data along a 150 m wide corridor from MHWS to 12 NM (EIAR Vol. 4, Appendix 10 – Environmental Baseline and Habitat Assessment Report – Inshore EICC), to help identify any changes to the seabed since the acquisition of the NorthConnect survey data and to address stakeholder concerns (see Table 16-2).

16.4.4 Existing baseline

This Section contains a summary of the archaeological baseline and sensitivity of the assets identified within the Study Area. It is split into the following sections:

- Summary of known heritage assets (designated and non-designated);
- Submerged prehistory and palaeolandscapes;
- Coastal and maritime archaeology; and
- Aviation archaeology.

Full discussion of each topic is set out within EIAR Vol. 4, Appendix 28: Marine Archaeology Baseline Report with the key points summarised here.

16.4.4.1 Designated heritage assets

Designated asset data were acquired from the sources presented in Table 16-3. Designated heritage assets in Scotland comprise:

- World Heritage Sites;
- Scheduled Monuments;
- Category A, B or C Listed Buildings;
- Inventory Gardens and Designed Landscapes;
- Inventory Battlefields;
- Historic Marine Protected Areas;
- Conservation Areas; and
- Properties in Care.

There are no designated marine heritage assets within the Study Area, including Scheduled Monuments, Historic Marine Protected Areas or wrecks designated under the Protection of Military Remains Act 1986. Stakeholder feedback received from HES in the Scoping Opinion (Table 16-2) has suggested that part of the Scheduled Monument curtilage of Boddam Castle (SM3252) extends into the intertidal zone (and therefore the Study Area), however, analysis of available data for the baseline assessment (derived from the HES publicly-available online resource) suggests this is not the case (Figure 16-1).

Conservation Areas are designated by local planning authorities under the Planning (Listed Buildings and Conservation Areas) (Scotland) Act 1997 and can play an important role in environmental enhancement, economic and community regeneration. The designation process examines areas of special architectural and / or historic interest and may include public consultation. Small parts of three Conservation Areas lie within the Study Area (all beyond the EICC and Array Area), where these extend below MHWS:

- Peterhead Roanheads (Designation Ref: CA426);
- Boddam (Designation Ref: CA428); and
- Port Errol Cruden Bay (Designation Ref: CA429).

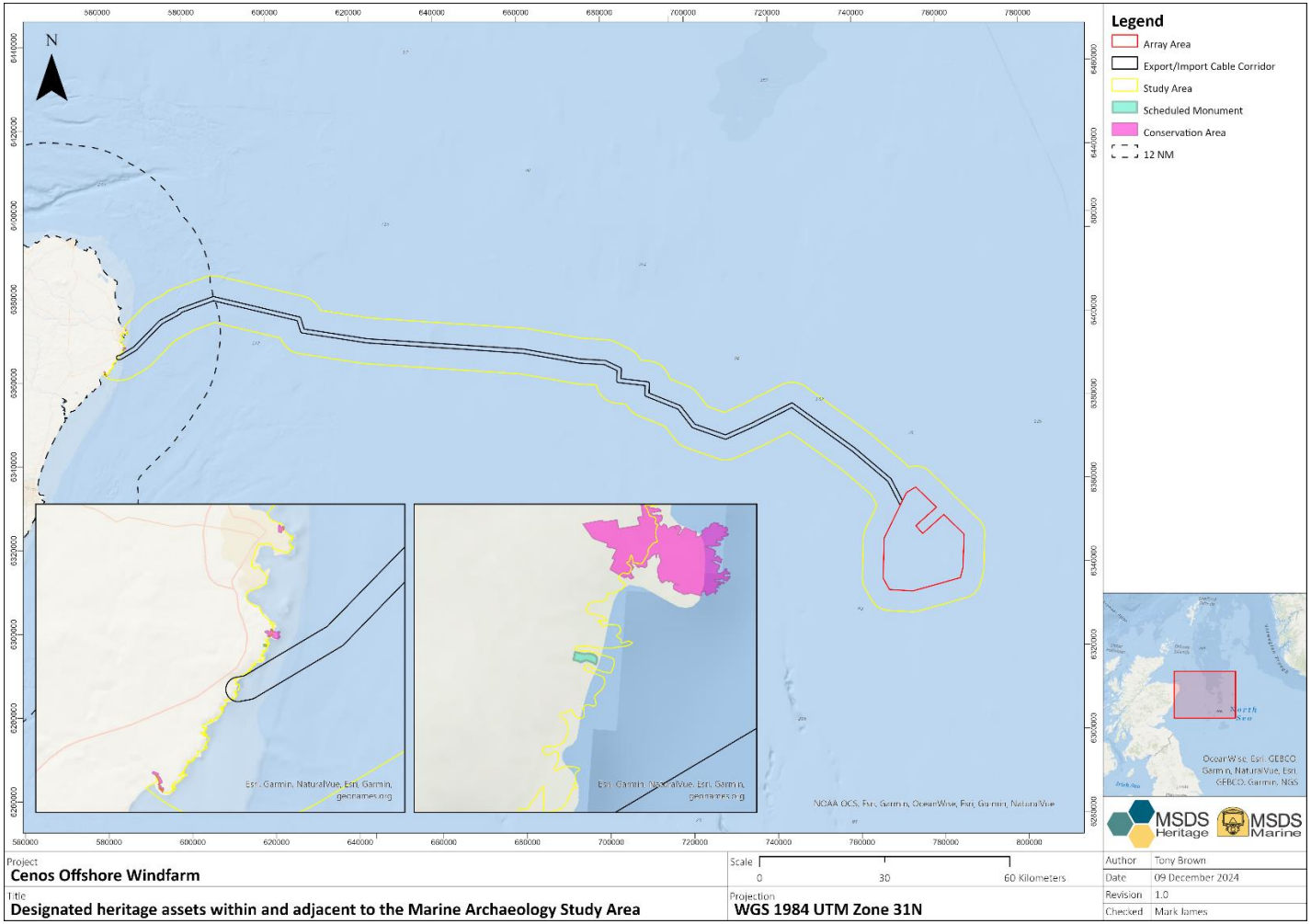

Figure 16-1: Designated heritage assets within and adjacent to the Marine Archaeology Study Area

16.4.4.2 Non-designated heritage assets

Non-designated heritage assets comprise assets often of regional or local importance. Whilst they have the potential to contribute to understanding of the past, they have not been considered of the highest value to be formally designated under national policy.

Non-designated asset data was acquired from the sources presented in Table 16-3. United Kingdom Hydrographic Office (UKHO) data, which is often supported by survey and targeted inspection results and therefore more likely to represent known remains, is discussed here. Additional historic environment data, such as documented loss locations, often more speculative in the marine zone, is discussed alongside coastal and maritime archaeology (Section 16.4.4.4). It is worth noting that not all UKHO records relate to remains of archaeological interest this includes discarded modern fishing gear, and 'lifted' or 'dead' wreck positions which may no longer relate to physical remains at a location.

Three UKHO records that have been identified within the Study Area are illustrated in Figure 16-2:

- One UKHO record (W_037; UKHO ID: 2493) within the Array Area;
- One UKHO record (W_047; UKHO ID: 2267) within the nearshore EICC; and
- One UKHO record (W_038; UKHO ID: 2526) within the offshore EICC.

Furthermore, one UKHO record (W_015; UKHO: 2364), though situated slightly outside of the nearshore EICC, has been shown through the geophysical review to relate to a wreck which extends into the EICC.

The UKHO record within the Array Area represents the wreck of the German submarine U-74 (Figure 16-2; W_037). The record notes that the wreck was last identified here by a diver sighting in 2008 and measurements are included, although it is also noted as a 'dead' position, meaning it could not be relocated after the initial sighting. No geophysical anomaly was detected at this position during Project-specific survey, the closest being one of low archaeological potential *c.* 600 m to the south. The UKHO position correlates with a Canmore record (ID: 322077), though two additional records and differing locations are provided by Canmore for the same wreck. The most likely position of U-74 is recorded outside of Dunbar Harbour, East Lothian, relating to a 'live' UKHO record (ID: 2896; sighted by a diver in 2008). Further detail is provided in Section 11.5 and Appendix B of **EIAR Vol. 4, Appendix 28: Marine Archaeology Baseline Report.**

One UKHO record within the nearshore EICC represents the wreck of the *Zitella*, a British-flagged steamship stranded in Longhaven Bay in 1940 (Figure 16-2; W_047). The UKHO considers this a 'live' location, however, it does not record subsequent observations or detections. An Historic Environment Record (HER) entry exists for this wreck, although no details of its condition or physical remains are given. No indication of the wreck is given by publicly available aerial and satellite imagery. It is therefore unclear if physical remains of the *Zitella* are present at the UKHO-given position and the NorthConnect nearshore data did not cover the position.

The additional wreck relating to a UKHO record beyond the Project Area but found to extend into the nearshore EICC (Figure 16-2; W_015) represents an unknown vessel, detected in 1983. The wreck relating to this record was found to extend into the nearshore EICC through the geophysical data review (of NorthConnect survey data) and has also been identified as a high potential geophysical anomaly.

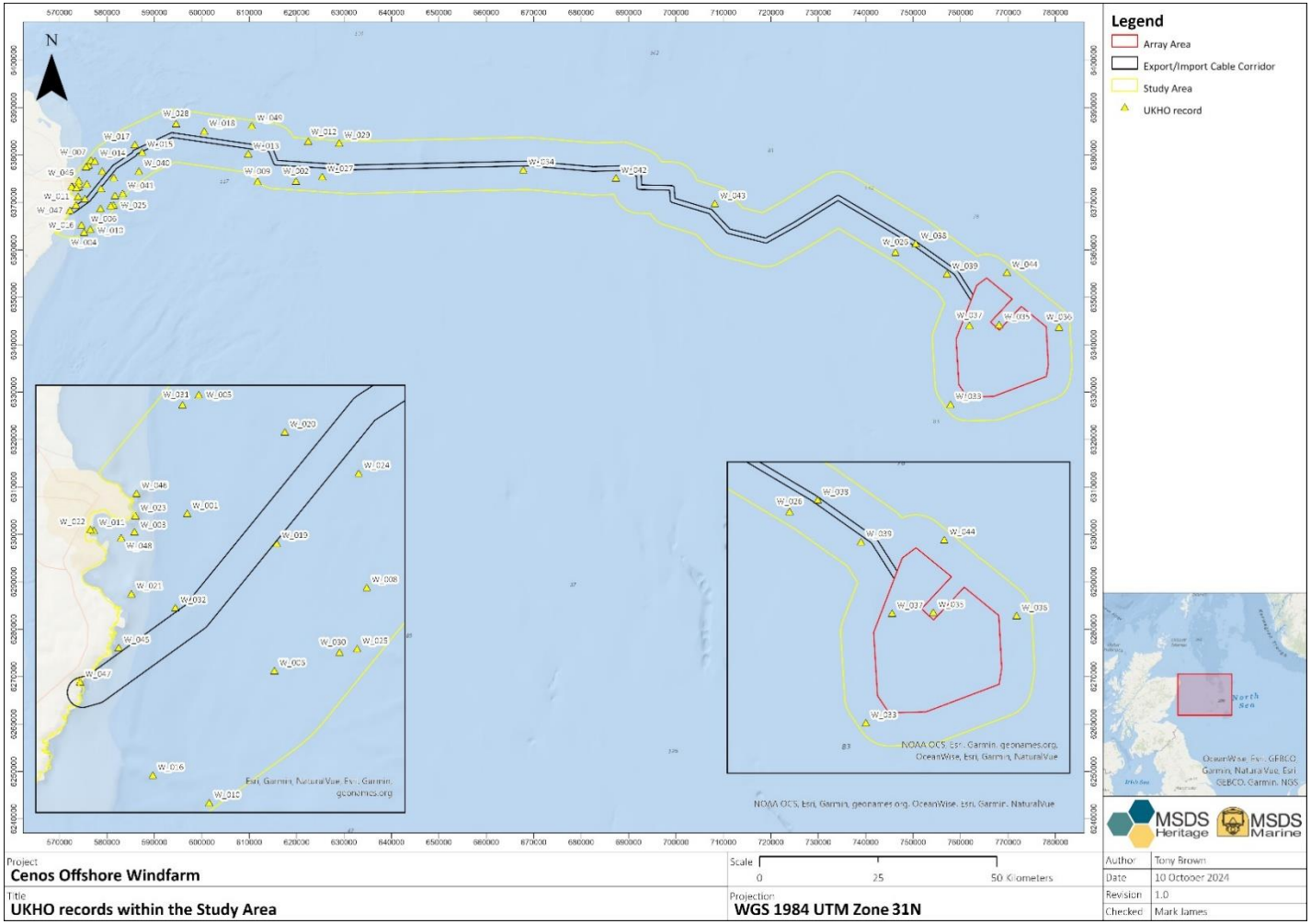

Figure 16-2 UKHO records within the Study Area

One UKHO record within the offshore EICC represents an unknown wreck detected in 1993 (Figure 16-2; W_038). This record also correlates with an identified high potential geophysical anomaly.

There are an additional 45 UKHO records within the Study Area, relating to wrecks and obstructions:

- Thirty records of wreck, comprising:
  - Twenty-two 'live' positions;
  - Five 'dead' positions;
  - Three 'lifted' positions;
- Ten records of foul ground, comprising:
  - Eight 'live' positions;
  - One 'dead' position;
  - One 'not fully surveyed' position; and
- Five as undefined.

Twenty-nine UKHO records lie within the nearshore EICC, exhibiting a generally irregular distribution, although a slight concentration is noted around Peterhead Bay. There are 15 records within the offshore EICC, with a slight concentration closer to the 12 NM boundary. Five records lie within the Array Area, demonstrating no discernible pattern. The distribution of records suggests a higher potential for wreck and foul ground within the nearshore EICC and closer part of the offshore EICC.

16.4.4.3 Submerged or prehistoric landscapes

The British Isles have been affected by several glacial events over the last million years, including the Anglian (480,000 to 430,000 BP), the Wolstonian (350,000 to 132,000 BP) and the Devensian (122,000 to 11,700 BP), as well as intervening marine transgressions, all of which have influenced the palaeolandscape and archaeological potential of the Study Area (RFN, 2024).

The Study Area experienced multiple phases of advance and retreat of the British-Irish Ice Sheet and associated marine regression and transgression. The patterns of glaciation were complex and the interpretation of glacial extents in different periods remains a dynamic and evolving field of scholarship. These large-scale events have influenced the geomorphology, geology and archaeological potential of the landscape (Brooks *et al*, 2011; Shennan *et al*, 2018).

A total of 15 Quaternary geological units were identified or postulated within the Study Area. The units are summarised in Table 16-4 and comprise a sequence of primarily glaciomarine and marine deposits, incisions and channel infills capped by recent seabed sediments.

Units within the Array Area and offshore EICC have been tentatively correlated with geological formations and members and have not been confirmed by the results of project-specific geotechnical investigation (Rovco, 2024a). SBP data obtained in the nearshore EICC by the NorthConnect project was correlated with geotechnical investigation undertaken here, however, this was limited by the shallow penetration and limited recovery of samples from the geotechnical activities (NorthConnect, 2018).

Environmental conditions, as inferred by the composition and depositional environments of identified geological units and sea level data and modelling, are a key consideration for determining archaeological potential. Other regional and national considerations have also informed the potential. Several stages of the Pleistocene have yet to produce any evidence of hominin activity in Britain and, in correlation with climate and environmental conditions, it is widely accepted by the current scholarship that hominins were not present during these periods:

- 460,000 to 400,000 BP (representing parts of Marine Isotope Stage (MIS) 12 to 11; Anglian and Hoxnian stages. Hominin remains have been attributed to other parts of these stages, i.e. *homo heidelbergensis* remains at Swanscombe, Kent, dated to *c*. 380,000 BP (MIS 11));
- 180,000 to 60,000 BP (MIS 8 to 4; Wolstonian, Ipswichian and Early Devensian stages); and
- 25,000 to 18,000 BP (MIS 2; Late Devensian stage).

Furthermore, no securely dated evidence of human activity has been recorded within a Scottish context pre-dating *c*. 12,000 BP (Saville and Ballin, 2009).

The units within the Study Area (provisional and confirmed) inform the archaeological and palaeoenvironmental potential. Most of the identified units represent glaciomarine or temperate marine deposits, laid down in environments unsuitable for hominin occupation and therefore holding a very low potential for archaeological remains. Glacial deposits (represented by the Wee Bankie Formation) likewise were laid down during hostile climatic conditions and therefore have a very low archaeological potential.

Sea level and glacial modelling (Brooks *et al*, 2011; Shennan *et al*, 2018) suggest that the Project Area lay beneath glacial ice during the Anglian, Wolstonian and Devensian glaciations and had transitioned to a fully marine environment by 18,000 BP at the latest (with some slightly later transgression along a thin strip adjacent to the present coastline possible). Correlation of the modelling with the archaeological resource in Scotland and the central North Sea suggests a very low potential for hominins to have occupied the Project Area.

There are no known prehistoric sites or findspots within the Study Area. There is potential for prehistoric remains to be contained within secondary contexts, where their primary, sub-aerial deposits have been eroded by subsequent hydrodynamic and / or glacial processes, though any such remains are likely to be highly dispersed and difficult to quantify.

Marine deposits have a broadly limited potential to hold palaeoenvironmental evidence with which to inform palaeolandscape reconstruction. Basal Coal Pit Formation deposits (basal horizon identified as H40 within the Array Area; Figure 16-3) have been found elsewhere to contain wood fragments which may be used to provide dating evidence and inform understanding of the development chronology of this Formation. Accordingly, a slightly greater potential for palaeoenvironmental evidence within lower parts of the Coal Pit Formation has been identified within the Array Area and offshore EICC, particularly within the tunnel valleys identified within the central and northern parts of the former (Figure 16-3). Furthermore, a slight potential may exist for upper elements of the Coal Pit Formation, which have been sampled from a borehole further north from the Project Area and found to contain evidence of intertidal conditions tentatively attributed to the Hoxnian interglacial. The current evidence suggests that this intertidal zone did not reach as far south as the Project Area and Hoxnian deposits have proven difficult to date from onshore Scottish contexts, therefore the overall likelihood of encountering and defining such within the Project Area is low.

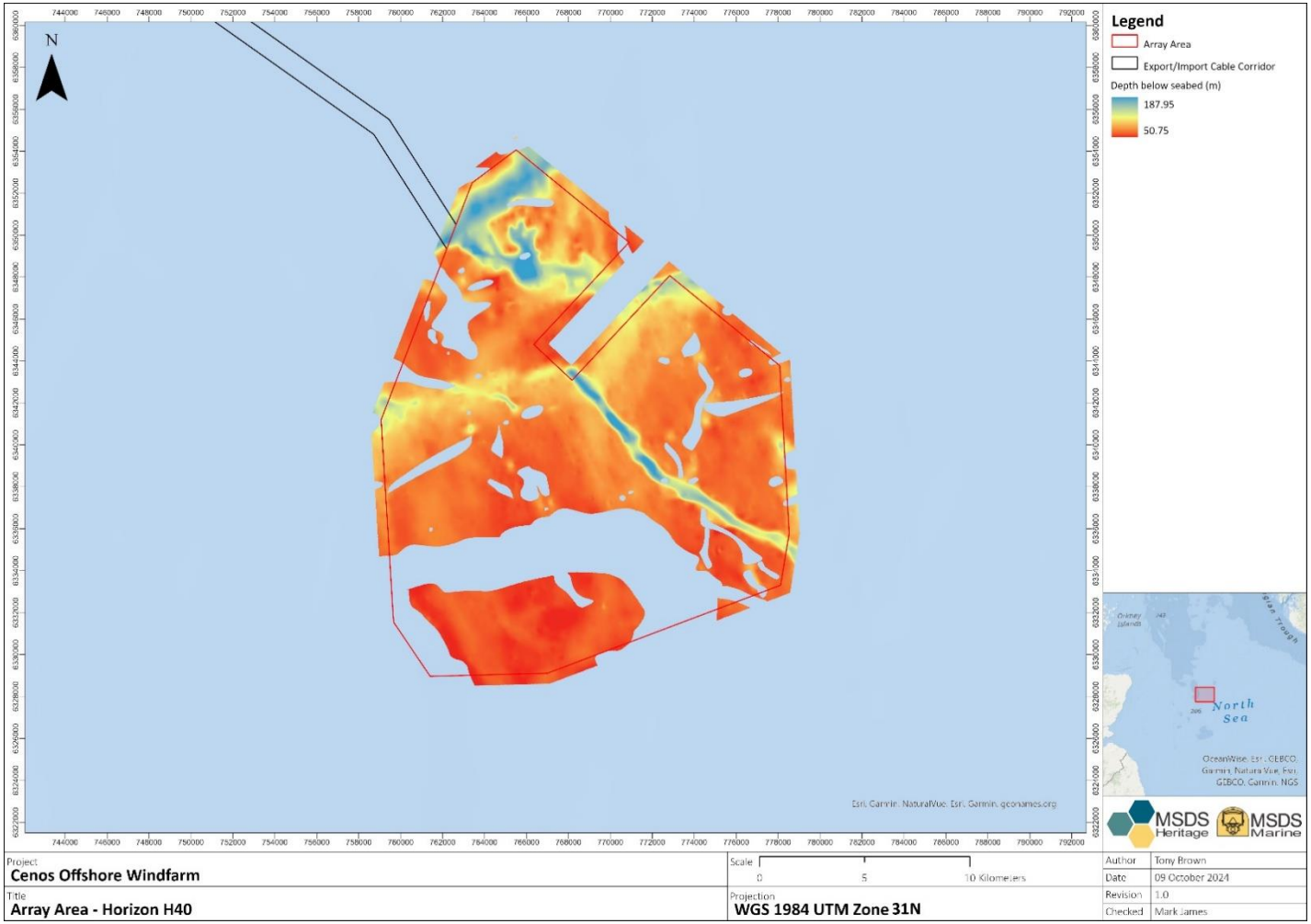

Figure 16-3 Array Area - Horizon H40

Table 16-4 Description and distribution of identified geological units

FORMATION / MEMBER	LITHOLOGY	DEPOSITIONAL ENVIRONMENT	AGE	MARINE ISOTOPE STAGE (MIS)	IDENTIFIED IN	ARCHAEOLOGICAL POTENTIAL	PALAEOENVIRONMENTAL POTENTIAL
Surficial sediments	Clayey, silty sand, with occasional gravel and isolated to scattered cobbles and boulders.	Marine.	Holocene; 11,700 BP to Present	1	Array Area, nearshore and offshore EICC	Very low	Negligible
Witch Ground Formation (upper facies)	Very loose to loose, slightly gravelly to gravelly, clayey sand, with layers of gravel, clay and silt.	Marine.	Holocene; 11,700 BP to Present	1	Nearshore EICC	Very low	Negligible
Witch Ground Formation (lower facies)	Very soft to soft, slightly sandy to very sandy, occasionally silty clay, with layers of sand.	Cool to temperate marine.	Holocene; 11,700 BP to Present	1	Nearshore EICC	Very low	Negligible
Witch Ground Formation (undifferentiated)	Clays, fine sands and silts.	Glaciomarine to temperate marine.	Holocene; 11,700 BP to Present	1	Offshore EICC	Very low	Negligible
Whitehorn Member (Forth Formation)	Clayey, silty sands, with occasional gravel and isolated to scattered cobbles and boulders.	Shallow marine.	Holocene; 11,700 BP to Present	1	Array Area	Very low	Negligible

FORMATION / MEMBER	LITHOLOGY	DEPOSITIONAL ENVIRONMENT	AGE	MARINE ISOTOPE STAGE (MIS)	IDENTIFIED IN	ARCHAEOLOGICAL POTENTIAL	PALAEOENVIRONMENTAL POTENTIAL
Forth Formation (undifferentiated)	Clays and silty clays to sands and gravelly sands, with scattered boulders.	Marine, glaciomarine, fluviomarine and estuarine.	Late Devensian to Holocene; 29,000 BP to Present	2 to 1	Nearshore and offshore EICC	Very low	Very low
Fitzroy Member (Forth Formation)	Interbedded clays and silty clays, with isolated to scattered cobbles and boulders.	Low energy marine.	Late Devensian; 29,000 to 11,700 BP	2	Array Area	Very low	Negligible
Wee Bankie Formation	Till, interbedded with thin layers of sand, silty clay, coarse sand and gravel deposits.	Glacial.	Late Devensian; 29,000 to 11,700 BP	2	Nearshore and offshore EICC	Very low	Very low
Swatchway Formation	Very soft to firm clay, with minor amounts of gravel, sand and silt.	Glaciomarine to temperate marine.	Late Devensian; 29,000 to 11,700 BP	2	Nearshore EICC	Very low	Very low
Coal Pit Formation (upper facies)	Sandy, silty clay and interlaminated clay and fine-grained sand. Clay generally stiff and over-consolidated, with some pebbles and boulders. Shell and shell fragments abundant in places.	Glaciomarine, possibly some temperate intertidal.	Late Wolstonian to Devensian; 191,000 to 57,000 BP	6 to 4	Array Area	Very low	Low

FORMATION / MEMBER	LITHOLOGY	DEPOSITIONAL ENVIRONMENT	AGE	MARINE ISOTOPE STAGE (MIS)	IDENTIFIED IN	ARCHAEOLOGICAL POTENTIAL	PALAEOENVIRONMENTAL POTENTIAL
Coal Pit Formation (lower facies)	As above.	Glaciomarine.	Late Wolstonian to Devensian; 191,000 to 57,000 BP	6 to 4	Array Area	Very low	Low to moderate
Coal Pit Formation (undifferentiated)	As above.	Glaciomarine, possibly some temperate intertidal.	Late Wolstonian to Devensian; 191,000 to 57,000 BP	6 to 4	Nearshore and offshore EICC	Very low	Low to moderate
Fisher Formation	Very stiff, over-consolidated, silty and sandy clay. Clay is generally sandy with pebbles.	Glacial and glaciomarine facies.	Wolstonian; 374,000 to 123,000 BP	10 to 6	Array Area, offshore EICC	Very low	Very low
Ling Bank Formation	Silt, with interbedded clay and sand.	Glaciomarine, possibly some temperate intertidal.	Anglian to Early Wolstonian; 478,000 to 243,000 BP	12 to 10	Array Area	Very low	Low
Aberdeen Ground Formation	Hard, heavily over-consolidated clay.	Sub-glacial, proximal glaciomarine, distal glaciomarine and marine facies.	Tiglian to Anglian; 2,600,000 to 424,000 BP	100 to 13	Array Area	Very low	Low

16.4.4.4 Coastal and maritime archaeology

The coastal and maritime archaeological receptor encompasses remains and evidence of human interaction with the marine environment, ranging from the immediate Late Pleistocene and Flandrian marine transgressions to the present. This timespan includes all archaeological periods from the Upper Palaeolithic to the Modern. Archaeological evidence in this context may comprise (but is not limited to):

- Vessels (including evidence of their construction, use and maintenance);
- Navigational aids (including lighthouses and buoys);
- Infrastructure (including harbours and jetties);
- Evidence of resource gathering (including fish traps, salterns); and
  Individual or groups of artefacts (including cargo).

Coastal and maritime evidence pre-dating the post-medieval period is rare and is poorly represented within the Study Area and northeast Scotland more widely. Although there are some coastal sites with medieval origins (St Peter's Church, Peterhead) and some of possible Iron Age origin (promontory forts at Blockie Head and Dundonnie), suggestive of occupation during these periods and highlighting a potential for contemporary interactions with the marine environment, no such evidence has been recorded to date and the overall likelihood of such being present within the Project Area is very low.

Recording of maritime losses was given more attention from the 18th century, during which period vessel use became more widespread as new technologies made seafaring safer and Britain traded with and transported between its colonies and other nations. Maritime losses from the 17th to 21st centuries are recorded in the dataset for the Study Area, reflecting this trend. In addition to the UKHO records presented in Section 16.4.4 and by Figure 16-2 (several of which correlate with Canmore and HER records), the baseline assessment has identified within the Study Area:

- Three hundred and ninety-one documented loss records (maritime losses derived from eyewitness and documentary evidence) held by Canmore and the HER (having no correlating UKHO record), comprising:
  - Three hundred and seventy-one maritime craft;
  - Three aircraft losses (discussed in Section 16.4.4.5);
  - Fifteen general obstructions;
  - One buoy;
  - One naturally occurring boulder;
- Twenty-one coastal and terrestrial records held by Canmore; and
- Five coastal and terrestrial records held by the HER.

Archaeological assessment of the geophysical data has identified:

- Six high potential anomalies (two of which correlate with UKHO records; one within the EICC – see above);
- Five medium potential anomalies;
- One hundred and forty-four low potential anomalies; and
- Sixty-one magnetic anomalies.

The documented loss records highlight the broad potential for maritime wreckage and cargo within the Study Area, supported by the geophysical and magnetic anomalies (which may or may not represent wrecks and / or associated material). Documented loss records themselves are of varying reliability, many attributed a broad position based on historic insurance records, coastguard reports and even eyewitness accounts. Spatial analysis of these records must be undertaken with caution and provisional conclusions caveated. Further detail relating to the utility, nature and character of documented losses can be found in EIAR Vol. 4, Appendix 28: Marine Archaeology Baseline Report.

The distribution of geophysical and magnetic anomalies within the Study Area, as identified through review of the geophysical and hydrographic data in EIAR Vol. 4, Appendix 28: Marine Archaeology Baseline Report, is presented by Table 16-5.

Table 16-5 Distribution of geophysical and magnetic anomalies

ANOMALY TYPE	NEARSHORE EICC	OFFSHORE EICC	ARRAY AREA	STUDY AREA (BEYOND PROJECT AREA)	TOTAL
High potential	2	1	3	0	6
Medium potential	0	2	2	1	5
Low potential	0	45	77	22	144
Magnetic	40	9	7	5	61
Total	42	57	89	28	216

Two high potential anomalies correlate with UKHO records, one within the offshore EICC (W_038) and one within the nearshore EICC (W_015; Figure 16-2).

The UKHO records (within the Project Area and Study Area), geophysical anomalies and magnetic anomalies most likely relate to material dating from the 19th century or later, as suggested by the greater volume of shipping and losses from these periods (see EIAR Vol. 4, Appendix 28: Marine Archaeology Baseline Report for further detail). The distribution of UKHO records (Figure 16-2) suggests a greater potential for remains within the nearshore EICC and adjoining part of the offshore EICC, however, the seabed sediment type within these areas (predominantly gravelly sand) presents a poor preservation environment. Finer grained sediments, as recorded within the central part of the offshore EICC and Array Area, suggest a good preservation environment.

Some types of maritime archaeological remains can remain undetected by conventional subsea surveys or may be missed as a result of the survey parameters, such as wooden remains, smaller artefacts and remains buried within seabed sediments. A broad potential for hitherto undetected and unknown archaeological remains therefore exists across the Project Area.

No coastal or intertidal assets were identified within the Project Area. The limited intertidal zone within the Project Area is characterised by outcropping bedrock and steep cliffs, representing a difficult and unfavourable environment for past human activity. It is feasible that elements of wreck may be present here, however, the combination of high-energy marine environment and hard substrate greatly reduce the potential for archaeological fabric to survive.

Wreck and wreck-related material may hold a combination of intrinsic, contextual and associative value and be considered of national or even international significance. These may contribute to several regional, national and international research objectives and be considered of the highest heritage importance. Geophysical anomalies of high and medium archaeological potential have been identified as having a notably likelihood of representing wrecks or wreck-related material (such as debris) and therefore may hold the same degree of heritage importance. This may be revised should further data for such anomalies come to light.

Geophysical anomalies of low archaeological potential and magnetic anomalies have been identified as being less likely to be of the highest cultural significance. These smaller entities may represent modern material of limited to no archaeological value or remains holding some degree of intrinsic, contextual and / or associative value. As a poorly understood resource given the available data, a definitive cultural significance cannot be attributed to these receptors, though the evidence currently suggests a likelihood of limited heritage importance.

Potential further archaeological remains within the Project Area may range from wrecks to modern fishing gear. Their value cannot be determined whilst remaining an unknown resource, however, their cultural significance may range from the highest to none.

16.4.4.5 Aviation archaeology

There are no known aviation remains within the Study Area. Three documented losses relating to aircraft are recorded herein, however, none of these are known or suspected to relate to physical remains at those positions. The wider landscape, however, did hold associations with wartime aviation, particularly during the First World War, presenting a limited overall potential. Any physical remains relating to, or suspected to relate to, aircraft losses would automatically fall under the Protection of Military Remains Act 1986 and therefore be considered of the highest heritage importance.

16.4.5 Future baseline

The existing environment for marine archaeology as set out above has been shaped by a combination of factors, with the most prevalent being changes in global sea levels and associated climatic and environmental conditions. These conditions have and will continue to affect the burial and preservation of remains.

Marine physical processes, including the cycle of burial and exposure due to storm events, have an ongoing effect on the preservation of archaeological material. Sediment cover provides protection from physical marine processes, reducing the risk of erosion and degradation. It is not possible to assess the effect of this impact upon individual heritage assets as this will be dependent on the nature of the exposed heritage asset and site-specific conditions. The potential increase and violence of storm activity as a result of climate instability may exacerbate the effects of the burial and exposure cycle on affected assets. Further detail on marine physical processes relevant to the Project is included within EIAR Vol. 2, Chapter 8: Marine Geology, Oceanography and Coastal Processes.

Underwater cultural heritage is also under threat from warming waters caused by climate change. As the sea levels rise, the impact of the tidal activity on heritage assets within and adjacent to the intertidal will increase. In addition, warming waters result in the northward migration of invasive species and may include the blacktip shipworm (*Lyrodus pedicellatus*) and great shipworm (*Teredo navalis*). These species are considered to be a major threat to wooden wrecks and other wooden structures within the marine environment.

Further marine infrastructure projects within the region will all have the potential to cause adverse direct impacts on heritage assets or contribute to beneficial impacts. This includes large-scale enhanced understanding of the archaeological resource through large area geophysical / geotechnical survey data released to the public domain or the enhanced knowledge of key characteristics, features or elements derived from site-specific survey and investigations. This is particularly relevant to the study of submerged palaeolandscapes, which may experience limited overall impacts from seabed development but benefit from the accumulation and analysis of geotechnical data and subsequent geoarchaeological review.

There is the potential for loss or disturbance of possible historic wreck sites arising from discovery and other marine infrastructure projects, however, these are routinely protected from likely impacts by robust, industry-standard mitigation strategies.

16.4.6 Summary and key issues

The key Marine Archaeology receptors identified in EIAR Vol. 4, Appendix 28: Marine Archaeology Baseline Report are presented by Table 16-6. In addition, all areas hold a potential for unidentified and as-yet unknown archaeological remains, including but not limited to:

- Additional wrecks;
- Debris and cargo; and
- Prehistoric remains derived from secondary contexts.

Table 16-6 Summary and key issues for Marine Archaeology

	PROJECT AREA
SUMMARY AND KEY ISSUES	**Array Area** • One UKHO wreck record; • Three high potential anomalies; • Two medium potential anomalies; • Seventy-seven low potential anomalies; • Seven magnetic anomalies; and • Palaeoenvironmental remains within basal Coal Pit Formation deposits.
	Offshore EICC • One high potential anomaly; • Two medium potential anomalies; • Forty-five low potential anomalies; • Nine magnetic anomalies; and • Palaeoenvironmental remains within basal Coal Pit Formation deposits.
	Nearshore EICC • Two UKHO wreck records (including W_015 situated beyond the EICC but with physical remains extending therein); • Two high potential anomalies (one relating to the above UKHO record); and • Forty magnetic anomalies.

16.4.7 Data gaps and uncertainties

Whilst efforts were made to obtain the maximum coverage possible, limited sections of the Array Area were not captured by the project-specific geophysical survey, due to weather conditions and related time constraints (Rovco, 2024a). However, it must be noted that sufficient data was collected to allow a robust and thorough assessment of the Array Area for the purposes of the EIAR, and additional high resolution geophysical data will be collected post-consent as part of the iterative design process.

In the nearshore EICC, the full suite of geophysical data was not acquired first-hand by the Project. Data for this area, surveyed in 2012 and 2016, was acquired by the NorthConnect project (NorthConnect, 2018). The deliverables made available for review were limited to the processed datasets and reports (including the resultant archaeological assessment), preventing the review of raw data 'as collected' nor were the datasets subject to quality assurance as to the suitability for archaeological interpretation. It is noted that the data collected by NorthConnect was deemed sufficient to inform the EIAR, and the Project was granted consent in 2019. The results of the archaeological

assessment undertaken for the NorthConnect project were assimilated into the baseline, informing this chapter - EIAR Vol. 4, Appendix 28: Marine Archaeology Baseline Report.

A verification survey of a 150 m wide corridor was undertaken within the Nearshore EICC, from MHWS to 12 NM, consisting of MBES data acquisition (EIAR Vol. 4, Appendix 10 – Environmental Baseline and Habitat Assessment Report – Inshore EICC), Section 16.4.3). The verification data were subject to archaeological assessment, however as noted, it was limited to MBES data only.

Data gaps, and limitations, have been highlighted, however the available geophysical data, alongside desk-based sources, is considered sufficient to characterise the marine historic environment, and present a robust baseline.

In areas where seabed impacts will occur the data will be subject to archaeological assessment. The archaeological assessment of this data is embedded within the mitigation for the Project as outlined within EIAR Vol. 4, Appendix 27: Written Scheme of Investigation and PAD.

16.5 Impact assessment methodology

16.5.1 Impacts requiring assessment

The impacts identified as requiring consideration for Marine Archaeology are listed in Table 16-7, below. Information on the nature of impact (i.e. direct or indirect) is also described.

Table 16-7 Impacts requiring assessment for Marine Archaeology

POTENTIAL IMPACT	NATURE OF IMPACT
Construction and decommissioning	
Disturbance and / or damage to known wrecks and geophysical anomalies of high or medium archaeological potential	Indirect
Disturbance and / or damage to geophysical anomalies of low archaeological potential	Direct / indirect
Disturbance and / or damage to magnetic anomalies	Direct / indirect
Disturbance and / or damage to unknown wrecks or unidentified archaeological remains	Direct / indirect

POTENTIAL IMPACT	NATURE OF IMPACT
Disturbance and / or damage to sub-seabed deposits of palaeoenvironmental potential	Direct
Operation and maintenance	
Disturbance and / or damage to known wrecks and geophysical anomalies of high or medium archaeological potential	Indirect
Disturbance and / or damage to geophysical anomalies of low archaeological potential and magnetic anomalies	Indirect
Disturbance and / or damage to unknown wrecks or unidentified archaeological remains	Direct / indirect
Decommissioning	
In the absence of detailed information regarding decommissioning works, and unless otherwise stated, the impacts during the decommissioning are considered analogous with, or likely less than, those of the construction phase. Where this is not the case, decommissioning impacts have been listed separately and have been assessed in Section 16.6.2.1.	

16.5.2 Impacts scoped out of the assessment

The impacts scoped out of the assessment during EIA scoping, and the justification for this, are listed in Table 16-8.

Table 16-8 Impacts scoped out for Marine Archaeology

IMPACT SCOPED OUT	JUSTIFICATION
Construction	
Impact to onshore heritage assets through changes to their setting arising from proposed new offshore infrastructure.	No significant effects are anticipated as the EICC construction activities will be temporary and limited visually. There will be no intervisibility between the Array Area and onshore cultural heritage assets as a result of the considerable distance of the Array Area from shore. Project-infrastructure above the sea, e.g. FTUs, will therefore have no intervisibility with onshore assets and

IMPACT SCOPED OUT	JUSTIFICATION
	there is no pathway for potential impacts relating to a change in setting.
Indirect impacts to the Scheduled Monument of Boddam Castle.	Within the Scoping Opinion, HES noted that the Scheduled Monument of Boddam Castle may be susceptible to vibration-related impacts during the HDD activities associated with the Project. Since Scoping the Applicant has provided additional information to HES, to support scoping out this impact. Namely: • Further explanation of the nature of the Project being strictly offshore (covering from MHWS); • The distance of Boddam Castle from vibration-related Project activities (approximately 1.9 km), • Reference to British Standard guidance relating to vibration-induced damage to structures (BS 5228, BS 7385 and BS 4866); and • Technical expert opinion on the likelihood of impact. On review of the available data, HES agreed (via email on 10th December 2024) that Boddam Castle can be scoped out of further assessment.
Potential transboundary effects to marine archaeological receptors.	Due to the localised nature (limited entirely to within the UK EEZ) of any potential impacts on known marine archaeological receptors, transboundary impacts are unlikely to occur. There is a potential for palaeochannels and palaeolandscapes within the North Sea to stretch beyond international boundaries. The impact on submerged landscapes is expected to be local within the Project and will be mitigated and offset by archaeological assessments of geophysical and geotechnical data.
Operation and maintenance	
Indirect impacts to the Scheduled Monument of Boddam Castle.	See justification under *Construction*, above in table.
Decommissioning	
Indirect impacts to the Scheduled Monument of Boddam Castle.	See justification under *Construction*, above in table.

16.5.3 Assessment methodology

An assessment of potential effects is provided separately for the construction, operation and maintenance and decommissioning phases.

The assessment for Marine Archaeology is undertaken largely following the principles set out in EIAR Vol. 2, Chapter 7: EIA Methodology. The sensitivity of the receptor is combined with the magnitude to determine the impact significance. Topic-specific sensitivity and magnitude criteria are assigned based on professional judgement, as described in Table 16-9 and Table 16-11.

The criteria for the assessment for Marine Archaeology differ from that laid out in EIAR Vol. 2, Chapter 7: EIA Methodology, in that a separate consideration of value has been undertaken, allowing for a more bespoke assessment of individual receptors (Table 16-10). For example, a heritage asset may be of local value but have high sensitivity. Assignation of the value of receptors using this approach is in line with national policy (HM Government, 2011) and guidance (HES, 2019):

- UK Marine Policy Statement (HM Government, 2011): "*2.6.6.7 In considering the significance of heritage assets and their setting, the marine plan authority should take into account the particular nature of the interest in the assets and the value they hold for this and future generations. This understanding should be applied to avoid or minimise conflict between conservation of that significance and any proposals for development.*"
- Designation Policy and Selection Guidance (HES, 2019): "*HEP1: Decisions affecting any part of the historic environment should be informed by an inclusive understanding of its breadth and cultural significance.*"

Furthermore, the matrix for determining the significance of effect on Marine Archaeology receptors differs from that laid out in EIAR Vol. 2, Chapter 7: EIA Methodology. The matrix used in the impact assessment of this Chapter considers greater sensitivity to all Marine Archaeology receptors, in acknowledgement of their inability to recover from change of any degree of significance The matrix used is derived from nationally accepted guidance (NatureScot and HES, 2018).

Following identification of the historic assets within the Study Area, this Section identifies the proposed changes and assesses the magnitude of change upon the historic environment. The term 'magnitude of change' is derived from national guidance (NatureScot and HES, 2018) and is synonymous and used interchangeably within the guidance with 'magnitude of impact'. These terms are also synonymous with 'magnitude of effect', used in this Chapter. The impact assessment makes specific reference to any alterations to the intrinsic, contextual or associative values of the heritage assets. Impacts are considered to include direct impacts, indirect impacts, inter-relationships between impacts and cumulative impacts.

For each impact, the assessment identifies receptors within the Study Area that are sensitive to that impact and implements a systematic approach to understand the impact pathways and the level of impacts on given receptors. The process considers the following:

- Sensitivity of a receptor;
- Value of a receptor (to inform the sensitivity);

- Magnitude of effect; and
- Significance of effect.

16.5.3.1 Sensitivity

The overall receptor sensitivity is determined by considering a combination of value, adaptability, tolerance and recoverability. This is achieved through applying known research and information on the status and sensitivity of the feature under consideration, coupled with professional judgement and experience.

The sensitivity of a receptor is a function of its capacity to accommodate change and reflects its ability to recover if it is affected. As a finite resource, heritage assets typically have no ability to recover from direct impacts which result in a loss to their physical fabric. Recovery may be experienced, for example, when impacts arise from temporary changes to their setting. Sensitivity is defined by the following factors:

- Tolerance: the susceptibility (ability to be affected or unaffected) of a receptor to an external factor;
- Adaptability: the ability of the receptor to adapt to, or avoid, an external factor;
- Recoverability: the ability of a receptor to return to a state close to that which existed before the activity or event caused change within a specified period of time; and
- Value: a measure of the receptor's heritage value.

To define the sensitivity of a receptor, the guidelines presented in Table 16-9 have been adopted in this Chapter.

Table 16-9 Sensitivity levels for receptors

SENSITIVITY OF RECEPTOR	DEFINITION
High	Individual receptor has very limited capacity to avoid, adapt to, accommodate or recover from the anticipated impact. Historic environment assets of high sensitivity are typically associated with the highest value, i.e. as assets of national or international importance. Such assets in Scotland include World Heritage Sites, Scheduled Monuments, Category A Listed Buildings, Inventory Gardens and Designed Landscapes, Inventory Battlefields, Historic Marine Protected Areas, some Conservation Areas and non-designated assets that meet the criteria for designation (in the opinion of the assessor). Category B or C Listed Buildings may also be considered of high value, where the existing designation does not adequately reflect their value (in the opinion of the assessor).
Medium	Individual receptor has limited capacity to avoid, adapt to, accommodate or recover from the anticipated impact.

SENSITIVITY OF RECEPTOR	DEFINITION
	Historic environment assets of medium sensitivity are typically valued at a regional level. Such assets in Scotland include Category B Listed Buildings, some Conservation Areas and non-designated assets of similar value (in the opinion of the assessor). Category C Listed Buildings may also be considered of medium value, where the existing designation does not adequately reflect their value (in the opinion of the assessor).
Low	Individual receptor has some tolerance to avoid, adapt to, accommodate or recover from the anticipated impact. Historic environment assets of low sensitivity are typically valued at a local level. Such assets in Scotland include Category C Listed Buildings, some Conservation Areas and non-designated assets of similar value (in the opinion of the assessor).
Negligible	Individual receptor is generally tolerant to and can accommodate or recover from the anticipated impact. Historic environment assets of negligible sensitivity are typically of limited to no value or archaeological / historical interest.

Sensitivity criterion is composite, combining value with sensitivity. In some instances, the inherent value of a receptor is recognised by means of designation and the 'value' element of the composite criterion recognises and gives weight in the assessment to that designation. However, irrespective of the recognised value, all receptors will exhibit a greater or lesser degree of sensitivity to the potential changes brought about by the Project. The assessment of sensitivity is a matter of judgement applied by professional experts, based on the receptors within the relevant Study Area.

16.5.3.2 Value

The UK Marine Policy Statement (HM Government, 2011) indicates that authorities should take account of the particular nature of the interest in the (heritage) assets and the value they hold for this and future generations.

Guidance followed by this impact assessment recommends the valuation of a heritage asset as a step towards defining that asset's sensitivity (NatureScot and HES, 2018). Therefore, although valuation forms a definitive part of the process, it is not weighed directly against magnitude nor used in isolation to determine the significance of effect.

Both designated and non-designated heritage assets can hold heritage value. Value considers whether the receptor is rare, has protected status or has importance at a local, regional, national or international scale. Designated heritage assets, such as Conservation Areas, have high value. For non-designated assets, significance (value) is best defined as a combination of intrinsic, contextual and associative values (HES, 2019):

- Intrinsic characteristics: relate to the physical form, structure and material of an asset and how these can contribute to our understanding of the past;
- Contextual characteristics: illustrate how an asset relates to its surroundings and our existing knowledge of the past: and
- Associative characteristics: illustrate how an asset relates to past people, events or activities.

High value and sensitivity are not necessarily linked within a particular impact. A receptor could be of high value but have a low or negligible sensitivity to an effect, for example, Lower Palaeolithic stone tools in a secondary context may be considered of high value but would not be highly sensitive to indirect impacts such as scour. Table 16-10 provides definitions for the value afforded to a receptor based on importance regarding legislation and guidance.

Table 16-10 Definitions of the value levels for historic assets

VALUE	DEFINITION
High	Internationally or nationally important. Within a marine or intertidal context, high value heritage receptors include: • World Heritage Sites and heritage assets of acknowledged international importance, or that can contribute significantly to acknowledged international research objectives; • Sites designated under the Marine (Scotland) Act 2010, Ancient Monuments and Archaeological Areas Act or Protection of Military Remains Act; • Additionally, in line with the UK Marine Policy Statement, any remains which are not currently designated but have equivalent significance to a designated asset are also considered to be of high value; and • Onshore, this would include Heritage Assets valued at national level. These may include Scheduled Monuments, Category A Listed Buildings, Registered Battlefields, Gardens and Designed Landscapes, and nationally important archaeological features and conservation areas (as defined in the Council's HER). Such assets may extend into the intertidal zone.
Medium	Within a marine or intertidal context, medium value receptors include: • Heritage assets that are not designated and that do not meet the criteria for designation (e.g. as a Historic Marine Protected Area or Scheduled Monument) but display intrinsic, contextual or associative value, as identified by HES (2019); • Heritage assets, groups of assets or landscapes, that contribute to regional research objectives, particularly those identified in the Scottish Archaeological Research Framework (ScARF); and • Onshore, this also includes Heritage Assets valued at a regional level. These may include Category B and some Category C Listed Buildings as well as regionally important archaeological features and conservation areas. Such assets may be situated within or extend into the intertidal or marine zone.
Low	Within a marine or intertidal context, low value receptors include: • Heritage assets displaying limited intrinsic, contextual or associative value, as identified by HES (2019); • Heritage assets, or groups of assets, that contribute to a limited degree to regional research objectives, particularly those identified in the Scottish Archaeological Research Framework (ScARF); and

VALUE	DEFINITION
	• Onshore this would include Heritage Assets valued at a local level. These may include Category C Listed Buildings, some conservation areas and non-designated assets of local value. Such assets may be situated within or extend into the intertidal or marine zone.
Negligible	Heritage assets with very little or no surviving archaeological interest and little or no intrinsic, contextual or associative value, as identified by HES (2019) and heritage assets or groups of assets that cannot appreciably contribute to acknowledged regional research objectives. Onshore this would include badly preserved and/or damaged or very common archaeological features and buildings of little or no value at local or any other scale. Such assets may extend into the intertidal zone.
Uncertain	Historic assets for which the importance of the resource has not been ascertained and archaeological resources the importance of which cannot be ascertained.

16.5.3.3 Magnitude

Magnitude is defined in terms of the level of the effect above background conditions and natural variability, by whatever parameters are measurable relative to the baseline. Magnitude considers that effects may be beneficial or adverse, and short-term, long-term or permanent. In relation to cultural heritage, effects are generally adverse and are classified for both direct / indirect (physical) impacts and setting impacts.

Direct impacts to heritage assets that result in damage and / or loss to the physical fabric that contributes to that asset's cultural significance are always permanent and irreversible. Magnitude quantifies the extent of change to the asset's cultural significance.

Methods set out in Table 16-11 align with the wider methods used in this EIAR for judging exposure and magnitude of effect, relating specifically to heritage assets. Definitions have been established with reference to key documentation, including the Marine Policy Statement (HM Government, 2011) and Scotland's National Marine Plan (Marine Scotland (now Marine Directorate), 2015).

Table 16-11 Magnitude criteria

MAGNITUDE CRITERIA	BENEFICIAL EFFECT	ADVERSE EFFECT
High	Large scale improvement of resource or attribute quality; extensive restoration or enhancement (beneficial). Overwhelming positive changes around the asset that may contribute to the cultural significance of the asset, taking the form of; visual changes to key aspects of the historic landscape.	Substantial loss or harm to the heritage asset / setting and / or integrity of the heritage asset or severe damage to key characteristics, features or elements (adverse), such that the heritage asset is lost or its significance is totally altered. Permanent / irreplaceable change which is certain to occur, or a total or near complete loss of cultural significance.

MAGNITUDE CRITERIA	BENEFICIAL EFFECT	ADVERSE EFFECT
Medium	Improvement to, or addition of, key characteristics, features or elements of the resource; improvement to attribute quality (beneficial). Visual changes to key aspects of the historic landscape or improved access, resulting in an enhancement of the understanding or appreciation of the asset.	Loss of, or alteration to, key characteristics, features or elements; measurable change in significance, attributes, quality or vulnerability (adverse), such that the heritage asset and its significance is altered. Appreciable change to setting resulting in a loss of understanding, appreciation or experience of the heritage asset. A notable depreciation of cultural significance.
Low	Minor improvement to, or addition of, one or a small number of characteristics, features or elements; very minor improvement to attribute quality (beneficial).	Minor loss of, or small alterations to, one or a small number of characteristics, features or elements; noticeable change in attributes, quality or vulnerability (adverse). Slight change to setting resulting in a minor loss of understanding, appreciation or experience of the heritage asset. A minor depreciation of cultural significance
Negligible	No change or unquantifiable change to the receptor and its significance.	

16.5.3.4 Significance of effect

The significance of the effect upon marine archaeology is determined by correlating the magnitude of the effect and the sensitivity of the receptor. The effects are assessed as of negligible, minor, moderate or major significance.

For the purposes of this assessment, any effects with a significance level of major and / or moderate have been deemed significant in EIA terms, while those of minor or negligible level are deemed not significant, in line with the EIA Handbook guidance (NatureScot and HES, 2018).

16.5.4 Embedded mitigation

As described in EIAR Vol. 2, Chapter 7: EIA Methodology, certain measures (primary and tertiary mitigation) have been adopted as part of the Project development process in order to reduce the potential for impacts to the environment, as presented in Table 16-12. These have been accounted for in the assessment presented below. The requirement for additional mitigation measures (secondary mitigation) will be dependent on the significance of the effects on Marine Archaeology receptors. All embedded mitigation and the mechanisms for implementation and adherence are described in further detail within EIAR Vol. 4, Appendix 27: Written Scheme of Investigation and PAD.

The Project is committed to the preparation of and adherence to a WSI and a PAD by a suitably experienced professional archaeological consultant for the mitigation of impacts to Marine Archaeology. An outline WSI and PAD are presented within EIAR Vol. 4, Appendix 27: Written Scheme of Investigation and PAD. A final, agreed WSI would be produced post-consent for the approval of stakeholders. Individual activities with the potential to impact Marine Archaeology receptors will adhere to the principles of the WSI (enshrining the Project embedded mitigation) and will be supplemented by Method Statements for each works package undertaken during all future phases of development.

Table 16-12 Embedded mitigation measures relevant to Marine Archaeology

MITIGATION MEASURE	CODE	TYPE	DESCRIPTION	SECURED BY
Archaeological Exclusion Zones	MM-051	Primary	Archaeological Exclusion Zones (AEZs) and Temporary Archaeological Exclusion Zones (TAEZs) will be implemented around identified (known) and potential Marine Archaeological receptors. The extents of exclusion zones will be determined by the potential significance of the receptor, the seabed dynamics, the potential impacts, and extents of any outlying debris. The exclusion zones will be agreed with the Archaeological Curator and will remain for the lifetime for the project, or an until further works are undertaken to allow re-assessment.	AEZs have been embedded into the Project design and through adherence to the WSI (details of AEZs to be held therein). An outline WSI and PAD is provided as part of the Application (**EIAR Vol. 4, Appendix 27: Written Scheme of Investigation and PAD**).
Retained Archaeologist	MM-052	Primary	The Project will retain the services of an archaeological consultant, the 'Retained Archaeologist', to implement the Written Scheme of Investigation. The Retained Archaeologist will provide guidance as to the requirements for archaeological assessment of further pre-construction surveys, and the specifications of such surveys. This can include, but is not limited to, geophysical, hydrographic, Remotely Operated Vehicle (ROV), diver, and geotechnical surveys. The Retained Archaeologist will provide input into site preparation, pre-construction, and construction	Embedded into the Project design and through adherence to the WSI (details of archaeological involvement in further surveys to be held therein). An outline WSI and PAD is provided as part of the Application (**EIAR Vol. 4, Appendix 27: Written Scheme of Investigation and PAD**).

MITIGATION MEASURE	CODE	TYPE	DESCRIPTION	SECURED BY
			activities where appropriate and where archaeological monitoring of such works may be required.	
Archaeological assessment of geotechnical samples	MM-053	Primary	The archaeological assessment of geotechnical samples will be undertaken as necessary, informed by the interpretated potential of the Project Area. The archaeological assessment of geotechnical samples will be preceded by a Method Statement and will follow a staged process after *Offshore Geotechnical Investigations and Historic Environment Analysis: Guidance for the Renewable Energy Sector* (COWRIE, 2011).	Embedded into the Project design and through adherence to the WSI (details of geoarchaeological assessment and staged process to be held therein). An outline WSI and PAD is provided as part of the Application (**EIAR Vol. 4, Appendix 27: Written Scheme of Investigation and PAD**).
Protocol for Archaeological Discoveries	MM-054	Tertiary	The Protocol for Archaeological Discoveries provides the mechanism for the reporting of unexpected finds of potential archaeological interest, and the subsequent treatment of such finds. The protocol does not replace archaeological processes but enhances the protection for the historic environment. The Protocol also provides additional mitigation for geophysical anomalies interpreted as of low archaeological potential.	Adherence to the PAD (details of protocol to be held therein). An outline WSI and PAD is provided as part of the Application (**EIAR Vol. 4, Appendix 27: Written Scheme of Investigation and PAD**).

MITIGATION MEASURE	CODE	TYPE	DESCRIPTION	SECURED BY
Written Scheme of Investigation	MM-055	Tertiary	The WSI will follow the best practise as outlined in *Archaeological Written Schemes of Investigation for Offshore Windfarm Projects* (The Crown Estate, 2021). The WSI: • Sets out the roles and respective responsibilities of the Applicant, Contractors and Retained Archaeologist and Archaeological Contractor(s); • Outlines the known and potential archaeological receptors that could be impacted by the project; • Sets out the importance of research frameworks in setting objectives that may be delivered through realisation of the known and potential archaeology; • Outlines the agreed mitigation and archaeological actions that are to take place in various circumstances; and • Provides methodologies for these archaeological actions, to be employed on archaeological work conducted in the post-consent period.	An outline WSI and PAD is provided as part of the Application (EIAR Vol. 4, Appendix 27: Written Scheme of Investigation and PAD).
Decommissioning programme	MM-009	Tertiary	The development of, and adherence to, a Decommissioning Programme, approved by Scottish Ministers prior to construction and updated throughout the Project's operational life. This will be written in accordance with applicable guidance and will detail the required activities, programme and environmental management for decommissioning.	The Decommissioning Programme will be required under Section 105 of the Energy Act 2004 (as amended) and a condition of the Section 36 consent.

16.5.4.1 Archaeological Exclusion Zones (AEZs)

Best practice favours the preservation *in situ* of archaeological remains, therefore, the preferred mitigation for known archaeological remains is avoidance (COWRIE, 2007). For the Project, AEZs have been proposed that prohibit development-related activities within their extents. The final Project design will take into account these preliminary zones, which may evolve or be removed (with the agreement of HES) as the Project progresses, subject to layout designs and additional subsequent surveys that may be required.

All AEZs agreed with stakeholders, included in EIAR Vol. 4, Appendix 27: Written Scheme of Investigation and PAD, will be embedded into the Project design. If impacts cannot be avoided, measures to reduce, remedy or offset disturbance will be agreed.

Ten AEZs have been placed around wrecks and geophysical anomalies of high or medium archaeological potential anomalies identified by the geophysical data assessment, as illustrated by Figure 16-4. These anomalies have been recommended AEZs based on the size of the anomaly, the extents of any debris, the potential significance of the anomaly, the potential impact of the development and the seabed dynamics within the area.

AEZs have been recommended as a distance from the visible extents of a wreck or anomaly. Particularly in the case of shipwrecks, which tend to be greater in length than width, the use of a circle set on a central point provides unequal protection around the extents. This not only impacts the protection afforded but does not present proportional mitigation.

Scope is allowed for the amendment of AEZs in light of further evidence and with the involvement of relevant stakeholders. Should the final EIC design bisect any AEZs, there will be a commitment to either investigate these and refine their extents and / or to re-route around these. Re-routeing will require the collection and assessment of data from the wider area to ensure that impacts do not take place before archaeological assessment of full-coverage geophysical data has been conducted and further mitigation applied, as appropriate). There will be no impacts to finalised AEZs during construction, operation and maintenance and decommissioning activities. Further details of AEZs and archaeological monitoring are provided in EIAR Vol. 4, Appendix 27: Written Scheme of Investigation and PAD.

Following the archaeological assessment of geophysical and hydrographic data, the following AEZs are recommended, as presented by Table 16-13.

Table 16-13 Archaeological Exclusion Zones (AEZs)

MSDS ID	POTENTIAL	DESCRIPTION	AEZ SIZE	EASTING	NORTHING
CS24_050	High	Potential debris	100 m extents	396219.8	6326948.0
CS24_077	High	Wreck	100 m extents	406275.4	6331102.0

MSDS ID	POTENTIAL	DESCRIPTION	AEZ SIZE	EASTING	NORTHING
CS24_093	High	Potential wreck	100 m extents	402933.5	6338289.2
CS24_146	High	Wreck	100 m extents	389381.6	6355251
CS24_165	High	Wreck	100 m extents	215227.4	6379497.6
CS24_166	High	Wreck	100 m extents	228549.0	6388869.0
CS24_019	Medium	Seabed disturbance	50 m extents	403772.2	6322169.5
CS24_094	Medium	Potential debris	50 m extents	406755.5	6333415.6
CS24_128	Medium	Potential debris	50 m extents	279120.8	6380937.7
CS24_133	Medium	Potential debris	50 m extents	320000.5	6377510.6

16.5.4.2 Temporary AEZs

TAEZs are recommended where an anomaly is not visible in the geophysical dataset but is known to exist based on information from other datasets (e.g. UKHO data or other surveys), where the position cannot be determined with enough accuracy for refined exclusion zones or where the extents are not fully known. These are often larger than AEZs but are identified as temporary, as they are highly likely to be altered following higher resolution or full coverage data assessment or investigation with an ROV, however, they will remain in place until alterations have been formally agreed with relevant stakeholders.

Although no TAEZs have been established at this stage, the mechanism for their implementation and adherence are included as mitigation should future surveys or activities require. The extent of any TAEZs will consider the proximity of available survey data, the potential to represent material of archaeological significance, the perceived accuracy of the position and other anomalies that may be present within the surrounding area.

Further detail is provided in EIAR Vol. 4, Appendix 27: Written Scheme of Investigation and PAD.

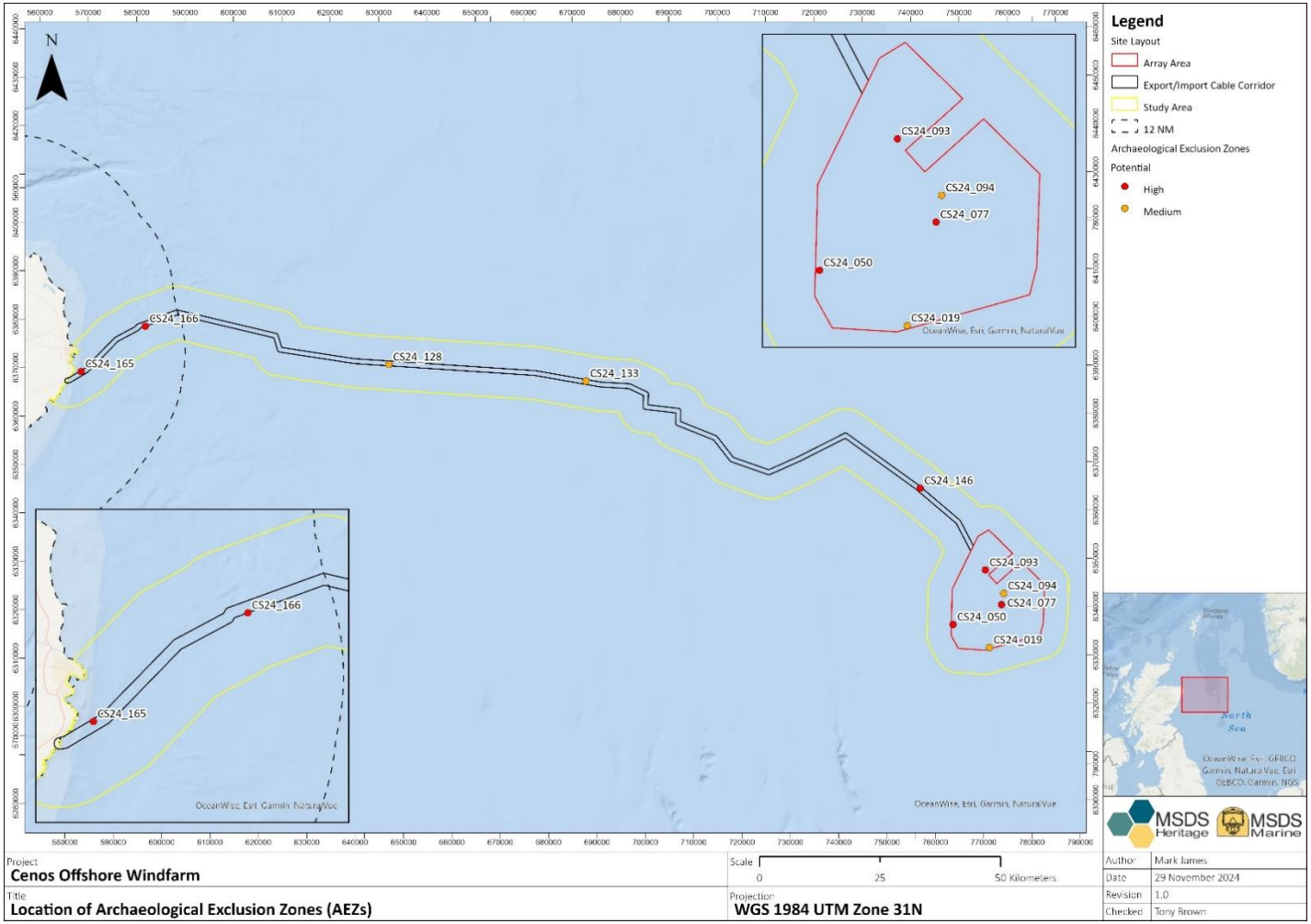

Figure 16-4 Location of Archaeological Exclusion Zones

16.5.4.3 Preservation by record

Where preservation *in situ* is not practicable, disturbance of archaeological sites or material will be offset by appropriate and satisfactory measures, also known as 'preservation by record'. In these circumstances, the effects of the Project will be offset by carrying out excavation and recording prior to the impact occurring (COWRIE, 2007).

Hitherto unidentified wrecks, archaeological sites or material may be encountered during the construction, operation and maintenance and / or decommissioning phases of the Project. Procedures will therefore be put in place to allow for such eventualities.

A Protocol for Archaeological Discoveries (PAD) will be developed for reporting finds of archaeological interest, in line with *The Offshore Renewables Protocol for Archaeological Discoveries* (The Crown Estate, 2014). This will involve the reporting of archaeological discoveries made during the lifetime of the Project. The PAD covers the reporting and investigating of unexpected archaeological discoveries encountered during construction, operation and maintenance and decommissioning activities, informed by the guidance of a marine archaeologist specialised in working with PADs for offshore wind farm projects. This protocol further makes provision for the implementation of TAEZs around areas of possible archaeological interest, for prompt archaeological advice and, if necessary, for archaeological inspection of important features prior to further activities in the vicinity. It complies with the Merchant Shipping Act 1995, including notification to the Receiver of Wrecks, in accordance with the Code of Practice for Seabed Developers (JNAPC, 2006).

Further detail is provided in EIAR Vol. 4, Appendix 27: Written Scheme of Investigation and PAD.

16.5.5 Worst-case scenario

As detailed in EIAR Vol. 2, Chapter 7: EIA Methodology, this assessment considers the worst-case scenario for the Project parameters which are predicted to result in the greatest environmental impact, known as the 'realistic worst-case scenario'. The worst-case scenario represents, for any given receptor and potential impact on that receptor, the scenario that would result in the greatest potential for change.

Given that the worst-case scenario is based on the design option (or combination of options) that represents the greatest potential for change, confidence can be held that development of any alternative options within the design parameters will give rise to no worse effects than assessed in this impact assessment. Table 16-14, below, presents the worst-case scenario for potential impacts on Marine Archaeology during construction, operation and maintenance and decommissioning. The information held within the table is derived from and greater detail can be found within EIAR Vol. 2, Chapter 5: Project Description. The worst-case scenarios for indirect impacts have been further informed by EIAR Vol. 2, Chapter 8: Marine Geology, Oceanography and Coastal Processes.

Table 16-14 Worst-case scenario specific to Marine Archaeology impact assessment

POTENTIAL IMPACT	WORST-CASE SCENARIO	JUSTIFICATION
Construction		

Direct impacts from seabed preparation	• Direct impacts within the Array Area:
	  • PLGR of 2.8 km^2 footprint (10 m wide disturbance corridor) over 100% of the Inter-Array Cable (IAC) seabed length (280 km);
	  • Boulder clearance (by ploughing or grab) of 5.6 km^2 footprint (20 m wide disturbance corridor) over 100% of the IAC seabed length;
	  • The PLGR footprint is contained wholly within that of the boulder clearance, therefore, the maximum footprint of direct impacts within the Array Area will be 5.6 km^2;
	• Direct impacts within the EICC:
	  • PLGR of 2.3 km^2 footprint (10 m wide disturbance corridor) over 100% of the Export/Import Cable route (230 km)
	  • Boulder clearance (by ploughing) of 0.56 km^2 footprint (20 m wide disturbance corridor) over 100% of Export/Import Cable route (28 km) between MHWS and 12 NM
	  • Boulder clearance (by ploughing) of 0.57 km^2 footprint over 28.4 km of Export-Import Cable route between 12 NM and Marine Protection Area (MPA). This clearance length will comprise a continuous length of 13 km and a further 10% (15.3 km) of the total route length (153 km) spread across the remaining route length of this section;
	  • Boulder clearance (by non-displacement ploughing) of 0.07 km^2 footprint over 10% (3.5 km) of route length of this section (35 km) between NCMPA and Offshore Substation and Converter Platform (OSCP);
		Unidentified archaeological remains, including wrecks, may be present within the Array Area and EICC. These have the potential to be directly / indirectly impacted by seabed preparation activities.

POTENTIAL IMPACT	WORST-CASE SCENARIO	JUSTIFICATION

	• Direct impacts within both:
	  • UXO clearance: up to 50 Low Order deflagration operations and up to 1 High Order detonation operation. Extent of seabed impacts is not known and would be determined following examination of any UXO; and
	  • Removal of out-of-service cables: recovery by PLGR to cut to limits of PLGR corridor. Cut section to be laid on seabed with a clump weight at each end. Maximum seabed impact from recovery of cable is unknown, as drag of cable can disturb the seabed beyond the PLGR corridor. Maximum seabed impact from cut section disposal unknown; expected to be greater than 10 m (L) (accounting for section cut to width of PLGR corridor and clump weights).	

Direct impacts from cable laying	• Direct impacts within the Array Area:
	  • Cable laying activities resulting in a total area of seabed disturbance of 5.6 km^2, within the footprint of boulder clearance (up to 1.5 m depth of lowering (DoL));
	  • Temporary mattress installation resulting in a total area of seabed disturbance of 0.054 km^2;
	  • Cable / pipeline crossing installation resulting in a total area of seabed disturbance of 0.0365 km^2;
	• Direct impacts within the EICC:
	  • Cable laying activities resulting in a total area of seabed disturbance of 0.005 km^2 , within the footprint of site preparation activities (up to 1.5 m DoL);
	  • Cable protection installation between MHWS and 12 NM resulting in a total area of seabed disturbance of 0.075 km^2;
	  • Cable protection installation between 12 NM and NCMPA resulting in a total area of seabed disturbance of 0.092 km^2;
		Unidentified archaeological remains, including wrecks, may be present within the Array Area and EICC. These have the potential to be directly / indirectly impacted by cable laying activities.

POTENTIAL IMPACT	WORST-CASE SCENARIO	JUSTIFICATION
	• Cable protection installation within NCMPA to OSCPs resulting in a total area of seabed disturbance of 0.0007 km^2; • Cable / pipeline crossing total area within MHWS to 12 NM: 0.063 km^2; • Cable / pipeline crossing total area within 12 NM to NCMPA: 0.0997 km^2; and Cable / pipeline crossing total area within NCMPA to OSCPs: 0.018 km^2.	
Direct impacts from trenchless installation exit points	• Direct impacts at HDD exit point (exact location(s) unavailable): • No interaction within the intertidal zone – exit point 190 m below MHWS; and • The 3 boreholes at the HDD exit point to be protected by rock placement or mattresses (up to 200 m^2).	Unidentified archaeological remains, including wrecks, may be present within the nearshore EICC. These have the potential to be directly / indirectly impacted by trenchless installation activities.
Direct impacts from FTU anchors and IAC anchor installation	• Semi-submersible options: • Swept area of seabed by FTU moorings resulting in a total area of seabed disturbance of 1.44 km^2; • Maximum number of anchors: 570 (up to 6 per Wind Turbine Generator (WTG)); • Anchor installation resulting in a total seabed footprint of 0.015 km^2 and maximum penetration of 57 m; • Maximum duration of piling (per pile): six hours; • Tension Leg Platform option: • Swept area of seabed by FTU moorings is not applicable to this option; • Maximum number of anchors: 855 (up to 9 per WTG); • Anchor installation resulting in a total seabed footprint of 0.028 km^2 and maximum penetration of 57 m; • Maximum duration of piling (per pile): four hours;	Unidentified archaeological remains, including wrecks, may be present within the Array Area. These have the potential to be directly impacted by FTU and IAC anchor installation activities. Anchor installation may also directly impact sub-seabed basal Coal Pit Formation deposits, which have palaeoenvironmental potential, and upper Coal Pit deposits, which hold a lesser palaeoenvironmental potential.

POTENTIAL IMPACT	WORST-CASE SCENARIO	JUSTIFICATION

	• IACs:
	  • Anchor installation (gravity anchors) resulting in a total seabed footprint of 0.002 km^2;
	  • Maximum total footprint of concrete mattress cable protection of 0.017 km^2; and
	  • Subsea hub installation resulting in a total seabed footprint of 0.0017 km^2.	

Direct impacts from offshore substation and converter platform (OSCP) foundation installation	• Maximum number of OSCP jacket foundations of 2; • Foundation installation (maximum 24 piles, 12 piles per OSCP jacket) resulting in a total seabed footprint of 0.0024 km^2 and maximum penetration of 57 m (maximum footprint inclusive of mud-mat installation); and • Maximum duration of piling (per pile): four hours.	Unidentified archaeological remains, including wrecks, may be present within the Array Area and EICC. These have the potential to be directly impacted by OSP foundation installation activities. OSP foundation installation may also directly impact sub-seabed basal Coal Pit Formation deposits, which have palaeoenvironmental potential, and upper Coal Pit deposits, which hold a lesser palaeoenvironmental potential.
Indirect impacts from all activities interacting with the seabed	• Deposition of transported sediment upon receptor, resulting in compression and damage: • 0 to 50 m from causal activity: zone of highest suspended sediment concentration (SSC) increase and greatest likely thickness of deposition. Very high SSC increase (tens to hundreds of thousands of mg/l) lasting for the duration of causal activity plus up to 30 minutes following cessation; where dominant (e.g. areas of outcropping glacial material), coarse sands and gravels, or larger clasts of still consolidated cohesive silts, may deposit	Identified and potential Marine Archaeological receptors within the Project Area may experience indirect impacts resulting in damage or loss of significance.

POTENTIAL IMPACT	WORST-CASE SCENARIO	JUSTIFICATION
	in local thicknesses of tens of centimetres to several metres; unconsolidated finer sediment (i.e. muddy fine sands) is unlikely to deposit in measurable thickness. After one hour from cessation, no remaining change to SSC expected and no measurable ongoing deposition; • 50 to 500 m from causal activity: zone of measurable SSC increase and measurable but lesser thickness of deposition. Mainly sands that are released or resuspended higher in the water column and resettling to the seabed whilst being advected by ambient tidal currents. High SSC increase (hundreds to low thousands of mg/l) during causal activity plus up to 30 minutes after cessation; sands and gravels may deposit in local thicknesses of up to tens of centimetres; fine sediment is unlikely to deposit in measurable thickness. After one hour from cessation, no change to SSC is expected and no measurable ongoing deposition; • 500 m from causal activity to the tidal excursion buffer distance: zone of lesser but measurable SSC increase and no measurable thickness of deposition. Mainly fine sediments maintained in suspension for more than one tidal cycle and advected by ambient tidal currents. Low to intermediate SSC increase (tens to low hundreds of mg/l) during causal activity; decreasing to low SSC increase (tens of mg/l one to six hours after cessation; decreasing gradually between six to 24 hours after cessation to background SSC (no measurable local increase). Fine sediment unlikely to deposit in measurable thickness; • Beyond the tidal excursion buffer distance or anywhere not tidally aligned to the active sediment disturbance: no expected measurable impact or change to SSC nor any measurable sediment deposition; and • Removal of seabed material supporting Marine Archaeology receptors, with the potential for subsequent destabilisation and damage to occur.	

POTENTIAL IMPACT	WORST-CASE SCENARIO	JUSTIFICATION
Operation and maintenance		
Direct impacts from buried cable replacement / repair	• The repair of up to 19 IACs; • The replacement of up to 19 IACs; and • Up to 4 EIC repairs during operational lifetime.	Unidentified archaeological remains, including wrecks, may be present within the Array Area and EICC. These have the potential to be directly / indirectly impacted by cable replacement / repair activities, should these occur beyond the extent of construction impacts.
Direct impacts from mooring line replacement	• The replacement of up to 57 mooring lines during operational lifetime.	Unidentified archaeological remains, including wrecks, may be present within the Array Area. These have the potential to be directly impacted by mooring line replacement activities, should these involve the laying of lines upon the seabed beyond the extent of construction impacts.
Direct impacts from WTG major component exchange	• Repair / replacement of WTG components requiring tow-back to shore will involve detachment and laying on seabed of mooring lines and dynamic cables; • Up to 190 tow-back operations during operational lifetime; and • Use of clump weights and mattresses to secure detached lines and cables.	Unidentified archaeological remains, including wrecks, may be present within the Array Area. These have the potential to be directly impacted by WTG tow-back activities, through the laying of detached lines and cables upon the seabed beyond the extent of construction impacts.
Indirect impacts from all activities interacting with the seabed	• Comparable to worst-case scenario for construction phase (see above).	Identified and potential Marine Archaeological receptors within the Project Area may experience

POTENTIAL IMPACT	WORST-CASE SCENARIO	JUSTIFICATION
		indirect impacts resulting in damage or loss of significance.
Decommissioning		
Direct impacts from cable removal	In the absence of detailed decommissioning activities, the implications for MI & OSU are similar, or likely less, to the worst-case scenarios for those outlined during the construction phase. Therefore, the worst-case parameters defined for the construction phase also apply to the decommissioning phase. More details are available on the decommissioning approach in EIAR Vol. 2, Chapter 5: Project Description.	
Direct impacts from WTG removal		
Direct impacts from excavation around piles (if required)		
Indirect impacts from all activities interacting with the seabed		

16.6 Assessment of potential effects

16.6.1 Potential effects during construction

16.6.1.1 Disturbance and / or damage to known wrecks and geophysical anomalies of high or medium archaeological potential

Several proposed activities during the construction phase, including seabed preparation, have the potential to result in direct and / or indirect impacts to known wrecks and geophysical anomalies of high or medium archaeological potential. Such activities comprise:

- PLGR;
- Boulder and UXO clearance;
- Cable laying;
- HDD; and
- Foundation and anchor installation.

As detailed in Table 16-14, the pathways for impacts during site preparation comprise use of ploughs, grapnels, grabs, high order UXO clearance and, to a lesser extent, low order clearance. These activities are applicable to both the Array Area and EICC. Pathways for impacts from construction activities would include trenching / excavation for cable laying (using cable plough, jet trencher or mechanical trencher), HDD apparatus and anchor / foundation piling (suction, driven or other piling method). HDD impacts would be applicable to the nearshore EICC only, anchor / foundation piling to the Array Area only and cable laying across the Project Area (EIC and IAC). These activities have the potential to damage and disperse archaeological remains.

Indirect impacts also have the potential to affect this receptor. EIAR Vol. 2, Chapter 8: Marine Geology, Oceanography and Coastal Processes indicates that the highest impact from sediment transportation would occur within 0 to 50 m of the causal activity (such as jetting or ploughing) and last for up to 30 minutes after cessation. The worst-case scenario would see up to several metres of gravel and coarse sands deposited within this zone. This additional overburden has the potential to compress and damage wreck material. From 50 to 500 m from the causal activity, principally sands, along with finer gravels, are anticipated to be deposited in thicknesses up to tens of centimetres for up to 30 minutes after cessation. Deposition beyond 500 m from the causal activity is unlikely to result in deposition quantities likely to impact this receptor. Further indirect impacts may occur through removal of sediments supporting wreck material, resulting in destabilisation and damage.

Wrecks may be considered of the highest value in terms of cultural significance, which can be reflected in designation as a Scheduled Monument or HMPA. Such remains have the potential to possess intrinsic, contextual and associative value, as laid out in national guidance (NatureScot and HES, 2018). High and medium potential geophysical anomalies have been identified as having the potential to represent additional wrecks and wreck-related material (such as debris), respectively, and therefore may possess the same value as known wrecks.

The worst-case scenario would see direct and / or indirect impacts from construction phase activities result in the permanent and irreversible damage and / or loss of this receptor or parts thereof, thus diminishing their intrinsic and

contextual value which are derived in part from the cohesion of archaeological material and its primary context, respectively. Contextual value may also be diminished should activities result in the transportation of archaeological remains from their primary context. Through adverse change to these values, associative value may also be lost, which is derived in part from interpretation of the asset's intrinsic and contextual data. Indirect impacts may cause similar damage / loss, resulting in similar change to these values. This receptor has no capacity to accommodate or recover from such impacts and therefore holds high sensitivity.

The magnitude of effect would be reduced by embedded mitigation. The establishment and adherence to AEZs throughout the construction phase would remove the potential for direct impacts to identified wrecks and geophysical anomalies of high and medium archaeological potential. A bespoke and appropriately sized buffer is implemented for each asset, within which no construction activities will take place. The AEZ would also prevent the removal of material supporting elements of this receptor and remove the potential for indirect impacts to be experienced through this pathway. Appropriate sizing of the AEZ to remove the receptor from the zone of highest transported sediment deposition (0 to 50 m from causal activity) will reduce the potential for significant effects through this pathway.

Further embedded mitigation provides for the involvement of an archaeologist during the planning of future surveys / activities, to ensure that requirements for marine archaeology are upheld and specifications can consider the collection of additional data to improve understanding of identified anomalies and wrecks. New and improved understanding of this receptor may be used to establish new AEZs and / or alter existing AEZs (through discussion with stakeholders) to minimise potential for impacts. All embedded mitigation and the methods for implementation and adherence are laid out in EIAR Vol. 4, Appendix 27: Written Scheme of Investigation and PAD.

In consideration of the embedded mitigation, direct impacts to known wrecks and geophysical anomalies of high and medium archaeological potential would be removed. Indirect impacts would be reduced to levels unlikely to result in damage / loss. Through this action, the intrinsic, contextual and associative values of this receptor would be preserved. The residual change would be of negligible magnitude.

Correlation of high sensitivity and negligible magnitude of effect would result in a negligible significance of effect (no change). The value of this receptor would be preserved by implementation of embedded mitigation, removing of the pathway for direct impacts and reducing the potential for indirect impacts to result in a significant effect.

Evaluation of significance

Considering the high sensitivity and the negligible magnitude of the effect, the overall effect on known wrecks and geophysical anomalies of high and medium archaeological potential from impacts during construction is considered to be Negligible (No change) and Not Significant in EIA terms.

Sensitivity	Magnitude of effect	Consequence
High	Negligible	Negligible (No change)

Impact significance - NOT SIGNIFICANT

16.6.1.2 Disturbance and / or damage to geophysical anomalies of low archaeological potential

Activities proposed during the construction phase also have the potential to impact geophysical anomalies of low archaeological potential. Construction activities, their distribution and impact pathways (direct and indirect) would be the same for this receptor as for wrecks and geophysical anomalies of high and medium archaeological potential (see Section 16.6.1.1).

Geophysical anomalies of low archaeological potential have been identified as likely anthropogenic in origin but unlikely to be of high archaeological significance, such as discarded fishing gear, discarded cargo or elements of wreck. The cultural significance of this receptor would be principally determined by its intrinsic value. Such assets have a limited potential to contribute to regional research objectives and would likely be considered of low overall value.

As smaller entities with lesser weight than, for example, whole wrecks, archaeological material represented by this receptor would likely be more mobile, compact and robust, having withstood or accommodated background impacts since deposition. As such, they may have the ability to accommodate, in part, impacts arising from the proposed construction activities, such as translocation through PLGR or boulder clearance.

The worst-case scenario would see direct and / or indirect impacts from construction phase activities result in the permanent and irreversible damage and / or loss of this receptor or parts thereof, thus diminishing their intrinsic value, which is derived in part from the cohesion of archaeological material. Indirect impacts may cause similar damage / loss, resulting in similar change to these values, however, the likely nature of this receptor suggests a greater capacity to resist potential indirect impacts. Likely comprising material of limited to no archaeological significance, this receptor has limited capacity to accommodate or recover from such impacts and therefore holds medium sensitivity.

Although mitigation of impacts to this receptor would not necessarily require the establishment of AEZs, the magnitude of effect would be reduced by other embedded mitigation. Archaeological involvement in further surveys may allow greater understanding of this receptor to be developed. UXO surveys typically target such anomalies and archaeological review of the survey results may enable other embedded mitigation to be implemented to reduce impacts to any identified archaeological remains.

A PAD would also be adhered to during the construction phase, outlining the method of reporting and preserving chance discoveries of archaeological remains through various construction activities, which may derive from geophysical anomalies of low archaeological potential. All embedded mitigation and the methods for implementation and adherence are laid out in EIAR Vol. 4, Appendix 27: Written Scheme of Investigation and PAD.

In consideration of the embedded mitigation, direct impacts to geophysical anomalies of low archaeological potential would be reduced, however, some degree of loss cannot be wholly excluded. Indirect impacts would be reduced to levels unlikely to result in damage / loss. Through this action, the intrinsic values of this receptor would be largely preserved. The residual change would be of maximum low magnitude.

Correlation of medium sensitivity and low magnitude would result in a minor significance of effect. The value of this receptor would be largely preserved by implementation of embedded mitigation, reducing the potential for direct and indirect impacts to result in a significant effect.

Should further investigations or surveys provide additional data relating to one or more geophysical anomalies of low archaeological potential, this may result reclassification, for example, if a low potential anomaly is found to represent an element of a wreck. In such cases, the anomaly / asset should be reassessed in accordance with its appropriate receptor group and any additional embedded mitigation applied as necessary.

Evaluation of significance

Considering the medium sensitivity and the low magnitude of the effect, the overall effect on geophysical anomalies of low archaeological potential from impacts during construction is considered to be Minor and Not Significant in EIA terms.

Sensitivity	Magnitude of effect	Consequence
Medium	Low	Minor

Impact significance - NOT SIGNIFICANT

16.6.1.3 Disturbance and / or damage to magnetic anomalies

Activities proposed during the construction phase also have the potential to impact magnetic anomalies. Construction activities, their distribution and impact pathways (direct and indirect) would be the same for this receptor as for wrecks and geophysical anomalies of high and medium archaeological potential (see Section 16.6.1.1).

Magnetic anomalies are likely anthropogenic in origin but may alternatively be geological. These typically represent discarded marine / fishing equipment, however, they may represent wreck, wreck material or other entities of archaeological significance. The criteria and process for determining the archaeological potential of this receptor is detailed within EIAR Vol. 4, Appendix 28: Marine Archaeology Baseline Report. Although the review of geophysical data identified several magnetic anomalies of some archaeological potential, these could not be characterised further or positioned with confidence. No magnetic anomalies were identified which, with the current data, have the potential to represent wrecks associated with other supporting evidence.

Wrecks may be considered of the highest value, with the potential to possess intrinsic, contextual and associative value, as laid out in national guidance (NatureScot and HES, 2018). Non-wreck related magnetic anomalies may hold moderate to negligible intrinsic, contextual and / or associative value, however, this cannot be refined further whilst uncertainty regarding their character and origin remains.

The worst-case scenario would see direct and / or indirect impacts from construction phase activities result in the permanent and irreversible damage and / or loss of this receptor or parts thereof, thus diminishing any intrinsic, contextual or associative held. Indirect impacts may cause similar damage / loss, resulting in similar change to any value held by the receptor.

The uncertainty of the nature and value of the receptor presents difficulty in determining its capacity to accommodate impacts and therefore its sensitivity. In consideration of the low likelihood of high value remains, the likely moderate to negligible value of this receptor and the worst-case scenario, a maximum of **medium sensitivity** is considered.

Mitigation of impacts to this receptor would not necessarily require the establishment of AEZs, however, the magnitude of effect would be reduced by other embedded mitigation. Archaeological involvement in further surveys may allow greater understanding of this receptor to be developed. UXO surveys typically target magnetic anomalies and archaeological review of the survey results may enable other embedded mitigation to be implemented to reduce impacts to identified archaeological remains, such as the establishment of new AEZs or TAEZs.

A PAD would also be adhered to during the construction phase, outlining the method of reporting and preserving chance discoveries of archaeological remains through various construction activities, which may derive from magnetic anomalies. All embedded mitigation and the methods for implementation and adherence are laid out in **EIAR Vol. 4, Appendix 27: Written Scheme of Investigation and PAD.**

In consideration of the embedded mitigation, direct impacts to magnetic anomalies would be reduced, however, some degree of loss cannot be wholly excluded. Indirect impacts would be reduced to levels unlikely to result in damage / loss. Through this action, the intrinsic values of this receptor would be largely preserved. The residual change would be of maximum **low magnitude**.

Correlation of medium sensitivity and low magnitude would result in a **minor significance of effect**. The value of this receptor would be largely preserved by implementation of embedded mitigation, reducing the potential for direct and indirect impacts to result in a significant effect.

Should further investigations or surveys provide additional data relating to one or more identified magnetic anomalies, this may result reclassification, for example, if a magnetic anomaly is found to represent an element of a wreck. In such cases, the anomaly / asset should be reassessed in accordance with its appropriate receptor group and any additional embedded mitigation applied as necessary.

Evaluation of significance

Considering the medium sensitivity and the low magnitude of the effect, the overall effect on magnetic anomalies from impacts during construction is considered to be **Minor** and **Not Significant** in EIA terms.

Sensitivity	Magnitude of effect	Consequence
Medium	Low	Minor

Impact significance - **NOT SIGNIFICANT**

16.6.1.4 Disturbance and / or damage to unknown wrecks or unidentified archaeological remains

Activities proposed during the construction phase also have the potential to impact unknown wrecks and unidentified archaeological remains. Construction activities, their distribution and impact pathways (direct and indirect including through the effects of sediment transport and marine physical processes) would be the same for this receptor as for wrecks and geophysical anomalies of high and medium archaeological potential (see Section 16.6.1.1).

The potential for hitherto unidentified wrecks and archaeological remains has been established by EIAR Vol. 4, Appendix 28: Marine Archaeology Baseline Report and summarised within Section 16.4.4 of this Chapter. For the purpose of this assessment, unidentified archaeological remains may comprise:

- *In situ* prehistoric sites, submerged palaeolandforms, isolated prehistoric artefacts and palaeoenvironmental remains;
- *Ex situ* prehistoric artefacts;
- Wrecks and isolated maritime artefacts; and
- Aircraft remains.

In situ prehistoric sites, wrecks and aircraft remains may be considered of the highest value, with the potential to possess intrinsic, contextual and associative value, as laid out in national guidance (NatureScot and HES, 2018). Other remains may hold one or more of these values, however, as an unknown resource, it is not possible to refine further with the data available. Any remains of these types may also be able to contribute to regional, national and international research frameworks and objectives.

The worst-case scenario would see direct and / or indirect impacts from construction phase activities result in the permanent and irreversible damage and / or loss of this receptor or parts thereof, thus diminishing any intrinsic, contextual and associative value held. Indirect impacts may cause similar damage / loss, resulting in similar change to these values. In the worst-case scenario, this receptor would have no capacity to accommodate or recover from such impacts and therefore holds high sensitivity.

Embedded mitigation has been integrated into the Project to minimise the significance of effect on unknown archaeological remains. AEZs around identified wrecks and geophysical anomalies of high and medium archaeological potential would also offer protection to unknown artefacts and sites therein (associated with the AEZ target or otherwise). Adherence to the PAD during the construction phase would raise the awareness of others engaged in construction activities which have the potential to encounter unknown archaeological remains.

Archaeological involvement in further surveys may allow greater understanding of this receptor to be developed. UXO, geophysical and geotechnical surveys have the potential to accumulate data which, when reviewed by a competent archaeologist, may indicate hitherto unknown sites of archaeological potential. Any such discoveries may then trigger other embedded mitigation, as appropriate. All embedded mitigation and the methods for implementation and adherence are laid out in EIAR Vol. 4, Appendix 27: Written Scheme of Investigation and PAD.

In consideration of the embedded mitigation, the magnitude of direct impacts to unknown archaeological remains would be reduced, however, some degree of damage / loss cannot be wholly excluded. The process of discovery itself is likely to result in some degree of impact which may equate to the worst-case scenario. Similarly, the magnitude

of indirect impacts cannot be determined with confidence and may, in the worst-case, result in damage / loss. Any impact may be of maximum high magnitude.

Correlation of high receptor sensitivity alongside high magnitude of effect produces a major significance of effect, which is considered significant in EIA terms. Therefore, further consideration of this receptor is necessary to reduce the significance of effect.

Archaeological review of future survey data (as an embedded mitigation measure) would reduce the likelihood of archaeological sites of the highest sensitivity remaining undetected and thus reduce the likelihood of these to experience impacts during the construction phase. Identification of new sites would then trigger a process through which appropriate embedded mitigation may be implemented, e.g. AEZs. The identification of new sites and any information gained on discovery and subsequent investigation has the potential to improve understanding of the character, extent and condition of any remains and allow suitable mitigation to be implemented beyond the Project. Long-term awareness and preservation of a newly discovered site would meet the primary objective of policy, legislature and guidance in relation to cultural heritage (i.e. preservation *in situ*) and open the potential for the site to contribute to regional, national and / or international research objectives, as befitting its character and value. Discovery therefore can be considered to have a maximum high beneficial magnitude of effect (i.e. in the instance of a discovery of the highest value).

Where instances of positive and negative change must be compared, industry guidance defers to professional judgement, informed by experience (NatureScot and HES, 2018). Unknown archaeological remains cannot meaningfully contribute to understanding or appreciation of the historic environment and may thus be construed as having no value, whilst remaining unknown. As an unknown resource in an unknown location, they are also vulnerable to natural processes and human activities, the latter in the marine environment including seabed development, fishing and recreation. Unmitigated impacts to unknown remains may result in total loss. Although discovery of new archaeological remains within the Project Area may in itself result in impacts, any subsequent potential impacts will be mitigated. Appropriate preservation and the potential for new discoveries to contribute to research frameworks and objectives would result in a beneficial (positive) outcome. It is therefore considered that the maximum high negative magnitude of effect on discovery would be balanced by a maximum high positive magnitude, thereafter, resulting in an overall negligible magnitude.

Correlation of high sensitivity and negligible magnitude would result in a negligible significance of effect. The value of this receptor would be preserved as far as reasonably possible by implementation of embedded mitigation, potentially resulting in a positive magnitude of effect. Further direct / indirect impacts will be managed through the embedded mitigation as appropriate.

New archaeological discoveries should be assessed for impacts in accordance with their appropriate receptor group and any additional embedded mitigation applied as necessary.

Evaluation of significance

Considering the high sensitivity and the negligible magnitude of the effect, the overall effect on unknown wrecks or unidentified archaeological remains from impacts during construction is considered to be **Negligible** and **Not Significant** in EIA terms.

Sensitivity	Magnitude of effect	Consequence
High	Negligible	Negligible (No change)
Impact significance - **NOT SIGNIFICANT**		

16.6.1.5 Disturbance and / or damage to sub-seabed deposits of palaeoenvironmental potential

Activities proposed during the construction phase also have the potential to directly impact sub-seabed deposits of palaeoenvironmental potential. Construction activities, their distribution and direct impact pathways may be the same for this receptor as for wrecks and geophysical anomalies of high and medium archaeological potential (see Section 16.6.1.1), however, as the deposits of greater potential are understood to comprise basal elements of glacial tunnel valley infill (Coal Pit Formation), these are likely to lie beyond the depth of impact of activities except for foundation / anchor installation. The total impact footprint would be equivalent to that of the foundations / anchors (see Table 16-14).

Palaeoenvironmental remains derive their significance from intrinsic and contextual value, for their potential to inform understanding of environmental conditions during the formation of parent geological units. The extent of palaeoenvironmental remains may be determined by the extent and characteristics of the parent unit and may therefore be widespread across a substantial area. The combination of a possible widespread resource and relatively limited footprint (of the Project's worst-case scenario) suggest that the receptor has some capacity to accommodate direct impacts, would be unlikely to experience a significant degree of loss or damage and therefore holds **medium sensitivity**.

Archaeological involvement in the planning of future surveys and archaeological review of acquired data are included as embedded mitigation of the Project, as laid out in **EIAR Vol. 4, Appendix 27: Written Scheme of Investigation and PAD.** Such activities would be undertaken prior to the commencement of construction activities and the results used to improve understanding of the palaeoenvironmental potential of geological deposits and possible impacts. Undertaking ground truthing activities (boreholes and vibrocores) would introduce a small impact to this receptor, however, this would be offset by the knowledge gained from analysis of any sample and other results. Such knowledge may contribute to regional, national and / or international research objectives. The limited impact from further surveys weighed against the potential benefits of the data acquired would result in a **negligible magnitude of effect**.

Correlation of medium sensitivity and negligible magnitude would result in a **negligible significance of effect**. The value of this receptor would be preserved by implementation of embedded mitigation, offsetting the negative

magnitude of effect experienced during geotechnical investigations by providing the benefit of greater understanding of the receptor.

Evaluation of significance

Considering the medium sensitivity and the negligible magnitude of the effect, the overall effect on sub-seabed deposits of palaeoenvironmental potential from impacts during construction is considered to be Negligible and Not Significant in EIA terms.

Sensitivity	Magnitude of effect	Consequence
Medium	Negligible	Negligible

Impact significance - NOT SIGNIFICANT

16.6.2 Potential effects during operation and maintenance

16.6.2.1 Disturbance and / or damage to known wrecks and geophysical anomalies of high or medium archaeological potential

Several proposed activities during the operation and maintenance phase have the potential to result in direct and / or indirect impacts to known wrecks and geophysical anomalies of high or medium archaeological potential. Such activities include:

- Buried cable replacement / repair;
- Mooring line replacement; and
- Wind Turbine Generator (WTG) major component exchange.

The pathway for direct impacts during buried cable replacement would comprise equipment used for cable deburial (not explicitly defined in EIAR Vol. 2, Chapter 5: Project Description but possibly comprising jet trencher) and the laying back of cables upon the seabed. The direct impact pathway during mooring line replacement would be laying of lines upon the seabed. During WTG major component exchange, the pathway would be through the laying of detached mooring lines and dynamic cables upon the seabed. Buried cable replacement is applicable to both the Array Area and EICC and mooring line replacement and WTG major component exchange to the Array Area only.

The extent of any direct impacts during the operation and maintenance phase would be less than that of the construction phase. Where operation and maintenance impacts occur within the footprint of construction impacts, it is likely that no greater impact will be experienced than has previously occurred. Direct impacts arising from operation and maintenance activities therefore concern where these activities interact with areas of the seabed not previously impacted during the Project.

Indirect impacts also have the potential to affect this receptor. EIAR Vol. 2, Chapter 8: Marine Geology, Oceanography and Coastal Processes indicates that the highest impact from sediment transportation would occur within 0 to 50 m of the causal activity (such as jetting or ploughing) and last for up to 30 minutes after cessation. The worst-case scenario would see up to several metres of gravel and coarse sands deposited within this zone. This additional overburden has the potential to compress and damage wreck material. From 50 to 500 m from the causal activity, principally sands, along with finer gravels, are anticipated to be deposited in thicknesses up to tens of centimetres for up to 30 minutes after cessation. Deposition beyond 500 m from the causal activity is unlikely to result in deposition quantities likely to impact this receptor. Further indirect impacts may occur through removal of sediments supporting wreck material, resulting in destabilisation and damage.

Wrecks may be considered of the highest value in terms of cultural significance, which can be reflected in designation as a Scheduled Monument or HMPA. Such remains have the potential to possess intrinsic, contextual and associative value, as laid out in national guidance (NatureScot and HES, 2018). High and medium potential geophysical anomalies have been identified as having the potential to represent additional wrecks and wreck-related material (such as debris), respectively, and therefore may possess the same value as known wrecks.

The worst-case scenario would see direct and / or indirect impacts from operation and maintenance phase activities result in the permanent and irreversible damage and / or loss of this receptor or parts thereof, thus diminishing their intrinsic and contextual value which are derived in part from the cohesion of archaeological material and its primary context, respectively. Through adverse change to these values, associative value may also be lost, which is derived in part from interpretation of the asset's intrinsic and contextual data. Indirect impacts may cause similar damage / loss, resulting in similar change to these values. This receptor has no capacity to accommodate or recover from such impacts and therefore hold high sensitivity.

The magnitude of effect would be reduced by embedded mitigation. The establishment and adherence to AEZs throughout the operation and maintenance phase would remove the potential for direct impacts to identified wrecks and geophysical anomalies of high and medium archaeological potential. A bespoke and appropriately sized buffer is implemented for each asset, within which no operation and maintenance activities will take place. The AEZ would also prevent the removal of material supporting elements of this receptor and remove the potential for impacts to be experienced through this pathway. Sizing the AEZ to remove the receptor from the zone of highest transported sediment deposition (0 to 50 m from causal activity) would reduce the potential for impacts through this pathway.

Further embedded mitigation provides for the involvement of an archaeologist during the planning of future surveys / activities, to ensure that requirements for marine archaeology are upheld and specifications can consider the collection of additional data to improve understanding of identified anomalies and wrecks. New and improved understanding of this receptor may be used to establish new AEZs and / or alter existing AEZs (through discussion with stakeholders) to minimise potential for impacts. All embedded mitigation is laid out in EIAR Vol. 4, Appendix 27: Written Scheme of Investigation and PAD.

In consideration of the embedded mitigation, direct impacts to known wrecks and geophysical anomalies of high and medium archaeological potential would be removed. Indirect impacts would be reduced to levels unlikely to result in damage / loss. Through this action, the intrinsic, contextual and associative values of this receptor would be preserved. The residual change would be of negligible magnitude.

Correlation of high sensitivity and negligible magnitude would result in a negligible significance of effect (no change). The value of this receptor would be preserved by implementation of embedded mitigation, removing of the pathway for direct impacts and reducing to potential for indirect impacts to result in a significant effect.

Evaluation of significance

Considering the high sensitivity and the negligible magnitude of the effect, the overall effect on known wrecks and geophysical anomalies of high and medium archaeological potential from impacts during construction is considered to be Negligible (No change) and Not Significant in EIA terms.

Sensitivity	Magnitude of effect	Consequence
High	Negligible	Negligible (No change)

Impact significance - NOT SIGNIFICANT

16.6.2.2 Disturbance and / or damage to geophysical anomalies of low archaeological potential

Activities proposed during the operation and maintenance phase also have the potential to impact geophysical anomalies of low archaeological potential. Operation and maintenance activities, their distribution and impact pathways (direct and indirect) would be the same for this receptor as for wrecks and geophysical anomalies of high and medium archaeological potential. Direct impacts during the operation and maintenance phase would also only be applicable where these occur beyond the extent of construction impacts (see Section 16.6.2.1).

Geophysical anomalies of low archaeological potential have been identified as likely anthropogenic in origin but unlikely to be of high archaeological significance, such as discarded fishing gear, discarded cargo or elements of wreck. The cultural significance of this receptor would be principally determined by its intrinsic value. Such assets have a limited potential to contribute to regional research objectives and would likely be considered of low overall value. Pre-construction surveys and embedded mitigation applied throughout the construction phase increases the potential for identification of features / sites / artefacts of archaeological significance within this receptor to have been identified and managed accordingly.

As smaller entities with lesser weight than, for example, whole wrecks, archaeological material represented by this receptor would likely be more mobile, compact and robust, having withstood or accommodated background impacts since deposition. As such, they may have the ability to accommodate, in part, impacts arising from the proposed operation and maintenance activities, such as translocation through jet trenching or compression beneath a detached mooring line.

The worst-case scenario would see direct and / or indirect impacts from construction phase activities result in the permanent and irreversible damage and / or loss of this receptor or parts thereof, thus diminishing their intrinsic value, which is derived in part from the cohesion of archaeological material. Indirect impacts may cause similar damage / loss, resulting in similar change to these values, however, the likely nature of this receptor suggests a greater capacity to resist potential indirect impacts. Likely comprising material of limited to no archaeological

significance, this receptor has limited capacity to accommodate or recover from such impacts and therefore holds medium sensitivity.

Although mitigation of impacts to this receptor would not necessarily require the establishment of AEZs, the magnitude of effect would be reduced by other embedded mitigation. Archaeological involvement in further surveys (such as monitoring during the operation and maintenance phase) may allow greater understanding of this receptor to be developed.

A PAD would also be adhered to during the operation and maintenance phase, outlining the method of reporting and preserving chance discoveries of archaeological remains through various operation and maintenance activities, which may derive from geophysical anomalies of low archaeological potential. All embedded mitigation and the methods for implementation and adherence are laid out in EIAR Vol. 4, Appendix 27: Written Scheme of Investigation and PAD.

In consideration of the embedded mitigation, direct impacts to geophysical anomalies of low archaeological potential would be reduced, however, some degree of loss cannot be wholly excluded. Indirect impacts would be reduced to levels unlikely to result in damage / loss. Through this action, the intrinsic values of this receptor would be largely preserved. The residual change would be of maximum low magnitude.

Correlation of medium sensitivity and low magnitude would result in a minor significance of effect. The value of this receptor would be largely preserved by implementation of embedded mitigation, reducing the potential for direct and indirect impacts to result in a significant effect.

Should further investigations or surveys provide additional data relating to one or more geophysical anomalies of low archaeological potential, this may result reclassification, for example, if a low potential anomaly is found to represent an element of a wreck. In such cases, the anomaly / asset should be reassessed in accordance with its appropriate receptor group and any additional embedded mitigation applied as necessary.

Evaluation of significance

Considering the medium sensitivity and the low magnitude of the effect, the overall effect on geophysical anomalies of low archaeological potential from impacts during construction is considered to be Minor and Not Significant in EIA terms.

Sensitivity	Magnitude of effect	Consequence
Medium	Low	Minor

Impact significance - NOT SIGNIFICANT

16.6.2.3 Disturbance and / or damage to magnetic anomalies

Activities proposed during the operation and maintenance phase also have the potential to impact magnetic anomalies. Operation and maintenance activities, their distribution and impact pathways (direct and indirect) would be the same for this receptor as for wrecks and geophysical anomalies of high and medium archaeological potential. Direct impacts during the operation and maintenance phase would also only be applicable where these occur beyond the extent of construction impacts (see Section 16.6.2.1).

Magnetic anomalies are likely anthropogenic in origin but may alternatively be geological. These typically represent discarded marine / fishing equipment, however, they may represent wreck, wreck material or other entities of archaeological significance. The criteria and process for determining the archaeological potential of this receptor is detailed within EIAR Vol. 4, Appendix 28: Marine Archaeology Baseline Report. Although the review of geophysical data identified several magnetic anomalies of some archaeological potential, these could not be characterised further or positioned with confidence. No magnetic anomalies were identified which, with the current data, have the potential to represent wrecks associated with other supporting evidence.

Wrecks may be considered of the highest value, with the potential to possess intrinsic, contextual and associative value, as laid out in national guidance (NatureScot and HES, 2018). Non-wreck related magnetic anomalies may hold moderate to negligible intrinsic, contextual and / or associative value, however, this cannot be refined further whilst uncertainty regarding their character and origin remains.

Pre-construction surveys and embedded mitigation applied throughout the construction phase increases the potential for identification of features / sites / artefacts of archaeological significance within this receptor to have been identified and managed accordingly. Therefore, the likelihood of impacts to magnetic anomalies of higher archaeological value during the operation and maintenance phase is reduced.

The worst-case scenario would see direct and / or indirect impacts from operation and maintenance phase activities result in the permanent and irreversible damage and / or loss of this receptor or parts thereof, thus diminishing any intrinsic, contextual or associative held. Indirect impacts may cause similar damage / loss, resulting in similar change to any value held by the receptor.

The uncertainty of the nature and value of the receptor presents difficulty in determining its capacity to accommodate impacts and therefore its sensitivity. In consideration of the low likelihood of high value remains, the likely moderate to negligible value of this receptor and the worst-case scenario, a maximum of medium sensitivity is considered.

Although mitigation of impacts to this receptor would not necessarily require the establishment of AEZs, the magnitude of effect would be reduced by other embedded mitigation. Archaeological involvement in further surveys (such as monitoring during the operation and maintenance phase) may allow greater understanding of this receptor to be developed.

A PAD would also be adhered to during the operation and maintenance phase, outlining the method of reporting and preserving chance discoveries of archaeological remains through various activities, which may derive from magnetic anomalies. All embedded mitigation and the methods for implementation and adherence are laid out in EIAR Vol. 4, Appendix 27: Written Scheme of Investigation and PAD.

In consideration of the embedded mitigation, direct impacts to magnetic anomalies would be reduced, however, some degree of loss cannot be wholly excluded. Indirect impacts would be reduced to levels unlikely to result in damage / loss. Through this action, the intrinsic values of this receptor would be largely preserved. The residual change would be of maximum low magnitude.

Correlation of medium sensitivity and low magnitude would result in a minor significance of effect. The value of this receptor would be largely preserved by implementation of embedded mitigation, reducing the potential for direct and indirect impacts to result in a significant effect.

Should further investigations or surveys provide additional data relating to one or more identified magnetic anomalies, this may result reclassification, for example, if a magnetic anomaly is found to represent an element of a wreck. In such cases, the anomaly / asset should be reassessed in accordance with its appropriate receptor group and any additional embedded mitigation applied as necessary.

Evaluation of significance

Considering the medium sensitivity and the low magnitude of the effect, the overall effect on magnetic anomalies from impacts during construction is considered to be Minor and Not Significant in EIA terms.

Sensitivity	Magnitude of effect	Consequence
Medium	Low	Minor

Impact significance - NOT SIGNIFICANT

16.6.2.4 Disturbance and / or damage to unknown wrecks or unidentified archaeological remains

Activities proposed during the operation and maintenance phase also have the potential to impact unknown wrecks or unidentified archaeological remains. Operation and maintenance activities, their distribution and impact pathways (direct and indirect) would be the same for this receptor as for wrecks and geophysical anomalies of high and medium archaeological potential. Direct impacts during the operation and maintenance phase would also only be applicable where these occur beyond the extent of construction impacts (see Section 16.6.2.1).

The potential for hitherto unidentified wrecks and archaeological remains has been established by EIAR Vol. 4, Appendix 28: Marine Archaeology Baseline Report and summarised within Section 16.4.4 of this Chapter. For the purpose of this assessment, unidentified archaeological remains may comprise:

- *In situ* prehistoric sites, submerged palaeolandforms, isolated prehistoric artefacts and palaeoenvironmental remains;
- *Ex situ* prehistoric artefacts;
- Wrecks and isolated maritime artefacts; and
- Aircraft remains.

In situ prehistoric sites, wrecks and aircraft remains may be considered of the highest value, with the potential to possess intrinsic, contextual and associative value, as laid out in national guidance (NatureScot and HES, 2018). Other remains may hold one or more of these values, however, as an unknown resource, it is not possible to refine further with the data available. Any remains of these types may also be able to contribute to regional, national and international research frameworks and objectives.

The worst-case scenario would see direct and / or indirect impacts from operation and maintenance phase activities result in the permanent and irreversible damage and / or loss of this receptor or parts thereof, thus diminishing any intrinsic, contextual and associative value held. Indirect impacts may cause similar damage / loss, resulting in similar change to these values. In the worst-case scenario, this receptor would have no capacity to accommodate or recover from such impacts and therefore holds high sensitivity.

Pre-construction surveys and embedded mitigation applied throughout the construction phase increases the potential for identification of features / sites / artefacts of archaeological significance within this receptor to have been identified and managed accordingly. Therefore, the likelihood of impacts to unknown archaeological remains during the operation and maintenance phase is reduced.

Embedded mitigation has been integrated into the Project to minimise the significance of effect on unknown archaeological remains. AEZs around identified wrecks and geophysical anomalies of high and medium archaeological potential would also offer protection to unknown artefacts and sites therein (associated with the AEZ target or otherwise). Adherence to the PAD during the operation and maintenance phase would raise the awareness of others engaged in activities which have the potential to encounter unknown archaeological remains.

Archaeological involvement in further surveys (such as monitoring during the operation and maintenance phase) may allow greater understanding of this receptor to be developed. Any discoveries may then trigger other embedded mitigation, as appropriate. All embedded mitigation and the methods for implementation and adherence are laid out in EIAR Vol. 4, Appendix 27: Written Scheme of Investigation and PAD.

In consideration of the embedded mitigation, the magnitude of direct impacts to unknown archaeological remains would be reduced, however, some degree of damage / loss cannot be wholly excluded. The process of discovery itself is likely to result in some degree of impact which may equate to the worst-case scenario. Similarly, the magnitude of indirect impacts cannot be determined with confidence and may, in the worst-case, result in damage / loss. Any impact may be of maximum high magnitude.

Correlation of high receptor sensitivity alongside high magnitude of effect produces a major significance of effect, which is considered significant in EIA terms. Therefore, further consideration of this receptor is necessary to reduce the significance of effect.

Archaeological review of future survey data (as an embedded mitigation measure) would reduce the likelihood of archaeological sites of the highest sensitivity remaining undetected and thus reduce the likelihood of these to experience impacts during the construction phase. Identification of new sites would then trigger a process through which appropriate embedded mitigation may be implemented, e.g. AEZs. The identification of new sites and any information gained on discovery and subsequent investigation has the potential to improve understanding of the character, extent and condition of any remains and allow suitable mitigation to be implemented beyond the Project.

Long-term awareness and preservation of a newly discovered site would meet the primary objective of policy, legislature and guidance in relation to cultural heritage (i.e. preservation *in situ*) and open the potential for the site to contribute to regional, national and / or international research objectives, as befitting its character and value. Discovery therefore can be considered to have a maximum high beneficial magnitude of effect (i.e. in the instance of a discovery of the highest value).

Where instances of positive and negative change must be compared, industry guidance defers to professional judgement, informed by experience (NatureScot and HES, 2018). Unknown archaeological remains cannot meaningfully contribute to understanding or appreciation of the historic environment and may thus be construed as having no value, whilst remaining unknown. As an unknown resource in an unknown location, they are also vulnerable to natural processes and human activities, the latter in the marine environment including seabed development, fishing and recreation. Unmitigated impacts to unknown remains may result in total loss. Although discovery of new archaeological remains within the Project Area may in itself result in impacts, any subsequent potential impacts will be mitigated. Appropriate preservation and the potential for new discoveries to contribute to research frameworks and objectives would result in a beneficial (positive) outcome. It is therefore considered that the maximum high negative magnitude of effect on discovery would be balanced by a maximum high positive magnitude, thereafter, resulting in an overall negligible magnitude.

Correlation of high sensitivity and negligible magnitude would result in a negligible significance of effect. The value of this receptor would be preserved as far as reasonably possible by implementation of embedded mitigation, potentially resulting in a positive magnitude of effect. Further direct / indirect impacts will be managed through the embedded mitigation as appropriate.

New archaeological discoveries should be assessed for impacts in accordance with their appropriate receptor group and any additional embedded mitigation applied as necessary.

Evaluation of significance

Considering the high sensitivity and the negligible magnitude of the effect, the overall effect on unknown wrecks or unidentified archaeological remains from impacts during construction is considered to be Negligible and Not Significant in EIA terms.

Sensitivity	Magnitude of effect	Consequence
High	Negligible	Negligible (No change)
	Impact significance - NOT SIGNIFICANT	

16.6.3 Potential effects during decommissioning

Effects on Marine Archaeology receptors associated with decommissioning are anticipated to result from the full removal of the Project components. Decommissioning activities will be subject to consultations and further

assessments closer to the time of decommissioning to understand technical feasibility, safety and risk, and environmental considerations in detail. These details will be included in a Decommissioning Programme which will be developed post-consent and updated over the life of the Project.

The decommissioning of the Project intends to complete the full removal of offshore infrastructure to below the mudline (where safe/practicable to do so), in line with the OSPAR Convention and forthcoming guidance from OSPAR's North-East Atlantic Environmental Strategy 2030. The majority of decommissioning works are likely to be undertaken in reverse to the sequence of construction works and involve similar or lesser levels of effects to construction.

A Decommissioning Programme will be prepared prior to construction, in line with the requirements of Section 105 of the Energy Act 2004 (as amended) and any applicable guidance available at the time. Currently it is assumed that:

- Floating Turbine Unit (FTU) substructure and WTG components will be removed and towed to port;
- Mooring lines will be removed and, where possible, piles will be removed or cut to a suitable distance below the mudline such that the upper portion is removed;
- Cables no longer required will be removed where safe to do so; where they cross live third-party assets, they may be cut and left *in situ* to prevent damage to third-party operations; and
- The OSCP(s) will be decommissioned and the jacket and topside(s) will be towed to shore. The piles will be cut to a suitable distance below the mudline.

The sensitivities and effect magnitudes for decommissioning are considered to be comparable to those identified for the construction phase. Therefore, in the absence of detailed information regarding decommissioning works, the effects during the decommissioning of the Project are considered analogous with, or likely less than, those of the construction phase.

Embedded mitigation shall be adhered to throughout all Project phases, including decommissioning. Should decommissioning activities result in impacts beyond the footprint of those arising from construction and operation and maintenance activities, the resultant effects and significance of these would therefore be analogous to those of similar activities, i.e. cable removal to cable replacement.

Unknown archaeological remains within proximity of decommissioning activities may have been detected during construction or operation and maintenance activities, however, further remains may feasibly be detected only during decommissioning. The potential for encountering hitherto unknown archaeological remains would increase should decommissioning activities result in impacts beyond those of previous phases.

The sensitivity of receptors and the magnitude of effects to Marine Archaeology receptors concluded as part of the assessment of potential effects during the construction phase (Section 16.6.1) are applicable to the decommissioning phase.

16.6.4 Summary of potential effects

A summary of the outcomes of the assessment of potential effects from the construction, operation and maintenance and decommissioning of the Project is provided in Table 16-15.

No significant effects on Marine Archaeology receptors were identified. Therefore, mitigation measures in addition to the embedded mitigation measures listed in Section 16.5.4 are not considered necessary.

Table 16-15 Summary of potential effects

POTENTIAL EFFECT	RECEPTOR	SENSITIVITY OF RECEPTOR	MAGNITUDE OF EFFECT	CONSEQUENCE (SIGNIFICANCE OF EFFECT)	SECONDARY MITIGATION REQUIREMENTS	RESIDUAL CONSEQUENCE (SIGNIFICANT OF EFFECT)
Construction						
Disturbance and / or damage from direct and / or indirect impacts	Known wreck remains; geophysical anomalies of high and medium archaeological potential	High	Negligible	No change (not significant)	None required above existing embedded mitigation measures.	N/a
	Potential archaeological remains	High	Negligible	Negligible (not significant)	None required above existing embedded mitigation measures.	N/a
	Geophysical anomalies of low archaeological potential; magnetic anomalies	Medium	Low	Minor (not significant)	None required above existing embedded mitigation measures.	N/a

POTENTIAL EFFECT	RECEPTOR	SENSITIVITY OF RECEPTOR	MAGNITUDE OF EFFECT	CONSEQUENCE (SIGNIFICANCE OF EFFECT)	SECONDARY MITIGATION REQUIREMENTS	RESIDUAL CONSEQUENCE (SIGNIFICANT OF EFFECT)
Disturbance and / or damage from direct impacts	Palaeoenvironmental remains	Medium	Negligible	Negligible (not significant)	None required above existing embedded mitigation measures.	N/a
Operation and maintenance						
Disturbance and / or damage from direct and / or indirect impacts	Known wreck remains; geophysical anomalies of high and medium archaeological potential	High	Negligible	No change (not significant)	None required above existing embedded mitigation measures.	N/a
	Potential archaeological remains	High	Negligible	Negligible (not significant)	None required above existing embedded mitigation measures.	N/a
	Geophysical anomalies of low archaeological	Medium	Low	Minor (not significant)	None required above existing embedded mitigation measures.	N/a

POTENTIAL EFFECT	RECEPTOR	SENSITIVITY OF RECEPTOR	MAGNITUDE OF EFFECT	CONSEQUENCE (SIGNIFICANCE OF EFFECT)	SECONDARY MITIGATION REQUIREMENTS	RESIDUAL CONSEQUENCE (SIGNIFICANT OF EFFECT)
	potential; magnetic anomalies					
Decommissioning						
The extent of decommissioning impacts is not anticipated to extend beyond those of the construction and operation and maintenance phases. Where decommissioning impacts occur, these would be in line with related activities during the construction and operation and maintenance phases, i.e. buried cable removal.						

16.7 Assessment of cumulative effects

16.7.1 Introduction

The general approach to cumulative effects assessment adopted for the Project is outlined within EIAR Vol. 2, Chapter 7: EIA Methodology and in EIAR Vol. 4, Appendix 31: Cumulative Effects Assessment Methodology. As part of the cumulative process, a long list of plans, activities and projects (developments) is first defined. Upon review of this long list, the construction period of some of the identified developments did not overlap with the construction phase of the Project, so these plans, activities and projects (developments) will not be considered further in this cumulative assessment.

Other projects scoped in for the cumulative effects assessment have been determined through their proximity to the Project Area and potential for cumulative effects to Marine Archaeology receptors to arise. The extent of potential effects has been informed by EIAR Vol. 2, Chapter 5: Project Description and EIAR Vol. 2, Chapter 8: Marine Geology, Oceanography and Coastal Processes, from which the worst-case scenario direct and indirect impacts, respectively, have been concluded.

Prior to review of EIAR Vol. 2, Chapter 8: Marine Geology, Oceanography and Coastal Processes, a provisional buffer of 50 km measured from the Project Area was used to screen other projects for potential cumulative effects. Following detail review of EIAR Vol. 2, Chapter 8: Marine Geology, Oceanography and Coastal Processes, it was found that the provisional buffer was not proportionate to the identified extent of potential indirect impacts and was amended accordingly.

The Marine Archaeology Study Area, used by EIAR Vol. 4, Appendix 27: Marine Archaeology Baseline Report to establish the baseline for Marine Archaeology encompasses all potential direct impacts and any measurable changes with the potential to result in indirect impacts to Marine Archaeology receptors, therefore, an equivalent 5 km Zone of Influence (ZoI) would incorporate similar potential impacts and has been used to screen projects for the cumulative effects assessment. Those projects screened in, using the final buffer of 5 km measured from the Project Area, are presented by Table 16-16.

The potential for both direct and indirect impacts has been considered during the screening process. Impacts to onshore heritage assets through changes to their setting as a result of the Project have been scoped out of this Chapter (see Section 16.5.2), therefore, settings are not considered in the cumulative effects assessment.

Table 16-16 List of developments considered for the Marine Archaeology cumulative impact assessment

LOCATION	PROJECT TYPE	PROJECT NAME	DISTANCE TO PROJECT (KM)	STATUS	CONFIDENCE
United Kingdom	Ports and Harbours Development	Peterhead Smith Quay Extension	187.7	Pre-Application (Early Development)	Low
United Kingdom	Aggregates and Dredge Disposal	North Buchan Ness	180.2	Operational	High
United Kingdom	Aggregates and Dredge Disposal	Peterhead	179.9	Operational	High
United Kingdom	Aggregates and Dredge Disposal	Peterhead Harbour	187.7	Operational	High
United Kingdom	Cable	Eastern Green Link 2	164.7	Consented	Medium
United Kingdom	Cable	Eastern Green Link 3	163.5	Pre-Application (Scoping)	Low
United Kingdom	Cable	Central North Sea Electrification (CNSE) Project	0.0	Pre-Application (Scoping)	Low
United Kingdom	Cable	TAMPNET CNSFTC	37.3	Operational	High
United Kingdom	Cable	North Sea Link	3.9	Operational	High
United Kingdom	Offshore Wind	GreenVolt	127.92	Consented	Low
United Kingdom	Offshore Wind	Salamander	145.6	Application	Low

LOCATION	PROJECT TYPE	PROJECT NAME	DISTANCE TO PROJECT (KM)	STATUS	CONFIDENCE
United Kingdom	Offshore Wind	Flora	137.4	Pre-Application (Early Development)	Low
United Kingdom	Offshore Wind	CampionWind	56.7	Pre-Application (Early Development)	Low
United Kingdom	Offshore Wind	Muir Mhor	102.7	Application	Low
United Kingdom	Offshore Wind	Hywind Scotland Pilot Park	156.4	Operational	High
United Kingdom	Offshore Wind	MarramWind	132.4	Pre-Application (Scoping)	Low

**Confidence ratings have been applied to each cumulative development where: 'Low' = pre-application or application, 'Medium' = consented and 'High' = under construction or operational.*

It is recognised that each of the projects included in Table 16-16 may result in direct impacts to potential heritage assets. When considered in isolation and, assuming the application of appropriate mitigation, physical impacts might only be determined to be of negligible or minor adverse significance at worst. However, when considered collectively on a regional scale, these multiple impacts may be considered of greater adverse significance. For example, it is possible that unique aspects of former landscapes or of the *in situ* maritime and aviation archaeological resource, may be impacted across two or more projects, resulting it a greater cumulative effect to a receptor than may be experienced on a project-by-project basis. In addition, if a site is damaged or destroyed, comparable sites elsewhere may increase in importance due to greater rarity and any future direct impacts will be of greater significance.

Each of the screened-in projects will undertake archaeological assessments in advance of construction, at varying scales of resolution, which are relevant to the wider understanding of the North Sea. Operation and maintenance and decommissioning activities may also yield additional information through the same or similar embedded mitigation applied by the Project.

Despite the significant data that is being produced through the consenting process, the extent of these networks and seascapes / landscapes from various periods remain largely unmapped and may either be confined within a project area or may extend beyond its bounds. It is possible, therefore, that cumulative impacts could occur through multiple impacts upon the same features, such as palaeolandforms.

The potential cumulative magnitude of these impacts remains poorly understood. It is acknowledged that strategic analysis in relation to the cumulative impact of multiple constructed and planned projects would facilitate greater understanding of the cumulative effect of offshore wind development within the North Sea. Therefore, benefit would be demonstrated in mapping features from the projects listed in Table 16-16, where datasets are made publicly available.

On a regional level, the adverse cumulative effects can be offset in part through the mapping of accessible data and provision of publicly accessible data post-consent, with results from the Project and from other offshore wind developments within the North Sea. In this way, contribution could be made to regional research initiatives and provide 'joined-up' objectives for post-consent investigation and mitigation. This could include links with academic and industry-wide research initiatives, such as the BRITICE-CHRONO project (The University of Sheffield, n.d.) and the North Sea Prehistory Research and Management Framework (Research Frameworks Network, 2024). This approach is presented in further detail within EIAR Vol. 4, Appendix 27: Written Scheme of Investigation and PAD.

All Marine Archaeology receptors scoped into the impact assessment for this Chapter have also been scoped into the cumulative effects assessment. These receptors comprise:

- Known wrecks and geophysical anomalies of high or medium archaeological potential;
- Geophysical anomalies of low archaeological potential;
- Magnetic anomalies;
- Unknown wrecks and unidentified archaeological remains; and
- Sub-seabed deposits of palaeoenvironmental potential.

Impacts for consideration for the assessment of cumulative effects comprise both direct and indirect impacts. It is noted, however, that different project types may have a slightly different list of scoped-in Marine Archaeology receptors, for example, dredge disposal projects may not scope-in impacts to sub-seabed deposits of palaeoenvironmental potential if no sub-seabed impacts are anticipated.

The following impacts are not considered for the assessment of cumulative effects:

- Impacts arising from changes to the setting of onshore assets resulting from offshore infrastructure (these have been scoped-out through the Scoping Report and agreed through the Scoping Opinion – see Section 16.3; and
- Impacts to Marine Archaeology receptors within the Array Area.

EIAR Vol. 2, Chapter 8: Marine Geology, Oceanography and Coastal Processes observes that no other projects are situated within one spring tidal excursion ellipse from the Array Area, therefore, there is no potential for cumulative impacts on stratification arising from interaction with these. Direct impacts have a highly localised area of effect and indirect impacts to Marine Archaeology would not occur outside of the tidal excursion buffer. Any impacts arising from other projects would not result in cumulative effects within the Array Area of the Project. All cumulative effects therefore apply to Marine Archaeology receptors within the EICC only.

16.7.2 Cumulative construction effects

16.7.2.1 Disturbance and / or damage to known wrecks and geophysical anomalies of high or medium archaeological potential

Activities undertaken during the construction phase of the projects highlighted in Table 16-16 may include:

- Site preparation (PLGR, boulder clearance, sandwave clearance, UXO clearance, removal of out-of-service cables);
- Cable laying (possibly including HDD) and cable protection;
- Foundation / anchor installation; and
- Other structure/ infrastructure installation.

Construction activities and impact pathways (direct and indirect) of other projects would be broadly the same for this receptor as for the Project (see Section 16.6.1.1), although pathways may vary with methodology / equipment / designs. Direct impacts may arise through direct interaction between a tool and the receptor (e.g. PLGR) or via a proxy (e.g. shockwave from High Order UXO detonation or interaction with a dragged out-of-service cable). Such activities, particularly where overlapping, such as at cable / pipeline crossing points, have the potential to result in cumulative direct impacts to known wrecks and geophysical anomalies of high or medium archaeological potential.

Indirect impacts may arise where seabed preparation activities destabilise receptors or deposit transported sediment on them. As suggested by EIAR Vol. 2, Chapter 8: Marine Geology, Oceanography and Coastal Processes, indirect impacts from increased SSC are most likely to be greatest within 0 to 50 m of the causal activity, though measurable increases to SSC and deposition are anticipated to also occur within the 50 to 500 m range and 500 m to the tidal excursion buffer limit.

Wrecks may be considered of the highest value in terms of cultural significance, which can be reflected in designation as a Scheduled Monument or HMPA. Such remains have the potential to possess intrinsic, contextual and associative value, as laid out in national guidance (NatureScot and HES, 2018). High and medium potential geophysical anomalies have been identified as having the potential to represent additional wrecks and wreck-related material (such as debris), respectively, and therefore may possess the same value as known wrecks.

The worst-case scenario would see direct and / or indirect impacts from construction phase activities result in the permanent and irreversible damage and / or loss of this receptor or parts thereof, thus diminishing their intrinsic and contextual value which are derived in part from the cohesion of archaeological material and its primary context, respectively. Through adverse change to these values, associative value may also be lost, which is derived in part from interpretation of the asset's intrinsic and contextual data. Indirect impacts may cause similar damage / loss, resulting in similar change to these values. This receptor has no capacity to accommodate or recover from such impacts and therefore hold high sensitivity.

The magnitude of effect from cumulative effects to this receptor may be greater than that on a project-by-project basis. This receptor would be managed by each project through embedded mitigation, including the establishment of AEZs and micro-routeing of cable corridors, removing the potential for direct impacts and reducing the magnitude

of any potential indirect impacts to levels unlikely to result in impacts. The receptor would experience a maximum negligible magnitude of effect.

Correlation of high sensitivity and negligible magnitude would result in a negligible significance of effect. The value of this receptor would be preserved by implementation of embedded mitigation across all cumulative projects, removing of the pathway for direct impacts and reducing to potential for indirect impacts to result in a significant cumulative effect.

16.7.2.2 Disturbance and / or damage to geophysical anomalies of low archaeological potential

Construction activities of other projects also have the potential to result in cumulative effects to geophysical anomalies of low archaeological potential. Construction activities and impact pathways (direct and indirect) may vary between projects and may include activities outlined in Section 16.7.2.1.

Geophysical anomalies of low archaeological potential have been identified as likely anthropogenic in origin but unlikely to be of high archaeological significance, such as discarded fishing gear, discarded cargo or elements of wreck. The cultural significance of this receptor would be principally determined by its intrinsic value. Such assets have a limited potential to contribute to regional research objectives and would likely be considered of low overall value.

As smaller entities with lesser weight than, for example, whole wrecks, archaeological material represented by this receptor would likely be more mobile, compact and robust, having withstood or accommodated background impacts since deposition. As such, they may have the ability to accommodate, in part, impacts arising from the proposed construction activities, such as translocation through PLGR or boulder clearance.

The worst-case scenario would see direct and / or indirect impacts from cumulative effects result in the permanent and irreversible damage and / or loss of this receptor or parts thereof, thus diminishing their intrinsic value, which is derived in part from the cohesion of archaeological material. Indirect impacts may cause similar damage / loss, resulting in similar change to these values, however, the likely nature of this receptor suggests a greater capacity to resist potential indirect impacts. Likely comprising material of limited to no archaeological significance, this receptor has limited capacity to accommodate or recover from such impacts and therefore holds medium sensitivity.

Embedded mitigation for each project would reduce the cumulative effects to this receptor. Typical mitigation may include archaeological involvement in further surveys and adherence to a PAD (see Section 16.6.1.2). New archaeological data, if shared between projects, may allow greater understanding of the archaeological character of this receptor to be developed and improve the potential for identification of archaeological remains and their preservation.

Embedded mitigation would reduce the potential for cumulative effects to geophysical anomalies of low archaeological potential. The potential for direct impacts would be reduced, however, some degree of loss cannot be wholly excluded. Indirect impacts would be reduced to levels unlikely to result in damage / loss. Through this action, the intrinsic values of this receptor would be largely preserved. The residual change would be of maximum low magnitude.

Correlation of medium sensitivity and low magnitude would result in a minor significance of effect. The value of this receptor would be largely preserved by implementation of project-specific embedded mitigation, reducing the potential for direct and indirect impacts to result in a significant cumulative effect.

16.7.2.3 Disturbance and / or damage to magnetic anomalies

Construction activities of other projects also have the potential to result in cumulative effects to magnetic anomalies. Construction activities and impact pathways (direct and indirect) may vary between projects and may include activities outlined in Section 16.7.2.1.

Magnetic anomalies are likely anthropogenic in origin but may alternatively be geological. These typically represent discarded marine / fishing equipment, however, they may represent wreck, wreck material or other entities of archaeological significance. Expert and competent review of geophysical data may be able to identify magnetic anomalies with a higher potential to be of archaeological significance, allowing these to be managed appropriately through project-specific mitigation. Magnetic anomalies are also typically investigated in UXO campaigns and archaeological involvement during the planning and undertaking of these or review of the acquired data, may aid in the identification of magnetic anomalies of archaeological potential. In this way, it is anticipated that archaeological remains of potentially the highest value, e.g. wrecks, will be identified and protected accordingly.

Wrecks may be considered of the highest value, with the potential to possess intrinsic, contextual and associative value, as laid out in national guidance (NatureScot and HES, 2018). Non-wreck related magnetic anomalies may hold moderate to negligible intrinsic, contextual and / or associative value, however, this cannot be refined further whilst uncertainty regarding their character and origin remains.

The worst-case scenario would see direct and / or indirect impacts from cumulative effects result in the permanent and irreversible damage and / or loss of this receptor or parts thereof, thus diminishing their intrinsic value, which is derived in part from the cohesion of archaeological material. Indirect impacts may cause similar damage / loss, resulting in similar change to these values, however, the likely nature of this receptor suggests a greater capacity to resist potential indirect impacts. The uncertainty of the nature and value of this receptor presents difficulty in determining its capacity to accommodate impacts and therefore its sensitivity. In consideration of the low likelihood of high value remains going undetected, the likely moderate to negligible value of this receptor and the worst-case scenario, a maximum of medium sensitivity is considered.

Embedded mitigation for each project would reduce the cumulative effects to this receptor. Typical mitigation may include archaeological involvement in further surveys (e.g. UXO target investigation) and adherence to a PAD (see Section 16.6.1.3). New archaeological data, if shared between projects, may allow greater understanding of the archaeological character of this receptor to be developed and improve the potential for preservation. The potential for direct impacts would be reduced, however, some degree of loss cannot be wholly excluded, as the process of identification may incur damage. Indirect impacts would be reduced to levels unlikely to result in damage / loss. Through this action, the intrinsic values of this receptor would be largely preserved. The residual change would be of maximum low magnitude.

Correlation of medium sensitivity and low magnitude would result in a minor significance of effect. The value of this receptor would be largely preserved by implementation of project-specific embedded mitigation, reducing the potential for direct and indirect impacts to result in a significant cumulative effect.

16.7.2.4 Disturbance and / or damage to unknown wrecks or unidentified archaeological remains

Construction activities of other projects also have the potential to result in cumulative effects to unknown wrecks or unidentified archaeological remains. Construction activities and impact pathways (direct and indirect) may vary between projects and may include activities outlined in Section 16.7.2.1.

The potential for hitherto unidentified wrecks and archaeological remains has been established by EIAR Vol. 4, Appendix 28: Marine Archaeology Baseline Report and summarised within Section 16.4.4 of this Chapter. For the purpose of this assessment, unidentified archaeological remains may comprise:

- *In situ* prehistoric sites, submerged palaeolandforms, isolated prehistoric artefacts and palaeoenvironmental remains;
- *Ex situ* prehistoric artefacts;
- Wrecks and isolated maritime artefacts; and
- Aircraft remains.

In situ prehistoric sites, wrecks and aircraft remains may be considered of the highest value, with the potential to possess intrinsic, contextual and associative value, as laid out in national guidance (NatureScot and HES, 2018). Other remains may hold one or more of these values, however, as an unknown resource, it is not possible to refine further with the available data. Any remains of these types may also be able to contribute to regional, national and international research frameworks and objectives, to a degree relative to their value.

The worst-case scenario would see direct and / or indirect impacts from construction phase activities result in the permanent and irreversible damage and / or loss of this receptor or parts thereof, thus diminishing any intrinsic, contextual and associative value held. Indirect impacts may cause similar damage / loss, resulting in similar change to these values. In the worst-case scenario, this receptor would have no capacity to accommodate or recover from such impacts and therefore holds high sensitivity.

Embedded mitigation for each project would be implemented to minimise the potential and magnitude of effects to this receptor, however, some degree of damage / loss is likely to occur through discovery. This negative magnitude would be offset by the positive magnitude of effects occurring through identification of new assets / sites, preservation of these (in line with national and international legislature, policy and guidance – see Section 16.2) and the potential to gain greater understanding of the wider marine archaeological resource and contribute to research objectives (see Section 16.6.1.4 for a detailed discussion regarding the magnitude of change to this receptor). Data sharing of new discoveries between projects would have a cumulative effect resulting in greater understanding of the marine archaeology of the North Sea, equating to a worst-case negligible magnitude of effect, but possibly resulting in a beneficial impact.

Correlation of high sensitivity and negligible magnitude would result in a negligible significance of effect. The value of this receptor would be preserved by implementation of embedded mitigation across all projects, removing of the pathway for direct impacts and reducing to potential for indirect impacts to result in a significant cumulative effect.

16.7.2.5 Disturbance and / or damage to sub-seabed deposits of palaeoenvironmental potential

Construction activities of other projects have the potential to directly impact sub-seabed deposits of palaeoenvironmental potential. As observed by EIAR Vol. 4, Appendix 28: Marine Archaeology Baseline Report, geological units closer to the seabed within much of the central North Sea, particularly those likely to be represented within those projects presented by Table 16-16, exhibit characteristics of glaciomarine to temperate marine depositional environments, suggesting limited potential for palaeoenvironmental evidence to be contained therein.

Impact pathways for cumulative effects to units with greater palaeoenvironmental potential, such as basal elements of the Coal Pit Formation, as exemplified within the Project Area, would likely comprise activities with deeper penetration impacts, such as foundation or anchor installation. This Formation pinches out within the nearshore EICC and is not recorded close to the coast. Port and harbour projects and dredge disposal projects are therefore not likely to impact this unit.

Units with palaeoenvironmental potential closer to the seabed have not been identified within the Project Area. Such units may exist within the development area of other projects, however, there would be no cumulative effects with those the Project.

Palaeoenvironmental remains derive their significance from intrinsic and contextual value, for their potential to inform understanding of environmental conditions during the formation of parent geological units. The extent of palaeoenvironmental remains may be determined by the extent and characteristics of the parent unit and may therefore be widespread across a substantial area, increasing the potential for cumulative effects. The combination of a possible widespread resource and relatively limited footprint (of the Project's worst-case scenario and that anticipated from other projects) suggest that the receptor has some capacity to accommodate direct impacts, would be unlikely to experience a significant degree of loss or damage and therefore holds medium sensitivity.

Embedded mitigation for each project would reduce the cumulative effects to this receptor. Typical mitigation may include archaeological involvement in further surveys, archaeological review of geotechnical investigation results and adherence to a PAD (see Section 16.6.1.5). New archaeological data, if shared between projects, may allow greater understanding of the archaeological character of this receptor to be developed and improve the potential for preservation.

Undertaking ground truthing activities (boreholes and vibrocores) would introduce a small impact to this receptor, however, this would be offset by the knowledge gained from analysis of any sample and other results. Such knowledge may contribute to regional, national and / or international research objectives. The limited impact from further surveys weighed against the potential benefits of the data acquired would result in a negligible magnitude of effect.

Correlation of medium sensitivity and negligible magnitude would result in a negligible significance of effect. The value of this receptor would be preserved by implementation of embedded mitigation across all projects, offsetting the negative magnitude of effect experienced during geotechnical investigations by providing the benefit of greater understanding of the receptor.

16.7.3 Cumulative operation and maintenance effects

Operation and maintenance activities proposed by the Project have been assessed for impacts to the following receptors:

- Known wrecks and geophysical anomalies of high and medium archaeological potential (Section 16.6.2.1);
- Geophysical anomalies of low archaeological potential (Section 16.6.2.2);
- Magnetic anomalies (Section 16.6.2.3); and
- Unknown wrecks and unidentified archaeological remains (Section 16.6.2.4).

The impact assessment and resultant significance of effect for each receptor is likely to be the same across other cable and offshore wind projects, where the methodology of operation and maintenance is similar. Also, through adherence to appropriate embedded mitigation through all project phases, it is envisaged that the maximum significance of effect would be no greater for each receptor than concluded for the construction phase. As such, cumulative effects for the operation and maintenance phase of other projects would result in no greater than a **minor effect** for each cable and offshore wind project.

Operation and maintenance activities for different types of projects may result in different impacts. Port and harbour maintenance may require periodic dredging, which may result in direct impacts to Marine Archaeology receptors, and aggregate and dredge disposal may result in higher SSC and deposition, possibly leading to indirect impacts. Impacts arising from such activities would be management by implementation and adherence to similar embedded mitigation as used by the Project, including AEZs, PAD and archaeological input into future surveys. On application of appropriate mitigation, it is anticipated that any cumulative effects arising from these activities would result in no greater cumulative effect than concluded for each receptor during the construction phase (maximum **minor effect** for each project).

16.7.4 Cumulative decommissioning effects

The decommissioning of the Project intends to complete the full removal of offshore infrastructure to below the mudline (where safe / practicable to do so). The majority of decommissioning works are likely to be undertaken in reverse to the sequence of construction works. However, there is limited information on the details around decommissioning of the Project and around the lifecycle of other developments. Considering this, it is assumed that decommissioning involves similar or lesser levels of effects to construction.

A Decommissioning Programme will be prepared prior to construction, in line with the requirements of Section 105 of the Energy Act 2004 (as amended) and any applicable guidance available at the time.

Embedded mitigation shall be adhered to throughout all Project phases, including decommissioning. Should decommissioning activities result in impacts beyond the footprint of those arising from construction and operation and maintenance activities, the resultant effects and significance of these would therefore be analogous to those of similar activities, i.e. cable removal to cable replacement.

Unknown archaeological remains within proximity of decommissioning activities may have been detected during construction or operation and maintenance activities, however, further remains may feasibly be detected only during decommissioning. The potential for encountering hitherto unknown archaeological remains would increase should decommissioning activities result in impacts beyond those of previous phases.

The sensitivity of receptors and the magnitude of effects to Marine Archaeology receptors concluded as part of the assessment of potential effects during the construction phase (Section 16.6.1) are applicable to the decommissioning phase.

16.7.5 Summary of cumulative effects

A summary of the outcomes of the assessment of cumulative effects for the construction, operation and maintenance and decommissioning phases of the Project is provided in Table 16-17.

Table 16-17 Summary of assessment of cumulative effects

POTENTIAL IMPACT	RECEPTOR	SENSITIVITY OF RECEPTOR	MAGNITUDE OF EFFECT	CONSEQUENCE (SIGNIFICANCE OF EFFECT)	SECONDARY MITIGATION REQUIREMENTS	RESIDUAL CONSEQUENCE (SIGNIFICANT OF EFFECT)
Construction						
Disturbance and / or damage from direct and / or indirect impacts	Known wreck remains; geophysical anomalies of high and medium archaeological potential	High	Negligible	No change (not significant)	None required above existing embedded mitigation measures.	N/A
	Potential archaeological remains	High	Negligible	Negligible (not significant)	None required above existing embedded mitigation measures.	N/A
	Geophysical anomalies of low archaeological potential; magnetic anomalies	Medium	Low	Minor (not significant)	None required above existing embedded mitigation measures.	N/A

POTENTIAL IMPACT	RECEPTOR	SENSITIVITY OF RECEPTOR	MAGNITUDE OF EFFECT	CONSEQUENCE (SIGNIFICANCE OF EFFECT)	SECONDARY MITIGATION REQUIREMENTS	RESIDUAL CONSEQUENCE (SIGNIFICANT OF EFFECT)
Disturbance and / or damage from direct impacts	Sub-seabed units with potential for palaeoenvironmental remains	Medium	Negligible	Negligible (not significant)	None required above existing embedded mitigation measures.	N/A
Operation and maintenance						
Disturbance and / or damage from direct and / or indirect impacts	Known wreck remains; geophysical anomalies of high and medium archaeological potential	High	Negligible	No change (not significant)	None required above existing embedded mitigation measures.	N/A
	Potential archaeological remains	High	Negligible	Negligible (not significant)	None required above existing embedded mitigation measures.	N/A
	Geophysical anomalies of low archaeological	Medium	Low	Minor (not significant)	None required above existing embedded mitigation measures.	N/A

POTENTIAL IMPACT	RECEPTOR	SENSITIVITY OF RECEPTOR	MAGNITUDE OF EFFECT	CONSEQUENCE (SIGNIFICANCE OF EFFECT)	SECONDARY MITIGATION REQUIREMENTS	RESIDUAL CONSEQUENCE (SIGNIFICANT OF EFFECT)
	potential; magnetic anomalies					
Decommissioning						
The extent of decommissioning impacts is not anticipated to extend beyond those of the construction and operation and maintenance phases. Where decommissioning impacts occur, these would be in line with related activities during the construction and operation and maintenance phases, i.e. buried cable removal.						

16.8 Inter-related effects

Inter-related effects are the potential effects of multiple impacts, effecting one receptor or a group of receptors. Inter-related effects include interactions between the impacts of the different phases of the Project (i.e. interaction of impacts across construction, operation and maintenance and decommissioning), as well as the interaction between impacts on a receptor within a Project phase. The potential inter-related effects for Marine Archaeology receptors are described below.

16.8.1 Inter-related effects between Project phases

All phases of the Project have the potential to result in effects to Marine Archaeology. Inter-related effects arising during operation and maintenance and decommissioning activities have the potential to result in additional impacts to those occurring during the construction phase.

Project lifetime effects are effects that occur throughout more than one phase to interact to potentially create a more significant effect on a receptor than if just assessed in isolation within the parameters of each phase.

Receptor-led effects involve spatially or temporal interaction of effects, to create inter-related effects on a receptor or receptor group. Receptor-led effects might be short-term, temporary or transient effects or incorporate long-term effects.

The potential interaction between impacts to Marine Archaeology receptors is presented by Table 16-18. For the purposes of this assessment, known archaeology comprises:

- Identified wrecks and geophysical anomalies of high and medium potential.

Potential archaeology includes the following receptors:

- Geophysical anomalies of low archaeological potential;
- Magnetic anomalies;
- Sub-seabed deposits of palaeoenvironmental potential; and
- Unidentified archaeological remains.

The potential for inter-related effects would be the same across all phases, therefore the interaction matrix presented by Table 16-18 is applicable to the construction, operational and maintenance and decommissioning phases of the Project.

Table 16-18 Interaction between impacts to Marine Archaeology

POTENTIAL INTERACTION BETWEEN IMPACTS			
	Direct impacts to identified known archaeology	Direct impacts to potential archaeology	Indirect impacts to archaeology form changes to physical processes
Direct impacts to identified known archaeology		No	No
Direct impacts to potential archaeology	No		Yes
Indirect impacts to archaeology (identified or unidentified)	No	Yes	

Direct impacts to known archaeology are removed through embedded mitigation, therefore, only potential archaeology may experience inter-related effects. The maximum significance of the individual effects, as assessed in Section 16.6, is presented by Table 16-19 for this receptor group. The sum of potential direct and indirect impacts across all Project phases may therefore be greater than those occurring during a single phase. However, any such impacts would be mitigated through adherence to the embedded mitigation, resulting in a maximum Minor significance of effect (Not Significant).

Table 16-19 Summary of the potential project lifetime inter-related effects for Marine Archaeology

RECEPTOR GROUP	SIGNIFICANCE OF EFFECTS			INTER-RELATED EFFECTS
	Construction	Operation and maintenance	Decommissioning	
Potential archaeology	Minor	Minor	Minor	Activities associated with each stage across the lifecycle of the Project may result in additive direct impacts (further details in Sections 16.6.1, 16.6.2 and 16.6.3). For example, changes to physical processes during the construction phase may expose unidentified archaeology which may then be more vulnerable to direct impacts

RECEPTOR GROUP	SIGNIFICANCE OF EFFECTS			INTER-RELATED EFFECTS
	Construction	Operation and maintenance	Decommissioning	
				(without sediment cover) during subsequent phases.

The significance of inter-related effects would be no greater than that of the individually assessed impact. Archaeological discoveries, either through assignation of archaeological significance to previously identified areas / objects of archaeological potential or through new discoveries, are accommodated by embedded mitigation. Direct impacts can lead to identification, at which point further embedded mitigation may be extended, as appropriate (e.g. through the establishment of new AEZs). Any subsequent impacts (direct or indirect) would be no of no greater effect significance. This would be applicable across all phases, as embedded mitigation (unless altered through provision of new data to inform this and agreement with stakeholders) would be maintained throughout the Project lifecycle.

16.8.2Inter-related effects within a Project phase

The greatest potential for spatial and temporal interactions would occur during the construction phase. Individual impacts were assigned significance of no change to minor adverse. Direct impacts to known archaeology are removed through adherence to embedded mitigation, therefore, only potential archaeology may experience inter-related effects.

The sum of potential direct and indirect impacts within a single Project phase to potential archaeology may therefore be greater than those occurring during a single activity. However, any such impacts would be reduced or removed through adherence to the embedded mitigation, resulting in no greater effect than as assigned individually.

16.8.3Inter-relationships

Inter-relationships are defined as the interaction between the impacts assessed within different topic assessment chapters on a receptor. The other chapters and impacts related to the assessment of potential effects on Marine Archaeology are provided in Table 16-20. Inter-relationships would be the same for all project phases.

Table 16-20 Marine Archaeology inter-relationships

CHAPTER	IMPACT	DESCRIPTION
EIAR Vol. 3, Chapter 8: Marine Geology, Oceanography and Coastal Processes	Indirect impacts to known and potential marine archaeological remains.	Changes to the physical processes of the marine environment may impact archaeological remains through removal of sediments protecting /

CHAPTER	IMPACT	DESCRIPTION
		stabilising them, resulting in damage / loss. Assessment by EIAR Vol. 3, Chapter 8: Marine Geology, Oceanography and Coastal Processes identified no likely significant changes would occur during the Project. These impacts are considered within the main assessment (see Sections 16.6.1.4 and 16.6.2.1). 16.6.1.4

16.9 Transboundary effects

Transboundary effects arise when impacts from a development within one European Economic Area (EEA) state's territory affects the environment of another EEA state(s).

Transboundary impacts in relation to marine archaeology may be relevant where wrecks of non-British, European origin experience impact from development. Several UKHO records within the Study Area relate to maritime losses originating from countries other than Scotland or the UK (see EIAR Vol. 4, Appendix 28: Marine Archaeology Baseline Report for details). Any physical remains with the potential to relate to these wrecks would, under international maritime law, fall under the protection and ownership of the country of registration. No such records fall within the Project Area and, therefore, none will experience direct impacts resulting from the Project. Records meriting implementation of an AEZ where this AEZ would fall within the Project Area are protected by the same embedded mitigation.

It is feasible that hitherto unknown vessels belonging to other EEA states may be encountered during the Project. Any such remains would be assessed for impacts according to their receptor type and afforded appropriate mitigation.

Direct impacts to the Coal Pit Formation, identified as having a potential for palaeoenvironmental evidence, have been reduced through embedded mitigation to a negligible significance of effect. This Formation extends further eastward into the Norwegian EEZ, however, mitigation of impacts within the Project Area precludes transboundary effects, providing the results gained through further investigation of the Formation (as provided for in the embedded mitigation) is made publicly available.

The widest range of worst-case scenario impacts comprises indirect impacts arising from deposition of increased SSC. EIAR Vol. 3, Chapter 8: Marine Geology, Oceanography and Coastal Processes concludes that no measurable increase to SSC will occur beyond the tidal excursion buffer distance, which lies wholly within the British EEZ. All other impacts will occur within the Project Area, therefore, transboundary effects for Marine Archaeology receptors do not need to be considered further.

16.10 Summary of mitigation and monitoring

Monitoring marine archaeology is a core principle for several embedded mitigation measures. Any monitoring requirements associated with marine archaeology will be detailed in the WSI and PAD and agreed post-consent. An outline WSI and PAD are provided in EIAR Vol. 4, Appendix 27: Written Scheme of Investigation and PAD.

No secondary mitigation, over and above the embedded mitigation measures proposed in Section 16.5.4 and outlined below, is either required or proposed in relation to the potential effects of the Project on Marine Archaeology as no significant impacts are predicted.

This Chapter has used the best available evidence to inform the assessment of potential effects on Marine Archaeology, however, there are potential uncertainties in the knowledge base in relation to Marine Archaeology.

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