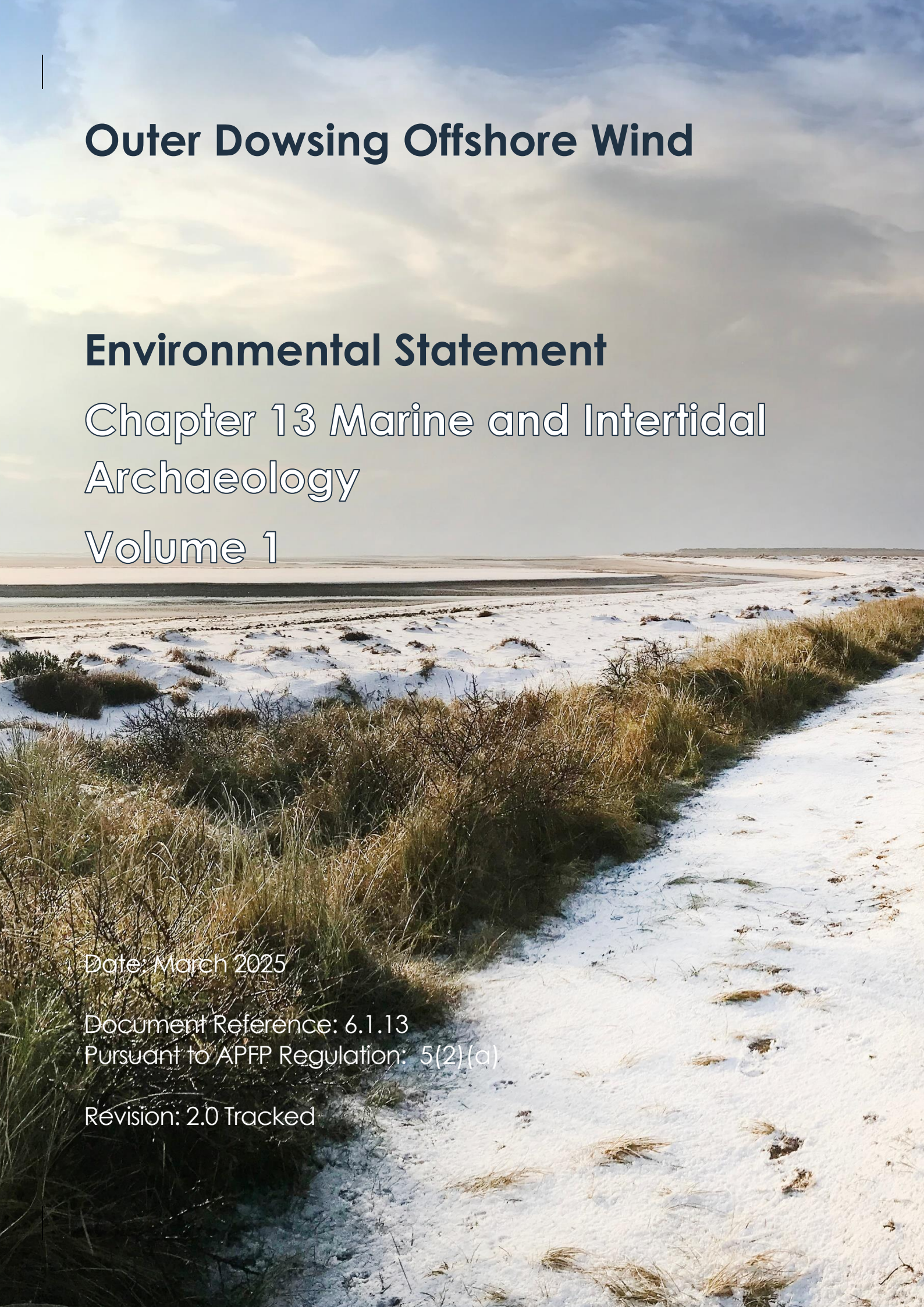
Outer Dowsing Offshore Wind

Environmental Statement

Chapter 13 Marine and Intertidal Archaeology

Volume 1



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Acronyms & Definitions

Abbreviations / Acronyms

Abbreviation / Acronym	Description
ADS	Archaeology Data Service
AEZ	Archaeological Exclusion Zone
ANS	Artificial Nesting Structures
BEIS	Department for Business, Energy & Industrial Strategy (now the Department for Energy Security and Net Zero (DESNZ))
BGS	British Geological Society
BMAPA	British Marine Aggregate Producers Association
BP	Before Present
BSF	Below Seafloor
CIA	Cumulative Impact Assessment
CITiZAN	Coastal and Intertidal Zone Archaeological Network
DBA	Desk Based Assessment
DCO	Development Consent Order
DECC	Department of Energy & Climate Change
DEFRA	Department for Environment, Food and Rural Affairs
DESNZ	Department for Energy Security and Net Zero, formerly Department of Business, Energy and Industrial Strategy (BEIS), which was previously Department of Energy & Climate Change (DECC)
dML	deemed Marine Licence
ECC	Export Cable Corridor (offshore ECC or indicative onshore ECC)
EIA	Environmental Impact Assessment
EMHERF	East Midlands Historic Environment Research Framework
EPP	Evidence Plan Process
ES	Environmental Statement
ETG	Expert Topic Group
GT R4 Ltd	The Applicant. The special project vehicle created in partnership between Corio Generation ~~(a wholly owned Green Investment Group portfolio company),~~ Gulf Energy Development and TotalEnergies
HDD	Horizontal Directional Drilling
HER	Historic Environment Record
HSC	Historic Seascape Characterisation
HVAC	High Voltage Alternating Current
ka	kiloannus (one thousand years)
LUC	Land Use Consultants
MA	Maritime Archaeology Ltd.
MAG	Magnetometer
MBES	Multi-Beam Echo Sounder
MDS	Maximum Design Scenario

Abbreviation / Acronym	Description
MHWS	Mean High Water Springs
MLWS	Mean Low Water Springs
MPS	Marine Policy Statement
MS	Method Statement
NHSC	National Historic Seascape Characterisation
NRHE	National Record of Historic Environment
NSIP	Nationally Significant Infrastructure Project
NSPP	The North Sea Palaeolandscapes Project
NSPRMF	North Sea Prehistory Research and Management Framework
O&M	Operation and Maintenance
ODOW	Outer Dowsing Offshore Wind (The Project)
ORBA	Offshore Restricted Build Area
ORCP	Offshore Reactive Compensation ~~Platforms~~Platform
OSS	Offshore Substation
OWF	Offshore Wind Farm
PAD	Protocol for Archaeological Discoveries
PEIR	Preliminary Environmental Information Report
RAF	Royal Air Force
ROV	Remotely Operated Vehicle
SBJ	Suction Bucket Jacket
SBP	Sub-bottom Profiler
SEA	Strategic Environmental Assessment
SoS	Secretary of State
SSS	Side Scan Sonar
SSSI	Site of Special Scientific Interest
TCE	The Crown Estate
TEZ	Temporary Exclusion Zones
UHSR	Ultra-High Seismic
UK	United Kingdom
UKHO	United Kingdom Hydrographic Office
UXO	Unexploded Ordnance
WSI	Written Schemes of Investigation
WTG	Wind Turbine Generator
WWI	World War One
WWII	World War Two
ZoI	Zone of Influence

Terminology

Term	Definition
Archaeological Exclusion Zone (AEZ)	A spatially defined zone around a known marine archaeological and cultural heritage receptor that will be avoided during intrusive works. The avoidance of AEZs must also consider that the use of anchors and lines, which could impact upstanding features, are adequately considered in the planning of operations.
Archaeological Interest	Refers to a site, find or anomaly of anthropogenic origin that has the potential to contribute to our knowledge and understanding of the past.
Archaeological Potential	Refers to the likelihood a site, find or anomaly is considered to map material of archaeological interest such as wreck or aviation crash sites, buried and confirmed palaeolandscapes and their margins, and the potential that such evidence would reveal a greater understanding of the past through expert investigation.
Archaeological Significance	Refers to the potential of a site or find to contribute to our knowledge and understanding of the past based on its period, rarity, documentation, group value, condition, vulnerability, diversity, and potential, as defined by DCMS, 2013.
AfL Array Area	The area of the seabed awarded to GT R4 Ltd. through an Agreement for Lease (AfL) for the development of an offshore windfarm, as part of The Crown Estate's Offshore Wind Leasing Round 4.
Array Area	The area offshore within which the generating station (including Wind Turbine Generators (WTG) and inter array cables), offshore accommodation platforms, offshore transformer substations and associated cabling will be positioned~~.~~, including the ORBA
Baseline	The status of the environment at the time of assessment without the development in place.
Before Present (BP)	Time scale referring to years before 1950.
Bronze Age	Archaeological period lasting from 4,600 – 2,200 BP. This period follows on from the Neolithic and is characterised by the increasing use of bronze work. It is subdivided in the Early, Middle and Late Bronze Age.
Deemed Marine Licence (dML)	A marine licence set out in a Schedule to the Development Consent Order and deemed to have been granted under Part 4 (marine licensing) of the Marine and Coastal Access Act 2009.
Decommissioning	The period during which a development and its associated processes are removed from active operation.
Development Consent Order (DCO)	An order made under the Planning Act 2008 granting development consent for a Nationally Significant Infrastructure Project (NSIP).
Early Medieval	Archaeological period lasting from AD 410 to 1066. This dates from the breakdown of the Roman rule in Britain to the Norman invasion in 1066

Term	Definition
	and is to be used for sites, monuments and finds of post Roman, Saxon and Viking date.
Early Prehistoric	Archaeological period lasting from 52,000 to 6,000 BP. For sites, monuments and finds which are characteristic of the Palaeolithic to Mesolithic but cannot be specifically assigned.
Effect	Term used to express the consequence of an impact. The significance of an effect is determined by correlating the magnitude of the impact with the sensitivity of the receptor, in accordance with defined significance criteria.
Environmental Impact Assessment (EIA)	A statutory process by which certain planned projects must be assessed before a formal decision to proceed can be made. It involves the collection and consideration of environmental information, which fulfils the assessment requirements of the EIA Regulations, including the publication of an Environmental Statement (ES).
Environmental Statement (ES)	The suite of documents that detail the processes and results of the EIA.
Export cables	High voltage cables which transmit power from the Offshore Substations (OSS) to the Onshore Substation (OnSS) via an Offshore Reactive Compensation Platform (ORCP) if required, which may include one or more auxiliary cables (normally fibre optic cables).
Geophysical	Relating to the physical properties of the earth.
Heritage	The historic environment and especially valued assets and qualities such as historic buildings and cultural traditions.
Historic England	The public body that champions and protects England's historic places.
Historic England National Record of the Historic Environment	National database of known wrecks and reported losses held by Historic England. Currently (March 2023) being developed into the National Marine Heritage Record (NMHR).
Historic Environment receptors	Physical resources such as shipwrecks, remains of aircraft, archaeological sites, archaeological finds, and material including pre-historic deposits as well as archival documents and oral accounts recognised as historical/archaeological or cultural significance.
Historic Landscape Characterisation	Maps and describes historic cultural influences within an area looking beyond individual heritage assets and interpreting the patterns and connections within a landscape, spatially and through time.
Historic Seascape Characterisation	Maps and describes historic cultural influences which shape seascape perceptions across marine areas and coastal land.
High Voltage Alternating Current (HVAC)	High voltage alternating current is the bulk transmission of electricity by alternating current (AC), whereby the flow of electric charge periodically reverses direction.
Impact	An impact to the receiving environment is defined as any change to its baseline condition, either adverse or beneficial.

Term	Definition
Inter-array cables (note: hyphenation)	Cable which connects the wind turbines to each other and to the offshore substation(s) , which may include one or more auxiliary cables (normally fibre optic cables).
Interlink cables	Cable which connects the Offshore Substations (OSS) to one another, which may include one or more auxiliary cables (normally fibre optic cables).
Intertidal	Area where the ocean meets the land between high and low tides.
Iron Age	Archaeological period lasting from 2,800 BP to AD 43. This period follows on from the Bronze Age and is characterised by the use of iron for making tools and monuments such as hillforts and oppida. The Iron Age is taken to end with the Roman invasion.
Landfall	The location at the land-sea interface where the offshore export cables and fibre optic cables will come ashore.
Last Glacial Maximum	Most recent time during the last glacial period that the ice sheets were at their greatest extents, approximately 26,500 – 19,000 BP.
Magnetometer	A device used to measure direction, strength, or relative change of magnetic field at a particular location.
Marine archaeology study area	Defined as the ES array area, Offshore Export Cable Corridor (ECC) up to MHWS and surrounded by a 1km buffer, artificial nesting structure areas surrounded by a 1km buffer and the biogenic reef area.
Marine Written Schemes of Investigation (WSI)	A document forming the agreement between the client, the appointed archaeologist, contractors, and the relevant stakeholders. The document sets out methods to mitigate the effects on all the known and potential Historic Environment receptors within the marine archaeology study area. An Outline Marine WSI, specific for the offshore area and developed during the EIA process will form frameworks for mitigation strategies that will be submitted with the DCO application. Followed by the Draft Marine WSI (based on the Outline Marine WSI) and the final Agreed Marine WSI (based on the Draft Marine WSI).
Maximum Design Scenario	The project design parameters, or a combination of project design parameters that are likely to result in the greatest potential for change in relation to each impact assessed.
Medieval	Archaeological period lasting from AD 1066 – 1540. The Medieval period or Middle Ages begins with the Norman invasion and ends with the dissolution of the monasteries.
Mesolithic	Archaeological period lasting from 12,000 – 6,000 BP. The Middle Stone Age, falling between the Palaeolithic and the Neolithic; marks the beginning of a move from a fisher-hunter-gatherer society towards food producing society.
Mitigation	Mitigation measures are commitments made by the Project to reduce and/or eliminate the potential for significant effects to arise as a result of the Project. Mitigation measures can be embedded (part of the

Term	Definition
	project design) or secondarily added to reduce impacts in the case of potentially significant effects.
Multi-beam Echo Sounder (MBES)	A type of sonar survey used to map the seabed by emitting acoustic waves in a fan shape beneath its transceiver. The time it takes for the sounds waves to reflect off the seabed and return to the receiver is used to calculate the water depth and produce a visualisation of depths and shapes of underwater terrain.
National Policy Statement (NPS)	A document setting out national policy against which proposals for Nationally Significant Infrastructure Projects (NSIPs) will be assessed and decided upon.
Nanotesla	Measurement describing the magnetic field (flux) of ferrous materials as measured by a magnetometer. (One nanotesla equals 10^{-9} tesla).
Neolithic	Archaeological period lasting from 6,000 – 4,200 BP. This period follows on from the Palaeolithic and the Mesolithic and is itself succeeded by the Bronze Age. This period is characterised by the practice of a farming economy and extensive monumental constructions.
NSIP Reform Action Plan	An Action Plan launched in February 2023 by Department for Levelling Up, Housing & Communities to reform the NSIP regime to ensure the effectiveness and resilience of the planning regime for the growing pipeline of critical infrastructure projects.
Offshore Export Cable Corridor (ECC)	The Offshore Export Cable Corridor (Offshore ECC) is the area within the Order Limits within which the export cable running from the array to landfall will be situated.
Offshore Restricted Build Area (ORBA)	The area within the array area, where no wind turbine generator, offshore transformer substation or offshore accommodation platform shall be erected.
Offshore Reactive Compensation Platform (ORCP)	A structure attached to the seabed by means of a foundation, with one or more decks ~~and a helicopter platform~~ (including bird deterrents) housing electrical reactors and switchgear for the purpose of the efficient transfer of power in the course of High Voltage Alternating Current (HVAC) transmission by providing reactive compensation
Offshore Substation (OSS)	A structure attached to the seabed by means of a foundation, with one or more decks and a helicopter platform (including bird deterrents), containing— (a) electrical equipment required to switch, transform, convert electricity generated at the wind turbine generators to a higher voltage and provide reactive power compensation; and (b) housing accommodation, storage, workshop auxiliary equipment, radar and facilities for operating, maintaining and controlling the substation or wind turbine generators
Order Limits	The area subject to the application for development consent, the limits shown on the works plans within which the Project may be carried out.

Term	Definition
Outer Dowsing Offshore Wind (ODOW)	The Project.
Palaeolithic	Archaeological period lasting from 52,000 – 12,000 BP. The period is defined by the practice of hunting and gathering and the use of chipped flint tools. This period is usually divided up into the Lower, Middle and Upper Palaeolithic.
Portable Antiquities Scheme	The Portable Antiquities Scheme is run by the British Museum and Amgueddfa Cymru – National Museum Wales to encourage the recording of archaeological objects found by members of the public in England and Wales.
Post-Medieval	Archaeological period lasting from AD 1540 – 1901. Begins with the dissolution of the monasteries (AD 1536 – 1541) and ends with the death of Queen Victoria (AD 1901). A more specific period is used where known.
Pre-construction and post-construction	The phases of the Project before and after construction takes place.
Preliminary Environmental Information Report (PEIR)	The PEIR was written in the style of a draft Environmental Statement (ES) and provided information to support and inform the statutory consultation process during the pre-application phase.
Protocol for Archaeological Discoveries	A document detailing how unexpected finds or sites made during the lifetime of the Project should be reported.
The Project	Outer Dowsing Offshore Wind, an offshore wind generating station together with associated onshore and offshore infrastructure.
Receiver of Wreck	Official of the British Government whose main task is to administer the law in relation to Wreck and Salvage.
Receptor	A distinct part of the environment on which effects could occur and can be the subject of specific assessments. Examples of receptors include species (or groups) of animals or plants, people (often categorised further such as 'residential' or those using areas for amenity or recreation), watercourses etc.
Roman	Archaeological period lasting from AD 43 – 410. Traditionally begins with the Roman invasion of Britain in AD 43 and ends with the emperor Honorius directing Britain to look to its own defences in AD 410.
Seascape	Landscapes with views of the coast or seas, and coasts and adjacent marine environments with cultural, historical and archaeological links with each other.
Side Scan Sonar	A sonar system that provides high-resolution seafloor morphology from both sides of the vessel track to produce an image of the seafloor.
Spudcan	Spudcans are the base cones on mobile-drilling jack-up platform. These inverted cones are mounted at the base of the jack-up and

Term	Definition
	provide stability to lateral forces on the jack-up rig when deployed into ocean-bed systems.
Study area	Area(s) within which environmental impact may occur – to be defined on a receptor-by-receptor basis by the relevant technical specialist.
Sub-bottom Profiler	An acoustic system used to determine physical properties of the seafloor and to image and characterise geological information a few meters below the seafloor.
Subsea	Subsea comprises everything existing or occurring below the surface of the sea.
The Applicant	~~GT R4 Ltd. The Applicant making the application for a DCO. The Applicant is GT R4~~GTR4 Limited (a joint venture between Corio Generation~~, Tota Energies~~ (and its affiliates), TotalEnergies and Gulf Energy Development ~~(GULF)),~~), trading as Outer Dowsing Offshore Wind~~. The Project is being developed by Corio Generation (a wholly owned Green Investment Group portfolio company), TotalEnergies and GULF.~~
The Project	Outer Dowsing Offshore Wind, an offshore wind generating station together with associated onshore and offshore infrastructure.
United Kingdom Hydrographic Office database	Database of known wrecks and obstruction held and maintained by the UKHO.
Ultra-High Resolution Seismic	An acoustic system used to image submerged buried features shallow water.
Wind turbine generator (WTG)	A structure comprising a tower, rotor with three blades connected at the hub, nacelle and ancillary electrical and other equipment which may include J-tube(s), transition piece, access and rest platforms, access ladders, boat access systems, corrosion protection systems, fenders and maintenance equipment, helicopter landing facilities and other associated equipment, fixed to a foundation

Reference Documentation

Document Number	Title	Most Recent Examination Reference
6.1.3	Chapter 3 Project Description	V2 Submitted at Deadline 5
6.1.7	Chapter 7 Marine Physical Processes	V2 Submitted at Deadline 5
6.1.17	Chapter 17 Seascape, Landscape and Visual	V3 Submitted at Deadline 5
6.1.18	Chapter 18 Marine Infrastructure and Other Users	V2 Submitted at Deadline 5
6.1.20	Chapter 20 Onshore Archaeology and Cultural Heritage	V3 Submitted at Deadline 5
8.8	Outline Marine Archaeological Written Scheme of Investigation (WSI)	PD1-050

13 Marine and Intertidal Archaeology

13.1 Introduction

1. This Chapter of the Environmental Statement (ES) presents the results of the Environmental Impact Assessment (EIA) for the potential impacts of Outer Dowsing Offshore Wind (ODOW) ("the Project") on Marine and Intertidal Archaeology. Specifically, this chapter considers the potential impact of the Project seaward of Mean High Water Springs (MHWS) during the construction, Operation and Maintenance (O&M), and decommissioning phases.
2. GT R4 Ltd (trading as Outer Dowsing Offshore Wind) hereafter referred to as the 'Applicant', is proposing to develop the Project. The Project will be located approximately 54km from the Lincolnshire coastline in the southern North Sea. The Project will include both offshore and onshore infrastructure including an offshore generating station (windfarm), export cables to landfall, Offshore Reactive Compensation ~~Platforms~~Platform (ORCPs), onshore cables, connection to the electricity transmission network, ancillary and associated development and areas for the delivery of up to two Artificial Nesting Structures (ANS) and the creation of a biogenic reef (if these compensation measures are deemed to be required by the Secretary of State) (see Volume 1, Chapter 3: Project Description (document reference 6.1.3) for full details).
3. This chapter should be read alongside the following chapters and documents:
   - Volume 1, Chapter 3: Project Description (document reference 6.1.3);
   - Volume 1, Chapter: 7 Marine Processes (document reference 6.1.7);
   - Volume 1, Chapter: 17 Seascape, Landscape and Visual (document reference 6.1.17);
   - Volume 1, Chapter 20: Onshore Archaeology and Cultural Heritage (document reference 6.1.20);
   - Volume 3, Appendix 13.1: Marine and Intertidal Archaeology Technical Report (document reference 6.3.13.1);
   - Volume 3, Appendix 13.2 Marine and Intertidal Archaeology Geoarchaeological assessment Phase One (Array)(document reference 6.3.13.2);
   - Volume 3, Appendix 13.3 Marine and Intertidal Archaeology Geoarchaeological assessment Phase One (ECC) (document reference 6.3.13.3); ~~and~~
   - Outline Offshore Archaeological Written Schemes of Investigation (WSI ~~(Document Reference)~~ (document reference: 8.8); and
   - Disposal Site Characterisation Report (document reference 15.15).

13.2 Statutory and Policy Context

4. This chapter was drafted by Maritime Archaeology Ltd. (MA) which is a Registered Organisation with the Chartered Institute for Archaeologists (CIfA); all work conducted is in accordance with the guidance and principles set out in CIfA's Code of Conduct (2014a) and Code of Professional Conduct (2019).
5. The Archaeological Curators (further detailed in document 8.8 Outline Marine Written Scheme of Investigation (WSI)), who have the jurisdiction over archaeology and cultural heritage, are Historic England seaward of Mean Low Water Springs (MLWS) and the Lincolnshire County Council landward of MLWS.
6. The relevant legislation and planning policy for offshore renewable energy Nationally Significant Infrastructure Projects (NSIPs), specifically in relation to marine and intertidal archaeology, is outlined in Table 13.1 below.

Table 13.1: Legislation and Policy Context

Legislation/policy	Key provisions	Section where comment addressed
Marine and Coastal Access Act (2009)	The Act sets out a framework for the management of marine functions and activities for areas which include waters in or adjacent to England up to the seaward limits of the territorial sea. It provides for the preparation and adoption of marine plans and for the regulation of licensable activities in the marine environment through the grant and enforcement of conditions on marine licences.	The Project will need to consider and comply with the requirements of the adopted United Kingdom (UK) Marine Policy Statement (MPS) (HM Government, 2011) and East Inshore and East Offshore Marine Plans (HM Government, 2014) as they relate to the impact of the proposed development on Historic Environment. The embedded mitigation will be secured through the deemed grant of a marine licence pursuant to the Act. The significance of Historic Environment receptors within the marine archaeology study area is presented in Volume 3, Appendix 13.1 Marine and Intertidal Archaeology Technical Report (document refence 6.3.13.1). The embedded mitigation is presented in Table 13.7.
Merchant Shipping Act (1995)	The Receiver of Wreck enforces the Merchant Shipping Act 1995, in the UK in relation to salvage and wreck. The Receiver of Wreck is responsible for processing incoming reports of wreck and cargo.	The Project may cause impacts on objects associated with wrecks. If any material is recovered during works associated with the Project which fall within the definition of 'wreck', the Receiver of Wreck must be notified and will seek to identify the original owner (see document 8.8).
Protection of Wrecks Act (1973)	Act to secure the protection of wrecks within designated areas in territorial waters, and the sites of such wrecks, from interference by unauthorised persons.	Historic Environment regarded as of special interest or significance may become designated with the Project area. There are currently no protected wrecks sites identified within the marine archaeology study area as presented in Section 3 of document reference 6.3.13.1.

Legislation/policy	Key provisions	Section where comment addressed
The 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 which may disturb the site are illegal unless licensed by the Ministry of Defence.	If any material associated with a vessel or aircraft that was in military service when lost or wrecked is located, the area will be protected under this Act. All military aircraft are automatically protected under this legislation; however, vessels must be designated individually. There are currently no aircraft wreck sites within the marine archaeology study area. Should an aircraft wreck site be identified a licence under this Act will be required before any works that may impact the wreck can commence.
Burial Act (1857)	The Act requires a licence to be granted prior to the removal of human remains from deliberately deposited contexts	If human remains are discovered during works associated with the Project, they will be protected under this Act. The actions required where human remains are found are further detailed in Section 7 of document reference 6.3.13.1.
The Treasure Act (1996), supplemented by the Treasure (Designation) Order 2002	This includes any metallic object (but not coins) which is over 300 years old (when found) and containing at least 10% by weight of gold or silver, any group of two or more metallic objects of any composition and of prehistoric date that come from the same find, all coins from the same find provided they are at least 300 years old when found (if the coins contain less than 10% gold or silver, there must be at least ten of them), any object, whatever it is made of, that is found in the same place as, or had previously been together with, another object that is treasure, any object that would previously have been treasure trove, but not covered by any of the above. That is, objects that are less than 300 years old, made substantially of gold or silver, that have been deliberately hidden with the intention of recovery and whose owners (or their heirs) are unknown, objects are part of the 'same find' if they are found in the same place, or had previously been together and have been scattered (perhaps by ploughing) since being	Should any relevant material be found during works associated with the Project, advice from the Coroner must be sought and their instructions adhered to as detailed in Section 7 of document reference 6.3.13.1.

Legislation/policy	Key provisions	Section where comment addressed
	deposited. Objects may well be part of the 'same find' (in an archaeological sense) even if they have been found at different times. Finders are required to report such finds by contacting the Coroner and delivering the items for handover as per the Coroner's instruction.	
Ancient Monuments and Archaeological Areas Act (1979)	Monuments that are of national importance within UK territorial waters can be protected by being designated within the schedule of monuments protected under this Act.	It is an offence to damage or conduct a range of specified activities on a 'scheduled monument' unless authorised to do so. There are currently no scheduled monuments in the marine archaeology study area as presented in Section 3 of document reference 6.3.13.1.
East Inshore and East Offshore Marine Plans (2014)	Objective 5: *"To conserve heritage assets, nationally protected landscapes and ensure that decisions consider the seascape of the local area."* Policy SOC2: *"Proposals that may affect heritage assets should demonstrate, in order of preference:* *a) that they will not compromise or harm elements which contribute to the significance of the heritage asset* *b) how, if there is compromise or harm to a heritage asset, this will be minimised* *c) how, where compromise or harm to a heritage asset cannot be minimised, it will be mitigated against or* *d) the public benefits for proceeding with the proposal if it is no possible to minimise or mitigate compromise or harm to the heritage asset".* Policy SOC3: *"Proposals that may affect the terrestrial and marine character of an area should demonstrate, in order of preference:*	All known and unknown Historic Environment receptors within the marine archaeology study area that may be affected by the Project and their archaeological significance has been described in document reference 6.3.13.1 and summarised in Section 13.4. Potential impacts on Historic Environment receptors are discussed in 13.7 and Section 13.9. Mitigation to avoid or offset any impacts as a result of the Project is detailed in document reference 6.3.13.1 and Table 13.9.

Legislation/policy	Key provisions	Section where comment addressed
	a) that they will not adversely impact the terrestrial and marine character of an area *b) how, if there are adverse impacts on the terrestrial and marine character of an area, they will minimise them* *c) how, where these adverse impacts on the terrestrial and marine character of an area cannot be minimised, they will be mitigated against* d) *the case for proceeding with the proposal if it is not possible to minimise or mitigate the adverse impacts".*	
UK Marine Policy Statement (MPS) (2011)	Paragraph 2.6.6.2 "*The historic environment of coastal and offshore zones represents a unique aspect of our cultural heritage. In addition to its cultural value, it is an asset of social, economic and environmental value. It can be a powerful driver for economic growth, attracting investment and tourism and sustaining enjoyable and successful places in which to live and work. However, heritage assets are a finite and often irreplaceable resource and can be vulnerable to a wide range of human activities and natural processes."*	All known and unknown Historic Environment receptors within the marine archaeology study area that may be affected by the Project and their archaeological significance has been described in document reference 6.3.13.1 and summarised in Section. Potential impacts on Historic Environment receptors are discussed in Section 13.7 and Section 13.9. Mitigation to avoid or offset any impacts as a result of the Project is detailed in document reference 6.3.13.1 and Table 13.9.
MPS (2011)	Paragraph 2.6.6.3 "*The view shared by the UK Administrations is that heritage assets should be enjoyed for the quality of life they bring to this and future generations, and that they should be conserved through marine planning in a manner appropriate and proportionate to their significance. Opportunities should be taken to contribute to our knowledge and understanding of our past by capturing evidence from the historic environment and making this publicly available, particularly if a heritage asset is to be lost."*	Embedded mitigation measure for the archaeological assessment of data as outlined in Table 13.9and document reference 6.3.13.1. Positive contributions to knowledge and understanding of the historic environment can be realised through data gathering, interpretation and publication. The results of the archaeological works will utilise as well as contribute to, reflect and enhance the ongoing research in the area.

Legislation/policy	Key provisions	Section where comment addressed
MPS (2011)	Paragraph 2.6.6.6 "*Marine activities have the potential to result in adverse effects on the historic environment both directly and indirectly, including damage to or destruction of heritage assets. In developing and implementing Marine Plans, the marine plan authority should take into account the available evidence, including information and advice from the relevant regulator and advisors, in relation to the significance of any identified heritage assets (or the potential for such assets to be discovered), and consider how they are managed. It should also take into account the historic character of the plan area, with particular attention paid to the landscapes (see section 2.6.5) and groupings of assets that give it a distinctive identity."*	The significance of the known Historic Environment receptors within the offshore zone and potential impact on known and unknown Historic Environment identified has been undertaken according to the methodology outlined in Section 13.8. The results of the assessments, including the heritage significance of the known receptors as well as the potential to locate Historic Environment of heritage significance during works are detailed in document reference 6.3.13.1. Ongoing consultation with relevant regulators and advisors is outlined in section 13.3.
MPS (2011)	Paragraph 2.6.6.8 "*The marine plan authority, working with the relevant regulator and advisors, should take account of the desirability of sustaining and enhancing the significance of heritage assets and should adopt a general presumption in favour of the conservation of designated heritage assets within an appropriate setting. The more significant the asset, the greater should be the presumption in favour of its conservation. Substantial loss or harm to designated assets should be exceptional and should not be permitted unless it can be demonstrated that the harm or loss is necessary in order to deliver social, economic or environmental benefits that outweigh the harm or loss*."	The commitment to avoid all known Historic Environment and to further investigate the area of impacts ensuring that unknown Historic Environment receptors are located, and impact mitigated will ensure preservation *in situ* (see document 8.5). Where Historic Environment receptors are directly impacted or removed from the seabed, justification will be clearly outlined in the relevant Method Statements produced ahead of any archaeological works and following agreement with Historic England.
Overarching National Policy Statement for Energy NPS EN-1 (2023)	Paragraph 5.9.10 *"As part of the ES the applicant should provide a description of the significance of the heritage assets affected by the proposed development, including any contribution made by their setting. The level of detail should be proportionate to the importance of the heritage assets and no more than is sufficient to understand the potential impact of the proposal on*	All known and unknown Historic Environment in the marine zone that may be affected by the Project and their archaeological significance have been described in detail in document reference 6.3.13.1 and summarised in 13.4. Potential impact on the Historic

Legislation/policy	Key provisions	Section where comment addressed
	their significance. As a minimum, the applicant should have consulted the relevant Historic Environment Record[236] (or, where the development is in English or Welsh waters, Historic England or Cadw) and assessed the heritage assets themselves using expertise where necessary according to the proposed development's impact." *[236] "Historic Environment Records (HERs) are information services maintained by local authorities and National Park Authorities with a view to providing access to comprehensive and dynamic resources relating to the historic environment of an area for public benefit and use. Details of Historic Environment Records in England are available from the Heritage Gateway website. For Wales, HERs can be obtained through the Historic Wales Portal at See https://historic-wales-rcahmw.hub.arcgis.com/ Historic England and Cadw hold additional information about heritage assets in English or Welsh waters. Historic England or Cadw should also be consulted, where relevant*"	Environment of the proposed development is discussed in Section 13.9 and Section 13.13.
EN-1 (2023)	Paragraph 5.9.11 *"Where a site on which development is proposed includes, or the available evidence suggests it has the potential to include, heritage assets with an archaeological interest, the applicant should carry out appropriate desk-based assessment and, where such desk-based research is insufficient to properly assess the interest, a field evaluation. Where proposed development will affect the setting of a heritage asset, accurate representative visualisations may be necessary to explain the impact[237]."* *[237] "Relevant guidance is given in the Historic England publication, The Setting of Heritage Assets See https://historicengland.org.uk/images-books/publications/gpa3-setting-of-heritage-assets/"*	Historic Environment and the archaeological potential within the marine archaeology study area have been considered and assessed in document reference 6.3.13.1 and summarised in section 13.4.

Legislation/policy	Key provisions	Section where comment addressed
NPS EN-1 (2023)	Paragraph 5.9.12 "*The applicant should ensure that the extent of the impact of the proposed development on the significance of any heritage assets affected can be adequately understood from the application and supporting documents. Studies will be required on those heritage assets affected by noise, vibration, light and indirect impacts, the extent and detail of these studies will be proportionate to the significance of the heritage asset affected."*	The archaeological significance and potential impact, including positive contribution on the marine archaeology receptors identified within the marine archaeology study area was undertaken according to the methodology outlined in Section 13.8. Table 13.6: outlines the Maximum Design Scenario (MDS) and relevant activities that may impact Historic Environment. Sections 13.9 to 13.13 provide further detail on how Historic Environment may be affected.
National Policy Statement for Renewable Energy Infrastructure (NPS EN-3) (2023)	Paragraph 2.8.168 "*Applicants should consult with the relevant statutory consultees, such as Historic England or Cadw, on the potential impacts on the marine historic environment at an early stage of development during pre-application, taking into account any applicable guidance (e.g., offshore renewables protocol for archaeological discoveries[59])*" [59] "*See https://www.wessexarch.co.uk/our-work/offshore-renewables-protocol-archaeologicaldiscoveries*"	Consultations with Historic England and other stakeholders throughout the development are outlined in Section 13.3.
NPS EN-3 (2023)	Paragraph 2.8.169 "*Assessment of potential impacts upon the historic environment should be considered as part of the Environmental Impact Assessment process undertaken to inform any application for consent.*"	Potential impacts on Historic Environment receptors are discussed in Section 13.7 and section 13.9. Mitigation to avoid or offset any impacts as a result of the Project is detailed in document reference 6.3.13.1 and Table 13.9.Table 13.9: Sensitivity (value) of the Environment
NPS EN-3 (2023)	Paragraph 2.8.170 "*Desk based studies to characterise the features of the historic environment that may be affected by a proposed development and assess any likely significant effects should be undertaken by competent archaeological experts.*"	Document reference 6.3.13.1 presents and details the archaeological Desk Based Assessment (DBA) and the archaeological assessment of geophysical data collected for the array area. The results are further summarised in Section 13.5.

Legislation/policy	Key provisions	Section where comment addressed
NPS EN-3 (2023)	Paragraph 2.8.175 "*Once a site has been chosen, it may be necessary to undertake further archaeological assessment, including field evaluation investigations prior to construction, to understand a known site's significance and full extent, and, to identify as yet unknown heritage assets when considering the options for detailed site development, in accordance with an archaeological written scheme of investigation included with the application.*"	Embedded mitigations relevant to Historic Environment receptors are set out in Table 13.7 and detail how data will be collected and assessed to ensure that as yet undiscovered Historic Environment receptors are identified throughout the life of the Project. Future works will be clearly outlined in the relevant Method Statements produced ahead of any archaeological works and following agreement with Historic England (see document 8.5). The embedded mitigations are expected to be reflected in the DCO requirements or deemed Marine Licence (dML) conditions.
NPS EN-3 (2023)	Paragraph 2.8.176 "*Assessment may also include the identification of any beneficial effects on the marine historic environment, for example through improved access or the contribution to new knowledge that arises from investigation."*	Potential beneficial effects on Historic Environment as a result of the Project activities are discussed in Table 13.7 and will ensure data and information collected is assessed for archaeological potential and significance and reported, which will enhance our understanding by gathering, researching and presenting new information and will lead to a publication.
NPS EN-3 (2023)	Paragraph 2.8.177 *"Where elements of a proposed project (whether offshore or onshore) may interact with historic environment features that are located onshore, the effects should be assessed in accordance with the policy at Section 5.9 in EN-1."*	The onshore and offshore archaeological resources have been cross-referenced, and technical reports have been shared between archaeological contractors. Relevant sections of 5.9 from EN-1 are included in this table.
NPS EN-3 (2023)	Paragraph 2.8.252	Archaeological Exclusion Zones (AEZs) as per Table 13.7 have been applied to all known wrecks and

Legislation/policy	Key provisions	Section where comment addressed
	"*The avoidance of important heritage assets to ensure their protection in situ, is the most effective form of protection*."	anomalies of high and medium archaeological potential identified in the geophysical data, as outlined Section 13.5. The embedded mitigations are further detailed in Table 13.7.
NPS EN-3 (2023)	Paragraph 2.8.253 "*This can be achieved through the implementation of exclusion zones around known and potential heritage assets which preclude development activities within their boundaries*."	AEZs as per Table 13.7 have been applied to all known wrecks and anomalies of high and medium archaeological potential identified in the geophysical data, as outlined Section 13.5. The embedded mitigations are further detailed in Table 13.7.
NPS EN-3 (2023)	Paragraph 2.8.254 "*These boundaries can be drawn around either discrete sites or more extensive areas identified in the Environmental Statement produced to support an application for consent."*	AEZs as per Table 13.7 have been applied to all known wrecks and anomalies of high and medium archaeological potential identified in the geophysical data, as outlined Section 13.5. The embedded mitigations are further detailed in Table 13.7.
NPS EN-3 (2023)	Paragraph 2.8.256 "*Where requested by the applicant, the Secretary of State should consider granting consents which allow for micrositing/microrouting (Draft NPS EN-3 (2023) paragraph 2.8.79) within a specified tolerance.*"	Where possible, all intrusive activities will be routed and microsited to avoid any identified Historic Environment with AEZs as per mitigation outlined in Table 13.7.
NPS EN-3 (2023)	*Paragraph 2.8.258* *"This allows changes to be made to the precise location of infrastructure during the construction phase so that account can be taken of unforeseen circumstances such as the discovery of marine archaeological remains.*"	Where possible, all intrusive activities will be routed and microsited to avoid any identified Historic Environment with AEZs as per mitigation outlined in Table 13.7
NPS EN-3 (2023)	Paragraph 2.8.325 *"The Secretary of State should be satisfied that any proposed offshore windfarm and/ or offshore transmission project has appropriately considered and mitigated for any impacts to the historic environment, including both known heritage assets, and discoveries that may be made during the course of development."*	Document reference 6.3.13.1 presents and details the archaeological DBA, and the archaeological assessment of geophysical data collected to date. The results are further summarised in Section 13.5. AEZs (as per Table 13.7) have been applied to all known wrecks and anomalies of high and medium archaeological potential identified in the geophysical

Legislation/policy	Key provisions	Section where comment addressed
		data, as outlined Section 13.5. The embedded mitigations are further detailed in Table 13.7

13.3 Consultation

7. Consultation is a key part of the Development Consent Order (DCO) application process. Consultation regarding Marine and Intertidal Archaeology has been conducted through the Evidence Plan Process (EPP) Expert Technical Group (ETG) meetings, the EIA scoping process (Outer Dowsing Offshore Wind, 2022) and the Preliminary Environmental Information Report (PEIR) process (Outer Dowsing Offshore Wind, 2023). An overview of the Project consultation process is presented within Volume 1, Chapter 6: Technical Consultation (document reference 6.1.6) and the Consultation Report (document reference 5.1)
8. A summary of the key issues raised during consultation to date, specific to Marine and Intertidal Archaeology, is outlined in Table 13.2 below, together with how these issues have been considered in the production of this ES.
9. The key issues arising from the Planning Inspectorate Scoping Opinion were concerning the scope of the marine archaeology study area, agreement to scope out transboundary impacts, clarifications on the impact assessment and agreement with the necessary assessment of geophysical and geotechnical data.
10. The key issues arising from consultation via the ETGs focused on similar points. Additionally, there was a focus on the assessment of Historic Seascape Characterisation (HSC), the correct implementation of both the Outline Marine WSI and Protocol for Archaeological Discoveries (PAD) documents, the assessment of geophysical and geotechnical data by a qualified marine archaeologist, and the importance of inclusion of archaeological objective when conducting survey campaigns.
11. The key issues arising from the comments received during the consultation carried out under s42 of the Planning Act 2008 (the 2008 Act) focused on the Maximum Design Scenario table with Historic England disagreeing with the chosen “Realistic Worst-Case Scenario”. Comments were also aimed at the use of significance of Historic Environment Receptors rather than their interest as outlined in EN-1.

Table 13.2: Summary of Consultation Relating to Marine and Intertidal Archaeology

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
9 September 2022 Scoping Opinion The Inspectorate on behalf of the Secretary of State (SoS)	*"… the Inspectorate agrees that transboundary impacts on marine archaeology are unlikely and can be scoped out from further assessment. However, the ES should clearly describe the findings, and any mitigation relied upon."*	Transboundary impacts have been scoped out of this assessment and are further described in Section 13.12.
9 September 2022 Scoping Opinion The Inspectorate on behalf of the SoS	*"The Scoping Report describes the study area but does not explain why the area chosen is sufficient to reflect the likely Zone of Influence (ZoI) for the Proposed Development. The ES should be based on a defined study area, which is sufficient to identify the likely significant effects of the Proposed Development, including any potential effects caused by changes to marine physical processes. The ES should also confirm whether the study area aligns with relevant policy and guidance and provide justification for any divergences."*	The marine archaeology study area includes a 1km buffer up to MHWS around both the array area and the Offshore Export Cable Corridor (ECC) as well as a 1km buffer around the Artificial Nesting Structure Areas. It is further defined in Section 13.4. This 1km buffers are designed to accommodate the potential imprecision of historic marine positioning.
9 September 2022 Scoping Opinion The Inspectorate on behalf of the SoS	*"The Scoping Report describes both penetration and compression impacts to the seabed from construction activities. The Applicant should ensure that these effects are fully explained in the ES, in order to explain the nature of compression impacts and establish whether there is potential for two different types of effect."*	Compression and penetration impacts have been considered separately and are outlined in Section 13.7 and Section 13.9.
9 September 2022 Scoping Opinion The Inspectorate on behalf of the SoS	"The Inspectorate considers that in addition to use of this information (geophysical and geotechnical information) to inform the assessment, the opportunity for this information to also identify areas of high archaeological potential is considered in the development of the design and explained in the ES."	The Baseline Environment (Section 13.4) outlines the known Historic Environment as well as the potential for unknown receptors not yet located and is further detailed in Section 3 of document reference 6.3.13.1.
9 September 2022 Scoping Opinion Historic England	*"Historic England would request that the Applicant define what 'Compression effects' are, as mentioned in Table 7.7.5, this is in the interest of clarification and should be included in the PEIR."*	Compression and penetration impacts have been considered separately and are outlined in Section 13.7 and Section 13.9.

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
9 September 2022 Scoping Opinion Historic England	*"It was good to see the inclusion of resources such as the Historic England Peat Database (paragraphs 7.7.16-18). However, it was disappointing to see that this was only considered from the marine aspect. To ensure a successful project it is crucial that a holistic approach is taken to ensure the results of study across marine, intertidal and terrestrial zones are considered from the start with an integrated approach. Presently the sections on marine and terrestrial do not really gel, and this risks an incoherent EIA that fails to adequately achieve its objectives."*	The potential for peat within the marine archaeology study area is summarised in Section 13.4 and further discussed in Section 3 of document reference 6.3.13.1 along with a gazetteer of the peat records for within the marine archaeology study area and surrounding regional context of the North Sea (Annex C of Volume 3, Appendix 13.1 (document reference 6.3.13)). Meetings and discussions have taken place between the onshore and offshore chapters to ensure cohesion.
10 October 2022 Post-Scoping ETG Historic England	*Historic England queried if the vibrocore logs provided adequate information on the geoarchaeological analysis works which should later in the Project.*	The core logs from the previous geotechnical campaigns will be utilised alongside geophysical data to determine where archaeological specific cores should be collected during future campaigns. This information will be compiled in a Geoarchaeology Phase 1 Report.
10 October 2022 Post-Scoping ETG Historic England	*Historic England confirm the embedded mitigation measures are appropriate approach for known features. For unknown features, a crucial element is adaptive mitigation. A system will be required by the Project for refining the survey work for the resolution to enable the Project to identify anomalies. The most highly sensitive sites will be those which are dispersed and fragmentary sites. Engagement and a two-way flow between archaeological consultants and the*	The EIA has taken into account the embedded mitigation and applied further adaptive mitigation where required to minimise the risk to Historic Environment. The mitigation proposed is outlined in Section 13.7 and Table 13.7.

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
	engineers/survey contracts is essential to ensure a sensible approach to adaptive mitigation.	
31 January 2023 Pre-PEIR ETG Historic England	*"I noticed on the slide "Surveys – Offshore" that in 2021 "Offshore Campaign/Lab testing of vibrocores" was completed. It would be helpful to know if the "lab testing" was conducted so that any recommended geo-archaeological analysis was conducted on viable samples and if the write-up of this work will be included in the PEIR? We also noted that in 2022 the "Potential ECC geophysical" survey was completed. It would be helpful to know if those data generated will be subject to archaeological analysis and interpretation for inclusion in the PEIR?"*	The assessment of geophysical data for the Offshore ECC was completed at ES phase. Initial geotechnical works were mainly designed around engineering requirements. The results, including all coring activity are detailed in document reference 6.3.13.2 and document reference 6.3.13.3. Offshore geophysical surveys (including Unexploded Ordnance (UXO) surveys) and offshore geotechnical campaigns undertaken pre-construction will be subject to full archaeological review.
31 January 2023 Pre-PEIR ETG Historic England	*"Regarding the geotechnical investigations to be conducted in the array area during 2023. The use of a "toolbox talk" is useful to explain procedures if finds of potential archaeological interest are encountered. We understand that processing of geotechnical material and conducting of geo-archaeological investigations will not be in time for the proposed PEIR consultation. However, we hope that the planning of this survey allows for a coring methodology that safeguards samples in the best condition to optimise geo-archaeological investigation. Such an approach should follow published guidance and agreed objectives as set out in a method statement produced in consultation with Historic England. We recommend that it is a survey objective that the output of the work conducted in 2023 informs the "larger scale" geotechnical survey to be conducted in 2024, but to be clear, the obtaining of "Archaeological input" is to be in accordance with a programme of*	Geotechnical investigations, including all coring activity is detailed in document reference 6.3.13.2 and document reference 6.3.13.3 . Geoarchaeological Protocol for Archaeological Discoveries (PAD) training (toolbox talks) will be conducted prior to any works taking place (see Section 13.7) Initial geotechnical works will mainly be designed around engineering requirements, with archaeological input provided during the planning stages of site investigation works. Geoarchaeological campaigns utilising both the already collected material as well as archaeologically specific cores will be undertaken and analysed following submission of specific

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
	investigation, discussed with Historic England, and which is conducted by accredited, experienced and professional geoarchaeological consultants."	Method Statement (MS) to Historic England (Table 13.3).
31 January 2023 Pre-PEIR ETG Historic England	*"Please confirm if a UK Hydrographic Office wreck report has been submitted for the anomaly encountered (unreferenced in the accompanying slide pack). We note your confirmation of known wreck location of Basto (undated) and that you will want to explain within the PEIR the strategy adopted to avoid these locations."*	Wreck was reported in May 2022.
19 September 2023 Post-PEIR ETG Comments received during the consultation carried out under s42 of the Planning Act 2008 (the 2008 Act)	Table 13.8 MDS - We offer the following comments as matters that must be addressed in any ES subsequently produced: We also do not agree with this assessment as the use of Gravity Base Foundations would appear to represent the "Realistic Worst-Case Scenario". The focus should be on seabed removal.	The MDS table (Table 13.8) has been updated to ensure that the correct realistic worst-case scenario has been used at ES stage.
19 September 2023 Post-PEIR ETG Comments received during the consultation carried out under s42 of the Planning Act 2008 (the 2008 Act)	Paragraphs 13.3.49 to 13.3.50 - the focus should be determining archaeological interest as a heritage asset (See Draft EN-1 dated March 2023, paragraph 5.9.3) rather than referral to significance assessment guidance which is linked to evidence gathering and the use of criteria to recommend sites for statutory protection. All subsequent paragraphs in this section require revision. The assets archaeological interest is the important factor to know whether it will have value.	These paragraphs have been amended to be in line with archaeological interest rather than significance (Section 13.3 of document reference 6.3.13.1).

13.4 Baseline Environment

13.4.1 Marine Archaeology Study Area

12. This chapter covers both the offshore and intertidal zone of the Project. A marine archaeology study area has been established for the purposes of collating and characterising baseline data as part of this ES. The marine archaeology study area is defined as the array area~~,~~ (including the Offshore Restricted Build Area (ORBA)), the Offshore Export Cable Corridor (ECC), ORCP areas, a 1km buffer up to Mean High Water Springs (MHWS) surrounding the array area and ECC, artificial nesting structure areas, buffered by 1km and the biogenic reef area (Volume 2, Figure 13.1). Prior to ES stage, the AfL array area ~~was~~and two cable corridors were used within the marine archaeology study area, but ~~it has~~they have since been refined.
13. The additional 1km buffers is common practise and allows for the consideration of direct and indirect effects on Historic Environment where seabed preparation or the instalment of structures is expected. It is designed to accommodate the potential imprecision of historic marine positioning and the strong tides which can cause the scattering of shipwreck artefacts and eroded archaeological material over considerable distances. As no seabed preparation is expected as a result of the biogenic reef area, a buffer has not been applied around these areas.
14. Shipwrecks located in the array area and/or Offshore ECC and/or ANS areas may have been recorded as lost outside the area or they may have been lost and drifted or dragged before settling on the seabed. While no impact of the Project is expected outside the array area and/or Offshore ECC and/or ANS, Volume 1, Chapter 7: Marine Processes (document reference 6.1.7), outlines how tidal ranges and seabed movements can be affected by the Project. This is further discussed in terms of impacts on Historic Environment in Section 13.7 and Section 13.9.
15. The area from MHWS landward is covered by Volume 1, Chapter 20: Onshore Archaeology and Cultural Heritage (document reference 6.1.20).

13.4.2 Compensation Areas

16. There are compensation areas within the Order Limits (included within the marine archaeology study area) which include areas for biogenic reef creation and recreation and areas for artificial nesting structures (ANS). These compensation areas are shown Volume 2, Figure 13.1 and a full list of all 20 wrecks and obstructions in the area are shown in Annex D of document reference 6.3.13.1.

13.4.3 Potential Historic Environment

17. The scope of the assessment has enabled the identification of Historic Environment potentially being impacted (positively or negatively) by the Project. The Historic Environment is defined as:
    - all aspects of the environment resulting from the interaction between people and places through time, including all surviving physical remains of past human activity, whether visible, buried or submerged, landscaped and planted or managed flora.

13.4.4 Data Sources

18. The following data sources detailed in Table 13.13 were collated and consulted for this chapter in order to undertake a desk-based review of the known marine archaeological and cultural heritages receptors and likely significant impacts.

Table 13.3: Key Sources of Data Regarding Historic Environment

Source	Summary	Coverage of study area
National Record of the Historic Environment (NRHE)	Point and polygon data in relation to wrecks and palaeoenvironmental evidence via Archaeology Data Service (ADS) ArchSearch.	Full coverage of the marine archaeology study area.
United Kingdom Hydrographic Office (UKHO)	Records of known wrecks and obstructions held by the UKHO and available via Admiralty Maritime Data Solutions: Marine Data Portal. Admiralty charts and historic mapping relevant to the defined marine archaeology study area.	Coverage of the marine archaeology study area up to MLWS.
Lincolnshire Historic Environment Record (HER)	Point data derived from Historic Environment Record held by Lincolnshire HER Office.	Limited coverage of the marine archaeology study area, though the detailed study provides useful characterisation of the directly adjacent subzone.
North Sea Palaeolandscape Project (NSPP) (University of Birmingham, 2011).	Palaeolithic and Mesolithic landscape mapping of the North Sea.	Partial coverage of the marine archaeology study area, though the detailed study provides useful characterisation of the directly adjacent subzone.
North Sea Prehistory Research and Management Framework (NSPRMF)	Provides a large-scale systematic and interdisciplinary study of the sedimentary and archaeological record now submerged beneath the shallow waters of the North Sea and English Channel, (Ongoing consultation).	Full coverage of the marine archaeology study area.

Source	Summary	Coverage of study area
Europe's Lost Frontiers (Gaffney and Fitch, 2022)	A continuation of the NSPP. Building on the mapping of Palaeolithic and Mesolithic landscapes of the North Sea, using palaeoenvironmental data and ancient DNA. Potential submerged Neolithic landscapes will also be explored.	Volume 1 of this project has been published and has partial coverage of the marine archaeology study area with useful characterisation of the directly adjacent subzone and palaeoenvironmental context of the region.
Technical Report for Strategic Environmental Assessment (SEA) Area 3 (Flemming, 2002).	Description of palaeolandscape potential of the North Sea basin.	Broadscale data with regional coverage.
Coastal and Intertidal Zone Archaeological Network (CITiZAN)	Interactive mapping of intertidal heritage in England.	Limited coverage of the marine archaeology study area, though the detailed study provides useful characterisation of the directly adjacent subzone.
Historic England Peat Database	Database of all intertidal and coastal peats containing location, nature, age and related archaeology.	Limited data within the marine archaeology study area, though peats have been found along the Lincolnshire coast and to the south along the Norfolk coast. Ten records are listed along the Lincolnshire coast within the marine archaeology study area, with an additional 33 records with unspecified locations within the North Sea.
British Geological Survey (BGS)	Database of a range of marine geoscience data held within the National Geoscience Data Centre (NGDC). Primarily shallow geology and geophysics data collected as either part of regional or local mapping work or provided by third parties.	Full coverage of the marine archaeology study area. No records of peat are found within the marine archaeology study area, however there are six within relative proximity of the marine archaeology study area, with the closest located 2km south of the Offshore ECC.
National Historic Seascape Characterisation (NHSC) Database	Database and thesaurus of all intertidal and offshore historic seascapes in the UK.	Full coverage of the marine archaeology study area up to mean low water springs (MLWS).
England's Historic Seascapes: Withernsea to Skegness Pilot Study (Museum of London Archaeology Service, 2009)	Description of palaeolandscape and marine archaeological potential in the offshore zone from Southwold to Clacton.	Broadscale data with regional coverage.
The Project specific geophysical and geotechnical survey data from the array area and Offshore ECC (2021/2022)	Geophysical surveys which include Multi-Beam Echo Sounder (MBES), Side Scan Sonar (SSS), magnetometer (MAG) and	Partial coverage of the marine archaeology study area. Full geophysical survey of the array

Source	Summary	Coverage of study area
	Sub-Bottom Profiler (SBP) data collection and geotechnical works which include boreholes and vibrocoring.	area and Offshore ECC but did not include ANS and reef areas. Initial geotechnical works will mainly be designed around engineering requirements, with archaeological input provided during the planning stages of site investigation works. Geoarchaeological campaigns utilising both the already collected material as well as archaeologically specific cores will be undertaken and analysed following submission of specific Method Statement (MS) to Historic England.
Wrecksite.eu	Records of known wrecks and obstructions. Admiralty charts and historic mapping relevant to the defined marine archaeology study area.	Full coverage of the marine archaeology study area up to MLWS.

13.4.5 Existing Environment

19. The offshore marine archaeological resource can be attributed to four main categories:

- Submerged prehistoric landscapes resulting from changes to sea-level and eventual stabilisation of sea-level at or near the present position. Such landscapes may contain highly significant evidence of prehistoric human occupation and/or environmental change;
- Archaeological remains of watercraft deposited when such vessels sank while at sea or became abandoned in an inter-tidal context which subsequently became inundated;
- Remains of aircraft crash sites, either coherent assemblages or scattered material, usually the result of World War Two (WWII) military conflict, but also numerous passenger casualties, particularly during the peak of seaplane activity during the World War One (WWI), though these rarely survive in the archaeological record; and
- Structural remains other than watercraft, including such elements as fish traps, abandoned quays, hards, defensive structures or sites lost to coastal erosion may be found within the intertidal zone (between MHWS and MLWS). Historic Environment located seaward of MHWS have been considered in this section.

20. Additionally, Historic Seascape Character will be assessed. This includes the historic cultural influences which shape present perception of seascapes, its uses, and its ability to accommodate change.

21. The marine archaeology study area has been assessed and described as a whole for the baseline, however the geophysical assessment for the array area, Offshore ECC and 1km buffer have been assessed separately in Volume 3, Appendix 13.1. Initially, two cable corridors were assessed for archaeological data but this has now been refined by the project. A summary of the records within the array area, Offshore ECC and 1km buffer are described below. The compensation areas have undergone a desk based assessment. A gazetteer of the 20 recorded sites, wrecks and obstructions within the compensation areas are presented in Annex D.

Summary of findings

22. Within the array area, there are 15 records for wrecks and obstructions (Volume 2, Figure 13.2). Of these, two wrecks and five obstructions have been identified in the geophysical data (SSS, MBES, and MAG). One additional wreck not previously recorded has been identified within the array. Three of these records are located with the ORBA. Further eight palaeochannel features were identified from the sub-bottom profiler data.
23. Within the Offshore ECC, there are ~~15~~13 records for wrecks, obstructions, foul ground and findspots (Volume 2, Figure 13.2). Of these ~~eleven~~nine wrecks and one obstruction have been identified in the geophysical data (SSS, MBES, and MAG).
24. Within the 1km buffer up to MHWS there are 26 records for wrecks, obstruction, foul ground and findspots (Volume 2, Figure 13.2). Of these, six have been identified in the geophysical data available for the 1km buffer surrounding the area.
25. Within the compensation areas and their associated buffers, there areas there 20 records for wrecks, obstruction, and foul ground (Volume 2, Figure 13.2).
26. In addition to this ES chapter, the technical report (document reference 6.3.13.1) was produced to further detail the findings outlined within this section.

13.4.6 Environmental Context and Maritime Activity

27. The area of seabed that the marine archaeology study area covers was previously a large swathe of dry land that was inhabited during the Pleistocene and early Holocene (Mesolithic). There have been numerous glacial cycles resulting in periods of lower and higher sea-level compared to today. The dynamic processes of climate and landscape change throughout the Pleistocene as a result of warming and cooling cycles and fluctuations in sea-level resulted in repeated (re)colonisation and abandonment of these landscapes (Cohen *et al*., 2017). Large swathes of land that are now submerged would have been inhabited and exploited by our human ancestors, and any archaeological finds from the Palaeolithic period in the offshore zone are likely to be from periods when the sea-level was lower.
28. The potential for submerged landscapes within the marine archaeological study area is high. To the south of the marine archaeology study area, at Happisburgh and Pakefield, the earliest evidence of hominin occupation of northern Europe (c. 900 kiloannus (ka) to 800 ka) comes from sites, features, and finds within the coastal and marine zone (Parfitt *et al*., 2005, 2010; Bynoe, 2018).

29. Due to the effects of ice scouring during each successive glacial period, the North Sea Basin has the highest potential for Palaeolithic material from within the last 100,000 years and increases significantly following the last glacial maximum, at the onset of the Holocene (Flemming, 2002). This is because these former Pleistocene land surfaces have not yet been eroded or reworked by younger landscapes (Cohen *et al*., 2017).
30. The deposits laid down in the marine zone during glacial cycles during the last 500,000 years are of great importance for understanding the localised geomorphological changes of the Lincolnshire coastline.
31. The archaeological and palaeoenvironmental potential of the offshore deposits from the North Sea is demonstrated by the wealth of artefacts, faunal remains and peat evidence that have been identified to date. However, *in situ* offshore finds are rare, with most artefacts within the marine zone being found on the seabed in a secondary context.
32. There are no *in situ* finds from the region, although the potential for the preservation of such material is well attested in similar contexts based on finds from development such as aggregate dredging area 240 approximately 98km south of the marine archaeology study area, off the coast of Norfolk (Tizzard *et al*., 2014) where an assemblage of Middle Palaeolithic tools has been recovered.
33. The rate of sea-level change had slowed considerably by c. 6,000 BP for much of the British Isles and much of the land mass connecting the United Kingdom (UK) and continental Europe was permanently inundated.
34. From around 4,500 BP the operation of maritime networks linking Britain across the North Sea, the Channel and the Irish Sea are shown in the long-distance exchange of exotic objects and artefacts. These included finds of Beaker pottery, copper and bronze weapons and tools, flint daggers, arrowheads and jewellery, or other adornments of gold, amber, faience, jet, and tin (Sturt and Van Noort via Research Framework, 2022).
35. The potential for substantial submerged landscape deposits offshore is further reduced in the Bronze Age due to the increasing stability in sea levels. However, with increasingly sedentary populations, both on the coast and inland, there came an inevitable rise in increased communications along the coast and waterways of the region.
36. There is substantial potential for *in situ* archaeological remains in the intertidal zone. These would include occupational material, ritual deposits, burials, and structures relating to coastal marine practices, such as jetties, causeways, and fish traps; however, there is also potential for secondary context material from eroded deposits in the inshore and intertidal zone.

37. By the Iron Age, sea level change no longer had a significant effect on the geomorphology of the coastline and was replaced by coastal erosion as the key factor in coastline changes. Maritime trade networks were further developed, with evidence of cross-channel, coastal and inland trade. From the late Iron Age there is much clearer evidence for increasing levels of contacts, trade, and exchange across the Channel. This evidence includes a wider range of materials than in the Bronze Age, including coins, pottery, and foodstuffs from the western Mediterranean, France and Belgium, and a range of other traded and imported Roman material.
38. The Roman occupation of the British Isles had an inherent maritime aspect due to the cross-Channel contact and connectivity that occurred both before and after the conquest. There is some uncertainty about the extent of coastal regression and transgression on the British coastline during the Roman period, however along the north and northeast coasts of Norfolk, to the south of the proposed development area, a Roman coast extending approximately 2km further seawards has been theorised (Walsh and Brockman *et al*., via Research Frameworks, 2022), increasing the potential of Roman artefacts to be found across the marine archaeology study area. Caistor and Lincoln were towns developed during the Roman occupation, with evidence of overseas trade. To the south, Brancaster housed a possible 'Saxon Shore Fort'. Two pot sherds recorded in the Lincolnshire Historic Environment Record (HER) (MLI41602 and MLI41607) are recorded within the intertidal zone of the marine archaeology study area.
39. There was a decline in maritime activity in the Early Medieval period, after the fall of the Roman Empire, until the late 6th century when there was a resurgence of trade with continental Europe which continued until the 9th century. As with the Roman period, the variety of maritime activities meant an extensive range of vessels were used. These vessels continued to increase in size and complexity, however smaller craft were still commonly used, especially for coastal and inshore activities. Within the marine archaeology study area, there is one record for a pot (MLI41601) from the medieval period listed in the Lincolnshire HER.
40. In the post-medieval period, there was a marked increase in detailed historical records, which meant that known maritime losses began to be recorded. There was also a continued increase in trade and maritime activity, and with this expansion of shipping activity and traffic came an ever-greater number of wrecking events. Within the marine archaeological study area three sailing vessels (UKHO10039, *Excelsior*, UKHO10041 *Dauntless* and UKHO8868 *Norfolk*) are attributed to the post-medieval period (Volume 2, Figure 13.2). These records are detailed in Section 3.3 of document reference 6.3.13.1.

41. The rapid pace of technological development in the beginning of the twentieth century had a great impact on the broad pattern of maritime activity. Wartime innovation led to the increase in use of new types of vessels and technologies, and a transformation of a growing global shipping trade. Globalisation also expanded into the leisure industry, with a decrease in the use of ocean linear in favour of cruise ships and newly developed passenger aircraft in the mid-1900s, and planes becoming the primary method of intercontinental travel. There are 19 recorded wrecks within the marine archaeology study area attributed to the modern period. These are detailed in Section 3.3 of document reference 6.3.13.1.

Known Wrecks and Obstructions

42. Wrecks and obstructions are classified by the UKHO as:
    - LIVE: wreck considered to exist as a result of detection through survey;
    - DEAD: not detected over repeated surveys, therefore not considered to exist in that location;
    - LIFT: wreck has been salvaged;
    - UNKNOWN: the state of the wreck is unknown or unconfirmed; and
    - ABEY: existence of wreck in doubt and therefore not shown on charts.
43. Records from the National Record of Historic Environment (NRHE) were checked against the UKHO records and any duplications were removed. Where the recorded wrecks were not also seen in the geophysical data the locations listed in the UKHO data were used.
44. The archaeological assessment of geophysical data combined with the baseline conditions has identified 21 LIVE wrecks, 7 DEAD wrecks, ~~23~~21 UNKNOWN or unconfirmed wrecks, along with one previously unrecorded wreck (MA0002 within the 1km buffer) within the marine archaeology study area (Volume 2, Figure 13.2). Of the wrecks recorded in the UKHO and NRHE baseline data assessment, ten were identified within the geophysical data.

Aviation Remains

45. Thousands of aircraft are likely to have been lost in UK territorial waters during the 20th century primarily during the World Wars. A high proportion of these losses are likely to be combat losses or accidental losses of military aircraft that occurred during WWII, but aviation remains could also include aircraft, airships, and other dirigibles dating to WWI, although these rarely survive in the archaeological record.
46. The Lincolnshire coastline has 118 Royal Air Force (RAF) aircraft losses recorded (Wessex Archaeology, 2008) however there are currently no reported losses of aircraft within the study area. Because of the concentration of military activity in the area there is a high potential for aircraft remains. Where in situ remains associated with any military aviation losses are found, they will be archaeologically significant and protected under the Protection of Military Remains Act 1986.

Recorded Losses

47. There are currently no additional recorded losses within the Order Limits for which there are no corresponding UKHO records or seabed remains, and for which only a general position is given.

Fisherman's Fasteners

48. Fishermen's fasteners are unidentified obstructions reported by fishermen with often very little information on accurate positioning or archaeological potential. The recorded positions might be indicative of a wreck or submerged feature, but they remain unidentified and are not associated with any known vessels or structural remains (including records classified as DEAD by the UKHO).
49. Within the marine archaeology study area, there are currently two records classed as fishermen's fasteners recorded, UKHO9482 and UKHO9483.

Unlocated Historic Environment

50. There is always a possibility that not yet identified Historic Environment receptors are located within the marine archaeology study area. Unlocated Historic Environment receptors are of unknown archaeological potential and heritage significance but might still be impacted by indirect or direct impacts caused by project activities. Large offshore renewable developments have over several years located previously unknown and unlocated sites of high archaeological significance within the various site boundaries, even after completing pre-construction surveys. Mitigation for unlocated Historic Environment is further discussed in Section 13.7.

Designated Sites

51. There are currently no Historic Environment receptors within the marine archaeology study area that are designated under the *Protection of Wrecks Act* 1973, or any other site designation or statutory protection.
52. There are a total of 118 RAF losses that have been documented off the coast of Lincolnshire, but the locations are currently unknown, as well as ten German aircraft losses as further detailed in Aircraft Crash Sites at Sea (Wessex Archaeology, 2008). The application of the *Protection of Military Remains Act* 1986 to UK military aircraft will apply to any aircraft remains found in UK territorial waters.
53. Along the Lincolnshire coast, where the Offshore ECC makes landfall there is one site that is designated as a Site of Special Scientific Interest (SSSI), Chapel Point to Wolla Bank SSSI. There are currently no recorded archaeological sites or finds designated at Chapel Point to Wolla Bank SSSI. However, the SSSI contains preserved palaeoenvironmental deposits that consist of Holocene sediments and special geological features which can provide a greater understanding of the palaeoenvironmental landscape from onshore to offshore.

Historic Seascape Characterisation

54. HSC has been used as a measure in this assessment to provide a contextual and regional approach to the marine archaeology study area. This narrative and all associated data is drawn from the National Historic Seascape Characterisation Consolidation which was undertaken in eight separate implementations projects dating from 2008 to 2015 (LUC, 2018 via Historic England). The assessment of the HSC data is therefore for contextual purposes and does not contain all modern infrastructure such as the Lincs Wind Farm and Triton Knoll. Historic seascapes cannot be destroyed or damaged but impacts to them can change their historical character.
55. Changes to the character of the sea surface of the historic seascape as a direct result of the construction, O&M and decommissioning phases will result from the addition of new infrastructure such as foundations and Wind Turbine Generators (WTGs) as well as ongoing activity from installation and maintenance vessels.
56. The HSC assessment draws on the consolidated NHSC database (LUC, 2018 via Historic England), Historic Seascape Characterisation: England's Historic Seascape: HSC Method Consolidation (Cornwall Council, 2008), and England's Historic Seascape: Demonstrating the Method (SeaZone, 2011), along with the Historic England's National Database (LUC, 2018), the Historic Seascape Characterisation Thesaurus (Historic England, 2017) and the more regionally specific England's Historic Seascapes: Withernsea to Skegness Pilot Study (Museum of London Archaeology Service, 2009). Contemporary offshore wind farm infrastructure such as Lincs Offshore Wind Farm and Triton Knoll Offshore Wind Farm were considered within the Seascape Characterisation.
57. The HSC regards the historic dimension of the present day seascape and considers the added effect of the Project within the multiple dimensions of the marine environment (sub seafloor, seafloor, water column, sea surface, coastal land and previous historic character) in combination with the existing activity within the Broad Historic Character types (Industry, Navigation, Fishing, Ports and Docks, Communications, Coastal Infrastructure, Military, Settlements, Recreation, and Cultural Topography) as further detailed in document reference 6.3.13.1, and summarised below.
58. At the coastal level character types include Industry, Navigation, Fishing, Ports and Docks, Communications, Coastal Infrastructure, Military, Settlements, Recreation and Cultural Topography (Volume 2, Figure 13.3). The dominant types are Fishing, Industry and Navigation which relate to historic and modern economies.
59. Within the sea surface and water column, character types include Navigation, Industry, Fishing, Military and Recreation (Volume 2, Figure 13.4and Figure 13.5). Activities on the sea surface and the water column are dominated by Fishing and Industry. The sea surface also comprises offshore infrastructure such as renewables, gas, oil, navigational markers, and ocean survey equipment.

60. Within the seafloor and sub-seafloor character types include Navigation, Industry, Fishing, Communications, Military and Cultural Topography (Volume 2, Figure 13.~~6 and~~6 and Volume 2, Figure 13.7). Activities on the seafloor and sub-seafloor are dominated by Industry, Fishing and Cultural Topography. Cultural topography and recreation may undergo a positive change with the increase in understanding of palaeolandscapes, peat deposits as well as artefacts and wrecks identified in the geophysical and geotechnical surveys undertaken for the Project. The impact on identified Historic Environment receptors is discussed in Volume 1, Chapter 13.

61. With regards to the outlined Broad Historic Character Types, ~~no significant change in~~change in industry has occurred as a result of contemporary offshore windfarms nearby and will further occur if this Project is completed. No further changes have occurred to Broad Historic Character Types and the multiple characters and dimensions of the marine environment as a result of the Project in isolation or cumulatively with neighbouring developments~~ is identified.~~.

62. It has been established that HSC was developed to be a positive force in informing change as well as recognising that landscape and seascape are both a product of that inevitable change. Developments should therefore respect and retain cultural distinctiveness and legibility wherever possible (Cornwall Council, 2008).

13.4.7 Future Baseline

63. Should the Project not go ahead, the existing environment, outlined above, is expected to remain relatively unaltered over the next 50-100 years. However, there are a number of proposed and active infrastructure projects planned in the vicinity (see Table 13.16) that have the potential to cause adverse, direct impacts on Historic Environment or contribute with beneficial impacts such as large-scale enhanced understanding of the archaeological resource through large area geophysical and geotechnical survey data released to public domain or the enhanced knowledge of key characteristics, features or elements deriving from site-specific survey and investigations.

64. In the case of exposed metal or wooden wrecks and archaeological debris on the seabed, there would continue to be a slow degradation and erosion of material. Due to the mobile sediments in the area, shifting sands would cause Historic Environment to cyclically become exposed and reburied.

65. In the case of wrecks and other Historic Environment that are buried and protected from exposure, the rate of degradation would be slower.

13.5 Archaeological Assessment of Geophysical Data

66. The archaeological assessment of geophysical data of the marine archaeology study area is presented below, and the results are summarised in Table 13.4. All geophysical anomalies have been cross-referenced with records of Historic Environment identified during the baseline assessment (see above). The definition of the archaeological potential of the anomalies is further defined in document reference 6.3.13.1.

67. Shallow geophysical and Ultra-High Seismic (UHSR) data was collected across the array area and Offshore ECC. The data quality of the SSS, MBES and SBP was assessed as good, meaning suitable, clear data in which anomalies can be clearly identified and interpreted and which provides the highest probability for Historic Environment to be identified. The exception to this was the magnetometer (MAG) data, which was assessed as adequate, meaning data which has been moderately affected by conditions such as weather, sea state or background noise, in which anomalies can been seen but are difficult to identify and interpret. The definition of survey data quality for archaeological interpretation is further detailed in Section 2.4 of document reference 6.3.13.1.

68. These results do not include the compensation areas as they have not yet undergone geophysical survey.

Table 13.4: Summary of Archaeological Anomalies within the Marine Archaeology Study Area Seen in the Geophysical Data

Archaeological Potential	Number of Anomalies
High	~~23~~21
Medium	~~166~~146
Low	~~2,228~~1,669
Total	~~2,417~~1,836

13.5.1 High Potential Anomalies

69. ~~23~~21 anomalies have been assessed as having High potential, as they are seen in all the geophysical data (SSS, MBES and MAG data), or they correlate with recorded locations of wrecks. Wrecks are of archaeological or historic interest as they hold, or may potentially hold, evidence of past human activity worthy of expert investigation at some point as per EN-1 (DESNZ, 2023a).

70. The ~~23~~21 anomalies with High archaeological potential are further detailed in document reference 6.3.13.1. Of the ~~23~~21 anomalies summarised below, ~~20~~18 correlate with UKHO/NRHE/Lincolnshire HER records (Volume 2, Figure 13.2 and Volume 2, Figure 13.~~8and~~8 and require an Archaeological Exclusion Zones (AEZ) of 100m.

13.5.2 Medium Potential Anomalies

71. ~~166~~146 anomalies of Medium archaeological potential were identified in the geophysical data (Volume 2, Figure 13.8). While these did not relate directly with any known UKHO/NRHE/Lincolnshire HER sites, some are in a close proximity and may represent debris associated with the recorded wrecks above.

72. Anomalies primarily identified from MAG data have been selected for their high magnetic anomaly of over 100nT.

73. While the magnetometer data in isolation cannot confirm if the object detected is of archaeological potential, a precautionary approach of avoidance is recommended for these ~~166~~146 targets of 50m. All areas on impact will be further investigated as per the commitment detailed in Table 13.9 and outlined in the Offshore WSI (document reference 8.5). After such survey, the anomaly can be removed from the list of constraints if proved not of archaeological potential or be given an updated exclusion zone.

13.5.3 Low Potential Anomalies

74. ~~2,228~~1,669 anomalies of Low archaeological potential were identified in the geophysical data. These anomalies have been characterised as a mixture of small features, often boulder-like, or isolated linear features and modern debris such as rope, chain, fishing gear or lost equipment, therefore no AEZ is recommended for any low potential anomalies as they such material would not deemed significant in archaeological terms.
75. Magnetic anomalies between 5nT and 100nT with no corresponding records or research resources and no corresponding anomalies in any of the assessed geophysical datasets have also been assigned low archaeological potential.
76. There is a degree of uncertainty with low potential anomalies as they have the potential to be unknown fouls, obstructions or even wrecks. Maritime losses records are not always accurate or complete, therefore we must take a precautionary approach. Maritime aircraft losses are widely unknown and can sometimes have a magnetic value of as little as 6nT. Rock outcrops with no other clear anthropogenic features can even been included as potential debris within the geophysical targets with low archaeological potential as they could potentially be of archaeological interest, with rocks and stones historically used as ballast, therefore potentially being indicative of buried wreck remains. The methodology for assessing anomalies is set out in Section 8 of document 8.5

13.6 Geoarchaeological Assessment of Geophysical Data

77. The nature, extent, and distribution of preserved palaeolandscapes is being mapped and understood as survey methods are developing. The contextual relationship between channels, micro and macro fauna, submerged forests, and identified and potential sites, both in the marine zone and terrestrial area, are becoming more apparent as the volume of data is increasing and this should continue to be assessed as per the phased approach outlined in Offshore Geotechnical Investigation and Historic Environment Analysis (COWRIE, 2011).
78. This section summarises the geoarchaeological assessment of geophysical data. A full description of the geoarchaeological potential within the study area is included in document reference 6.3.13.1 and the archaeological assessments of the deposit within vibrocores collected in the array area and the ECC is outlined in Annexe F and G, document reference 6.3.13.1.

79. The assessment of sub-bottom data in combination with the archaeological assessment of cores collected in the array area show that the seafloor morphology is made up of bedforms including, mega ripples, sand waves and sandbanks and deeper areas such as bathymetric depressions, also known as tunnel valleys. The seafloor morphology is likely to be the result of the flow of currents and tide movements.

80. The Offshore ECC is primarily composed of mobile sandy and gravelly surface deposits, formed into sand waves and ripples, overlying fine sands and soft clay representing the Botney Cut Formation, which was not seen in the array area. Below the Botney Cut Formation a complex Boulder Bank Formation is noted, represented of firm to stiff clays and in places gravels.

81. Further, a clear system of palaeochannels were identified. The palaeochannels are cut into the base of Unit A and seen incising the underlying Quaternary sediments, Unit B and Unit C. No blanking or indication of peat or shallow gas was noted within the array area, however vibrocores along the ECC were recorded to contain organic deposits and sub-bottom data noted areas of shallow gas across the ECC (GeoXYZ, 2023).

82. The palaeochannel systems (labelled MA3000-MA3007) are generally stretching across the marine archaeology study area in a north northwest to south-southeast direction and can reach depths up to 32m Below Seafloor (BSF) as illustrated on Volume 2, Figure 13.9 and further detailed in document reference 6.3.13.1.

83. The outline deposit model presented in Table 13.5 will be further refined following a phased geoarchaeological assessment as detailed in the Outline Marine WSI (see document 8.5).

Table 13.5: Outline Deposit Model table

Unit	Stratigraphy	Description	Epoch	Geoarchaeological potential
Unit A	Holocene mobile sands	Mobile loose to medium gravelly SAND	Holocene	Sedimentary low geoarchaeological potential, however archaeological artefacts may be located within these sediments
Unit B	Botney Cut Formation	Laminated fine SAND with very soft to soft CLAY	Quaternary, Marine Isotope Stage 2	Potential to contain material of geoarchaeological interest
Unit C	Bolders Bank Formation	Fine to medium SAND and soft to stiff CLAY with sand, gravel chalk and pebbles. At base GRAVEL	Quaternary, Isotope Stage 3-2	Potential to contain material of geoarchaeological interest
Unit D	Egmond Ground Formation	Medium to fine SAND and gravels	Quaternary, Marine Isotope Stage 11	Limited potential to contain material of geoarchaeological interest
Unit E	Swarte Bank Formation	SAND and CLAY with occasional gravel	Quaternary, Marine Isotope Stage 12	Limited potential to contain material of geoarchaeological interest
Unit F	Bedrock	Cretaceous CHALK	Cretaceous	No geoarchaeological interest

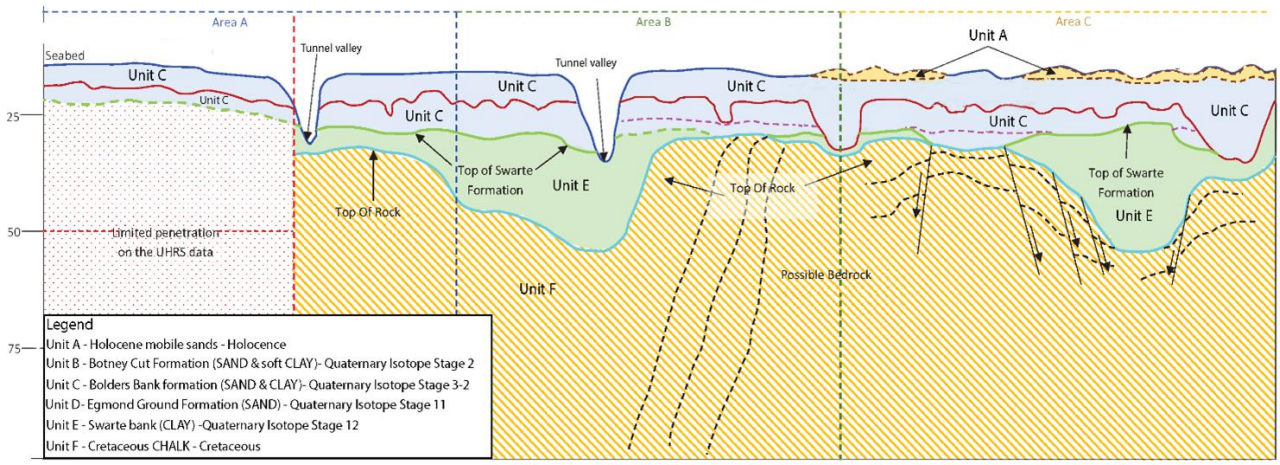

Plate 13.1: Illustrated outline deposit model (array area). Adapted from Outer Dowsing Offshore Wind Farm Geophysical UHRS And Light Geotechnical Survey East Anglia, Offshore UK, ENVIROS Survey & Consultancy Limited, 2022.

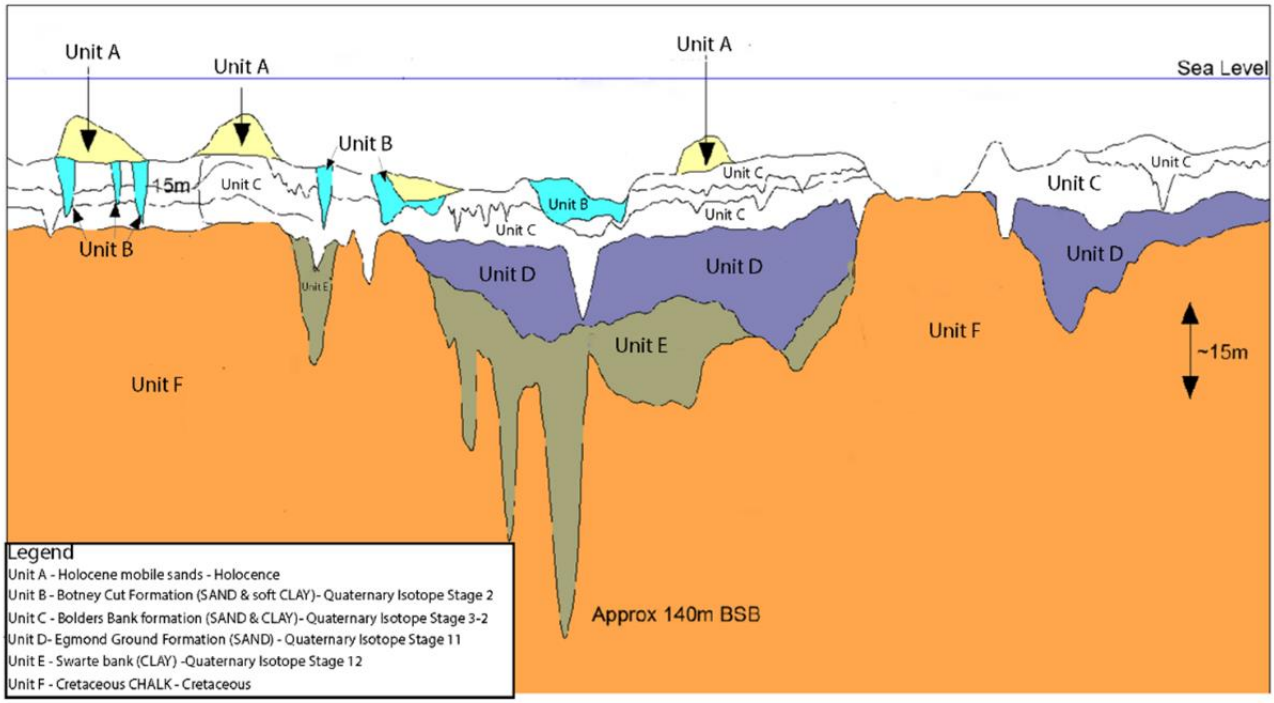

Plate 13.2: Illustrated outline deposit model (ECC). Adapted from Offshore & Nearshore Geophysical & Geotechnical Results & Charts (Vol. 5). GEOxyz, 2023.

13.7 Basis of Assessment

13.7.1 Scope of the Assessment

84. The array area of the Project is approximately 436km^2 and lies approximately 54km east of the Lincolnshire coast at its closest point. The Offshore ECC runs west from the array area and covers approximately 233km^2, up to and including the intertidal zone as defined as ending at MHWS. The landfall will be made at Wolla Bank, to the south of Anderby Creek.

85. As outlined in Section 13.4 the marine archaeology study area includes a 1km buffer around the array area (including the ORBA) and Offshore ECC up to MHWS as well as a buffer around the ANS and a non-buffered biogenic reef area (Volume 2, Figure 13.1).

Impacts Scoped In for Assessment

86. The following impacts have been scoped into this assessment:

- Construction:
  - Impact 1: Direct impact of sediment removal containing undisturbed archaeological contexts during seabed preparation ahead of construction activities leading to the total or partial loss of Historic Environment;
  - Impact 2: Direct impact by penetration of foundations leading to the total or partial loss of Historic Environment;
  - Impact 3: Direct impact by compression of foundations leading to the total or partial loss of Historic Environment;
  - Impact 4: Direct impact by penetration leading to disturbance of stratigraphic context containing archaeological material from the combined weight of the WTGs or Offshore Platforms leading to total or partial loss of Historic Environment;
  - Impact 5: Direct impact by compression leading to disturbance of stratigraphic context containing archaeological material from the combined weight of the WTGs or Offshore Platforms leading to total or partial loss of Historic Environment;
  - Impact 6: Direct impact by penetration of cable laying operations leading to total or partial loss of Historic Environment;
  - Impact 7: Direct impacts by compression of cable laying operations leading to total or partial loss of Historic Environment;
  - Impact 8: Direct impacts by penetration effects of jack-up barges and anchoring of construction vessels during various activities leading to total or partial loss of Historic Environment;
  - Impact 9: Direct impacts by compression effects of jack-up barges and anchoring of construction vessels during various activities leading to total or partial loss of Historic Environment; and
  - Impact 10: Indirect impacts causing disturbance of sediment containing potential

Historic Environment (material and context) leading to the exposure of those Historic Environment to natural, chemical, or biological processes and indirectly causing or accelerating their loss.

- Operation and maintenance:
  - Impact 12: Direct impact by penetration leading to disturbance effects of maintenance activities at WTGs, Offshore Platforms and along all cables leading to total or partial loss of Historic Environment;
  - Impact 13: Direct impact by compression leading to disturbance effects of maintenance activities at WTGs, Offshore Platforms and along all cables leading to total or partial loss of Historic Environment;
  - Impact 14: Direct impacts by penetration effects of jack-up barges and anchoring of O&M vessels during various activities at WTGs, Offshore Platforms and along all cables leading to total or partial loss of Historic Environment;
  - Impact 15: Direct impacts by compression effects of jack-up barges and anchoring of O&M vessels during various activities at WTGs, Offshore Platforms and along all cables leading to total or partial loss of Historic Environment.
  - Impact 16: Indirect impacts causing disturbance of sediment containing potential Historic Environment during maintenance activities leading to the exposure of those Historic Environment to natural, chemical, or biological processes and indirectly causing or accelerating their loss; and
  - Impact 17: Indirect impacts causing scour effects as a result of the presence of WTGs, Offshore Platforms and the exposure of cables or the use of cable protection measures leading to the exposure of those Historic Environment to natural, chemical or biological processes causing or accelerating their loss.
- Decommissioning:
  - Impact 19: Direct impacts by penetration effects of jack-up barges and anchoring of decommissioning vessels leading to total or partial loss of Historic Environment;
  - Impact 20: Direct impacts by compression effects of jack-up barges and anchoring of decommissioning vessels leading to total or partial loss of Historic Environment; and
  - Impact 21: Indirect impacts creating draw-down of sediment into voids left by removed WTG foundations or Offshore Platforms leading to loss of sediment or destabilisation of archaeological sites and contexts indirectly exposing Historic Environment to natural, chemical, or biological processes and causing or accelerating loss of the same.

Impacts Scoped Out for Assessment

87. In line with the Scoping Opinion (The Inspectorate, 2022), and based on the receiving environment, expected parameters of the Project (Volume 1, Chapter 3), and expected scale of impacts/potential for a pathway for effect on the environment, the only impact to be scoped out of the assessment is potential transboundary effects.

88. It should be noted that, while all potential transboundary impacts are proposed to be scoped out, should wrecks or aircrafts of non-British nationality be affected by the Project, further archaeological investigations may be warranted and in line with the procedures outlined in the Outline Marine WSI (see document 8.5). Further discussions on protection should include the relevant organisation in the country of relevance. There is also a potential for palaeochannels and palaeolandscapes within the North Sea to stretch beyond international boundaries. The impact on submerged landscapes in those cases is expected to be local within the Project and will be mitigated and offset by archaeological assessments of geotechnical data.

13.7.2 Realistic Worst Case Scenario

89. The following section identifies the Maximum Design Scenario (MDS) in environmental terms, defined by the project design envelope. This has been used to establish the maximum potential impact associated with the Project on Historic Environment receptors. The engineering parameters of the project design envelope are defined in Volume 1, Chapter 3. Table 13.8 below defines the MDS by impact.

Table 13.6: Maximum Design Scenario for Marine and Intertidal Archaeology for the Project Alone

Potential Effect	Maximum Design Scenario Assessed	Justification
Construction		
Impact 1: Direct impact of sediment removal containing undisturbed archaeological contexts during seabed preparation ahead of construction activities leading to the total or partial loss of Historic Environment.	Total maximum impact of seabed preparation ▪ 50 Wind Turbine Generators (WTG) foundations (Gravity Base Structures (GBS)) 36,300m^3 per foundation, total impact 1,815,000m^3 ▪ 50 WTG foundations (Suction Bucket Jacket (SBJ)) 4,100m^3 per foundation, total impact 205,000m^3 ▪ Seven Offshore Substation (OSS) foundations (4 OSS, 2 ~~Offshore Reactive Compensation Platforms (ORCP)~~ORCPs and 1 accommodation platform) (GBS) 48,500m^3 per foundation, total impact 339,~~5000m^3~~500m^3 ▪ Two Artificial Nesting Structures (ANS) foundations (GBS) 36,300m^3 per foundation, total impact 72,600m^3 Total volume of sediment disturbed by sandwave clearance ▪ Inter-array cables 7,819,671m^3 ▪ Interlink cables 2,563,945m^3 ▪ Offshore export cables 5,750,513m^3	The maximum assessment assumptions represent the maximum seabed disturbance by sediment removal that could potentially affect Historic Environment located within the proposed development. Biogenic reef creation is not expected to require seabed preparation.
Impact 2: Direct impact by penetration of foundations leading to the total or partial loss of ~~HisBeiastoric~~Historic Environment.	Maximum depth below seabed ▪ 100 WTG foundations (Pin piled jacket (SPA-1)) 95m depth per foundation, total impact 38,000m ▪ Seven OSS foundations (Pin piled jacket (SPA-1)) 110m depth per foundation, total impact 18,480m ▪ Two ANS foundations (Pin piled jacket (SPA-1)) 95m depth per foundation, total impact 760m	The maximum assessment assumptions represent the maximum disturbance by the foundations that could potentially affect Historic Environment located within the proposed development. Biogenic reef creation is not expected to result in penetration of the seabed.

Potential Effect	Maximum Design Scenario Assessed	Justification
	Maximum scour protection volume ▪ 50 WTG foundations (GBS), per foundation 30,900m^3, total impact 1,545,000m^3 ▪ 50 WTG foundations (SBJ), per foundation 23,400m3, total impact 1,170,000m^3 ▪ OSS foundations (GBS), per foundation 41,000m^3, total impact 287,000m^3 ▪ ANS foundations (GBS), per foundation 30,900m^3, total impact 61,800m^3	
Impact 3: Direct impact by compression of foundations leading to the total or partial loss of Historic Environment.	Expected seabed pressure (kPa) ▪ WTG foundations (suction bucket jacket), per foundation 800, total impact 80,000kPa ▪ OSS foundations (suction bucket jacket), per foundation 800, total impact 5,600kPa ▪ ANS foundations (suction bucket jacket), per foundation 800, total impact 1,600kPa Maximum scour protection volume ▪ 50 WTG foundations (GBS), per foundation 30,900m^3, total impact 1,545,000m^3 ▪ 50 WTG foundations (SBJ), per foundation 23,400m^3, total impact 1,170,000m^3 ▪ OSS foundations (suction bucket jacket), per foundation 51,150m^3, total impact 358,050m^3 ▪ ANS foundations (GBS), per foundation 30,900m^3, total impact 61,800m^3	The maximum assessment assumptions represent the maximum disturbance by compression that could potentially affect Historic Environment located within the proposed development. Biogenic reef creation is not expected to result in compression impacts. This is based on the data received by the Project.

Potential Effect	Maximum Design Scenario Assessed	Justification
Impact 4: Direct impact by penetration leading to disturbance of stratigraphic context containing archaeological material from the combined weight of the WTGs or Offshore Platforms leading to total or partial loss of Historic Environment.	Maximum depth below seabed ▪ 100 WTG foundations (Pin piled jacket (SPA-1)) 95m depth per foundation, total impact 3,630,000m ▪ Seven OSS foundations (Pin piled jacket (SPA-1)) 110m depth per foundation, total impact 770m ▪ Two ANS foundations (Pin piled jacket (SPA-1)) 95m depth per foundation, total impact 190m Expected seabed pressure (kPa) ▪ WTG foundations (suction bucket jacket), per foundation 800, total impact 80,000kPa ▪ OSS foundations (suction bucket jacket), per foundation 800, total impact 5,600kPa ▪ ANS foundations (suction bucket jacket), per foundation 800, total impact 1,600kPa Maximum scour protection volume ▪ 50 WTG foundations (GBS), per foundation 30,900m^3, total impact 1,545,000m^3 ▪ 50 WTG foundations (SBJ), per foundation 23,400m3, total impact 1,170,000m^3 ▪ OSS foundations (suction bucket jacket), per foundation 51,150m^3, total impact 358,050m^3 ▪ ANS foundations (GBS), per foundation 30,900m^3, total impact 61,800m^3	The maximum assessment assumptions represent the maximum disturbance by combined weight that could potentially affect Historic Environment located within the proposed development. Biogenic reef creation is not expected to result in penetration of the seabed. This is based on the data received by the Project.
Impact 5: Direct impact by compression leading to disturbance of stratigraphic	Expected seabed pressure (kPa)	The maximum assessment assumptions represent the maximum disturbance by combined weight that could potentially affect marine

Potential Effect	Maximum Design Scenario Assessed	Justification
context containing archaeological material from the combined weight of the WTGs or Offshore Platforms leading to total or partial loss of Historic Environment.	▪ WTG foundations (suction bucket jacket), per foundation 800, total impact 80,000kPa ▪ OSS foundations (suction bucket jacket), per foundation 800, total impact 5,600kPa ▪ ANS foundations (suction bucket jacket), per foundation 800, total impact 1,600kPa	archaeological and cultural heritage receptors located within the proposed development. Biogenic reef creation is not expected to result in compression impacts. This is based on the data received by the Project.
Impact 6: Direct impact by penetration of cable laying operations leading to total or partial loss of Historic Environment.	Cable installation ▪ 377.42km total length of inter-array cables; ▪ Maximum length of offshore interlink cables, 123.75km ▪ Up to four offshore export cables may be installed with a total length of 440km; Total volume of sediment disturbed by sandwave clearance ▪ Inter-array cables 7,819,671m^3 ▪ Interlink cables 2,563,945m^3 ▪ Offshore export cables 5,750,513m^3 Maximum width of seabed disturbed during installation ▪ Inter-array cables 33m ▪ Interlink cables 33m ▪ Offshore export cables 33m Cable burial depth ▪ Inter-array cables up to 3m ▪ Interlink cables up to 3m ▪ Offshore export cables up to 3m	The maximum assessment assumptions represent the maximum disturbance by cable laying activities that could potentially affect marine archaeological and cultural heritage receptors located within the proposed development. Biogenic reef creation is not expected to result in penetration of the seabed.

Potential Effect	Maximum Design Scenario Assessed	Justification
	Maximum area of seabed covered by cable protection – Rock protection area ▪ Inter-array cables 1,030,357m^2 ▪ Interlink cables 278,438m^2 ▪ Offshore export cables (array) 330,000m^2 ▪ Offshore export cables (ECC) 657,552m^2 Total area of seabed disturbed from boulder clearance ▪ Inter-array cables 7,472,916m^2 ▪ Interlink cables 2,450,250m^2 ▪ Offshore export cables (array) 1,089,000m^2 ▪ Offshore export cables (ECC) 2,169,922m^2 Cable protection - Rock berm volume per crossing ▪ Inter-array cables per crossing 270,000m^3 ▪ Interlink cables per crossing 144,000m^3 ▪ Offshore export cables per crossing 342,000m^3 Up to six Horizontal Directional Drilling (HDD) exit pits, maximum exit pit excavated material volume is expected to be 5,000m^3.	
Impact 7: Direct impacts by compression of cable laying operations leading to total or partial loss of Historic Environment.	Cable installation ▪ 377.42km total length of inter-array cables; ▪ Maximum length of offshore interlink cables, 123.75km ▪ Up to four offshore export cables may be installed with a total length of 440km;	The maximum assessment assumptions represent the maximum disturbance by cable laying activities that could potentially affect Historic Environment located within the proposed development. Biogenic reef creation is not expected to result in compression impacts.

Potential Effect	Maximum Design Scenario Assessed	Justification
	Total volume of sediment disturbed by sandwave clearance ▪ Inter-array cables 7,819,671m^3 ▪ Interlink cables 2,563,945m^3 ▪ Offshore export cables 5,750,513m^3 Maximum width of seabed disturbed during installation ▪ Inter-array cables 33m ▪ Interlink cables 33m ▪ Offshore export cables 33m Cable burial depth ▪ Inter-array cables up to 3m ▪ Interlink cables up to 3m ▪ Offshore export cables up to 3m Maximum area of seabed covered by cable protection – Rock protection area ▪ Inter-array cables 1,030,357m^2 ▪ Interlink cables 278,438m^2 ▪ Offshore export cables (array) 330,000m^2 ▪ Offshore export cables (ECC) 657,552m^2 Total area of seabed disturbed from boulder clearance ▪ Inter-array cables 7,472,916m^2 ▪ Interlink cables 2,450,250m^2 ▪ Offshore export cables (array) 1,089,000m^2	

Potential Effect	Maximum Design Scenario Assessed	Justification
	▪ Offshore export cables (ECC) 2,169,922m^2 Cable protection - Rock berm volume per crossing ▪ Inter-array cables per crossing 270,000m^3 ▪ Interlink cables per crossing 144,000m^3 ▪ Offshore export cables per crossing 342,000m^3 Up to six HDD exit pits, maximum exit pit excavated material volume is expected to be 5,000m^3.	
Impact 8: Direct impacts by penetration effects of jack-up barges and anchoring of construction vessels during various activities leading to total or partial loss of Historic Environment.	Maximum volume of sediment disturbed for all jack-up operations during construction of WTG, assuming up to six legs with an average spudcan area of 250m^2 per foot, a maximum of 511 operations totalling a maximum disturbance area of 1,613m^2 per jack-up operation and a total of 824,243m^2. Total impact of anchor footprints during construction WTG, 388 operations, 800m^2 per operation (Anchor dimension of 10x10m, eight anchors per jack-up), total of 310,400m^2	The maximum assessment assumptions represent the maximum disturbance by vessel activities that could potentially affect Historic Environment located within the proposed development. Details on the actual depth into and under the seabed and therefore risk to presently unknown elements of the historic environment has not been provided by the Project at this stage.
Impact 9: Direct impacts by compression effects of jack-up barges and anchoring of construction vessels during various activities leading to total or partial loss of Historic Environment.	Maximum volume of sediment disturbed for all jack-up operations during construction of WTG, assuming up to six legs with an average spudcan area of 250m^2 per foot, a maximum of 511 operations totalling a maximum disturbance area of 1,613m^2 per jack-up operation and a total of 824,243m^2. Total impact of anchor footprints during construction WTG, 388 operations, 800m^2 per operation (Anchor dimension of 10x10m, eight anchors per jack-up), total of 310,400m^2	The maximum assessment assumptions represent the maximum disturbance by combined weight that could potentially affect Historic Environment located within the proposed development.

Potential Effect	Maximum Design Scenario Assessed	Justification
Impact 10: Indirect impacts causing disturbance of sediment containing potential Historic Environment (material and context) leading to the exposure of those Historic Environment to natural, chemical or biological processes and indirectly causing or accelerating their loss.	Total maximum impact of seabed preparation ▪ 50 WTG foundations (GBS) 36,300m^3 per foundation, total impact 1,815,000m^3 ▪ 50 WTG foundations (SBJ) 4,100m^3 per foundation, total impact 205,000m^3 ▪ Seven OSS foundations (4 OSS, 2 ~~ORCP~~ORCPs and 1 accommodation platform) (GBS) 48,500m^3 per foundation, total impact 339,~~5000m3~~ 500m^3 ▪ Two ANS foundations (GBS) 36,300m3 per foundation, total impact 72,600m^3 Total volume of sediment disturbed by sandwave clearance ▪ Inter-array cables 7,819,671m^3 ▪ Interlink cables 2,563,945m^3 ▪ Offshore export cables 5,750,513m^3 Total area of seabed disturbed from boulder clearance ▪ Inter-array cables 7,472,916m^2 ▪ Interlink cables 2,450,250m^2 ▪ Offshore export cables (array) 1,089,000m^2 ▪ Offshore export cables (ECC) 2,169,922m^2 Up to six HDD exit pits, maximum exit pit excavated material volume is expected to be 5,000m^3. Maximum volume of sediment disturbed for all jack-up operations during construction of WTG, assuming up to six legs with an average	The maximum assessment assumptions represent the maximum disturbance by sediment disturbance that could potentially affect Historic Environment located within the proposed development.

Potential Effect	Maximum Design Scenario Assessed	Justification
	spudcan area of 250m^2 per foot, a maximum of 511 operations totalling a maximum disturbance area of 1,613m^2 per jack-up operation and a total of 824,243m^2. Total impact of anchor footprints during construction WTG, 388 operations, 800m^2 per operation (Anchor dimension of 10x10m, eight anchors per jack-up), total of 310,400m^2 Creation and recreation of biogenic reef.	
Operation and Maintenance		
Impact 12: Direct impact by penetration leading to disturbance effects of maintenance activities at WTGs, Offshore Platforms and along all cables leading to total or partial loss of Historic Environment.	Maximum footprint of seabed disturbance of cable repairs ▪ Inter-array cables 15,000m^2 per event ▪ Interlink cables 15,000m^2 per event ▪ Offshore export cables 15,000m^2 per event WTG activities, maximum footprint of seabed disturbance ▪ Component replacement 1,500m^2 ▪ J-tube repair/ replacement 1,500m^2 Maximum footprint of temporary seabed disturbance per event ▪ 155,000m^2 for export cables ▪ 210,000m^2 for interconnector cables Array, interconnector cables and export cable repair .activities: ▪ Remedial burial, maximum width of disturbed seabed 30m ▪ Maximum cable trench width 10m ▪ Maximum length of cable repair per event, 1,500m	The maximum assessment assumptions represent the maximum disturbance by O&M activities that could potentially affect Historic Environment located within the proposed development. Biogenic reef creation is not expected to result in penetration of the seabed.

Potential Effect	Maximum Design Scenario Assessed	Justification
	Maximum footprint of jack-up during repairs ▪ Array and interconnector cables 1,500m^2 per event ▪ Offshore export cables 1,500m^2 per event	
Impact 13: Direct impact by compression leading to disturbance effects of maintenance activities at WTGs, Offshore Platforms and along all cables leading to total or partial loss of Historic Environment.	Maximum footprint of seabed disturbance of cable repairs, ▪ Inter-array cables 15,000m^2 per event ▪ Interlink cables 15,000m^2 per event ▪ Offshore export cables 15,000m^2 per event WTG activities, maximum footprint of seabed disturbance ▪ Component replacement 1,500m^2 ▪ J-tube repair/ replacement 1,500m^2 Maximum footprint of temporary seabed disturbance per event ▪ 155,000m^2 for export cables ▪ 210,000m^2 for interconnector cables Array, interconnector cables and export cable repair activities ▪ Remedial burial, maximum width of disturbed seabed 30m ▪ Maximum cable trench width 10m ▪ Maximum length of cable repair per event, 1,500m Maximum footprint of jack-up during repairs ▪ Array and interconnector cables 1,500m^2 per event ▪ Offshore export cables 1,500m^2 per event	The maximum assessment assumptions represent the maximum disturbance by Operation and Maintenance (O&M) activities that could potentially affect Historic Environment located within the proposed development. Biogenic reef creation is not expected to result in compression impacts.
Impact 14: Direct impacts by penetration effects of jack-up	Maximum offshore visits ▪ Up to 1,440 WTG visits	The maximum assessment assumptions represent the maximum disturbance by vessel activities

Potential Effect	Maximum Design Scenario Assessed	Justification
barges and anchoring of O&M vessels during various activities at WTGs, Offshore Platforms and along all cables leading to total or partial loss of Historic Environment.	▪ Up to 440 WTG foundation visits Maximum number of seabed survey events per lifetime, 38 Number of vessels ▪ Up to 10 CTVs ▪ Up to 2 SOVs ▪ Up to 12 supply vessels ▪ Up to 4 JUVs	during O&M activities that could potentially Historic Environment located within the proposed development.
Impact 15: Direct impacts by compression effects of jack-up barges and anchoring of O&M vessels during various activities at WTGs, Offshore Platforms and along all cables leading to total or partial loss of Historic Environment.	Maximum offshore visits ▪ Up to 1,440 WTG visits ▪ Up to 440 WTG foundation visits Maximum number of seabed survey events per lifetime, 38 Number of vessels ▪ Up to 10 CTVs ▪ Up to 2 SOVs ▪ Up to 12 supply vessels ▪ Up to 4 JUVs	The maximum assessment assumptions represent the maximum disturbance by O&M activities that could potentially affect Historic Environment located within the proposed development.
Impact 16: Indirect impacts causing disturbance of sediment containing potential Historic Environment during maintenance activities leading to the exposure of those Historic Environment to natural,	Maximum footprint of seabed disturbance of cable repairs, ▪ Inter-array cables 15,000m^2 per event ▪ Interlink cables 15,000m^2 per event ▪ Offshore export cables 15,000m^2 per event WTG activities, maximum footprint of seabed disturbance ▪ Component replacement 1,500m^2	The maximum assessment assumptions represent the maximum sediment disturbance during O&M that could potentially affect Historic Environment located within the proposed development.

Potential Effect	Maximum Design Scenario Assessed	Justification
chemical or biological processes and indirectly causing or accelerating their loss;	▪ J-tube repair/ replacement 1,500m^2 Maximum footprint of temporary seabed disturbance per event ▪ 155,000m^2 for export cables ▪ 210,000m^2 for interconnector cables Array, interconnector cables and export cable repair activities ▪ Remedial burial, maximum width of disturbed seabed 30m ▪ Maximum cable trench width 10m ▪ Maximum length of cable repair per event, 1,500m Maximum footprint of jack-up during repairs ▪ Array and interconnector cables 1,500m^2 per event ▪ Offshore export cables 1,500m^2 per event Maximum offshore visits ▪ Up to 1,440 WTG visits ▪ Up to 440 WTG foundation visits Maximum number of seabed survey events per lifetime, 38 Number of vessels ▪ Up to 10 CTVs ▪ Up to 2 SOVs ▪ Up to 12 supply vessels ▪ Up to 4 JUVs	

Potential Effect	Maximum Design Scenario Assessed	Justification
Impact 17: Indirect impacts causing scour effects as a result of the presence of WTGs, Offshore Platforms and the exposure of cables or the use of cable protection measures leading to the exposure of those Historic Environment to natural, chemical or biological processes causing or accelerating their loss.	Up to 100 WTGs and associated foundations; Up to four OSSs and associated foundations; Up to two ORCPs and associated foundations; One accommodation platform and associated foundations; Two ANS structures; Biogenic reef creation. Maximum scour protection volume ▪ 50 WTG foundations (GBS), per foundation 30,900m3, total impact 1,545,000m^3 ▪ 50 WTG foundations (SBJ), per foundation 23,400m3, total impact 1,170,000m^3 ▪ OSS foundations (suction bucket jacket), per foundation 51,150m3, total impact 358,050m^3 ▪ ANS foundations (GBS), per foundation 30,900m3, total impact 61,800m^3 Maximum area of seabed covered by cable protection – Rock protection area ▪ Inter-array cables 1,030,357m^2 ▪ Interlink cables 278,438m^2 ▪ Offshore export cables (array) 330,000m^2 ▪ Offshore export cables (ECC) 657,552m^2 Cable protection - Rock protection volume ▪ Inter-array cables 944,494m^3 ▪ Interlink cables 255,234m^3	The maximum assessment assumptions represent the maximum sediment disturbance during O&M that could potentially affect Historic Environment located within the proposed development.

Potential Effect	Maximum Design Scenario Assessed	Justification
	▪ Offshore export cables (array) 302,500m^3 ▪ Offshore export cable (ECC) 602,756 m^3 Array cable repair activities ▪ Remedial burial, maximum width of disturbed seabed 30m ▪ Maximum cable trench width 10m ▪ Maximum length of cable repair per event, 1,500m	
Decommissioning		
Impact 19: Direct impacts by penetration effects of jack-up barges and anchoring of decommissioning vessels leading to total or partial loss of Historic Environment.	It is anticipated that all the offshore structures above the seabed level, together with all subsea cables, will be completely removed. The decommissioning sequence will generally be the reverse of the construction sequence (reverse lay) and involve similar types and numbers of vessels and equipment.	The Maximum Design Scenario (MDS) represents the maximum seabed disturbance by vessels activities that could potentially affect Historic Environment during decommissioning.
Impact 20: Direct impacts by compression effects of jack-up barges and anchoring of decommissioning vessels leading to total or partial loss of Historic Environment.	Maximum volume of sediment disturbed for all jack-up operations during construction is assuming up to six legs with an average spudcan area of 250m^2 per foot, a maximum of 511 operations totalling a maximum disturbance area of 1,613m^2 per jack-up operation and a total of 824,243m^2. The same or similar impact is expected during decommissioning. Total impact of anchor footprints during construction WTG, 388 operations, 800m^2 per operation (Anchor dimension of 10x10m, eight anchors per jack-up), total of 310,400m^2. The same or similar impact is expected during decommissioning.	The MDS represents the maximum sediment disturbance that could potentially affect Historic Environment during decommissioning.

Potential Effect	Maximum Design Scenario Assessed	Justification
Impact 21: Indirect impacts creating draw-down of sediment into voids left by removed WTG foundations or Offshore Platforms leading to loss of sediment or destabilisation of archaeological sites and contexts indirectly exposing Historic Environment to natural, chemical, or biological processes and causing or accelerating loss of the same.	Total maximum impact of removal of structures ■ 50 WTG foundations (GBS) 36,300m^3 per foundation, total impact 1,815,000m^3 ■ 50 WTG foundations (SBJ) 4,100m^3 per foundation, total impact 205,000m^3 ■ Seven OSS foundations (4 OSS, 2 ORCP and 1 accommodation platform) (GBS) 48,500m^3 per foundation, total impact ~~4,850,000m^3~~339,500m^3 ■ Two ANS foundations (GBS) 36,300m^3 per foundation, total impact 72,600m^3	The MDS represents the maximum sediment disturbance that could potentially affect Historic Environment during decommissioning.

13.7.3 Mitigation Measures

90. The measures contained in Table 13.7 are mitigation measures or commitments that have been identified and adopted as part of the evolution of the project design of relevance to marine and intertidal archaeology, and include project design measures, compliance with elements of good practice and the use of standard protocols.

91. The embedded mitigation measures described below are secured through the Outline Marine WSI (see document 8.5). The measures are also required to be agreed with relevant stakeholders when the final Agreed WSI is issued and would be expected to be a condition of the deemed Marine Licences (dMLs) (as part of the DCO).

92. Wherever possible mitigation will be proactive in the identification of potential Historic Environment and reactive in measures to minimise impact and risk on known and recently located receptors.

Table 13.7: Embedded Mitigation Relating to Marine and Intertidal Archaeology

Project phase	Mitigation Measures Embedded into the Project Design
Marine Written Schemes of Investigation	An Outline Marine Written Schemes of Investigation (WSI) document has been produced to accompany the ES to outline defined mitigation measures necessary for this stage and further archaeological campaigns for the Project which builds on the baseline characterisation completed to date for the entire proposed development. The methodological approaches to survey data capture standards and analysis that will best support archaeological analysis and interpretation. The use of *in-situ* mitigation measures such as AEZs, as are presently spatially identified, with clear instruction that the Outline Marine WSI provides the basis for steering the Project post-consent and a draft Marine WSI to be produced pre-construction in accordance with any DCO held as relevant to defined phases of this Project.
Archaeological Exclusion Zones (AEZ)	All intrusive activities undertaken during the life of the Project will be routed and microsited to avoid any identified Historic Environment receptors pre-construction, with AEZs as detailed in the Marine WSI unless other mitigation is agreed with Historic England. AEZs are buffers around Historic Environment receptors that are to be avoided during construction works. The avoidance of AEZs must also consider that the use of anchors and lines, which could impact upstanding features, are adequately taken into account in the planning of operations.
Protocol for Archaeological Discoveries (PAD)	Additional unknown or unexpected archaeological and cultural heritage receptors identified during the Project stages will be reported utilising the Project specific PAD. The application of a PAD, as well as applicable to any defined project stages, will also be applicable to any post-consent and pre-construction phase.
Archaeological assessment of available data	Offshore geophysical surveys (including UXO surveys) and offshore geotechnical campaigns undertaken pre-construction will be subject to full archaeological review, where relevant, in consultation with Historic England. Areas with geoarchaeological potential will be targeted during the geotechnical sampling campaigns and results published will aim to enhance the palaeogeographic knowledge and understanding of the area. All Archaeological assessment of available data must be in association with a WSI produced in consultation with Historic England.

Project phase	Mitigation Measures Embedded into the Project Design
Post-construction monitoring plan	A post-construction monitoring plan as per the Outline Marine WSI will be produced. The post-construction monitoring plan will monitor areas or sites deemed to be of high archaeological significance recommended for further investigation and outline how post-construction monitoring campaigns will collect, assess in order to report on changes to Historic Environment receptors that may have occurred during the construction phase.

13.7.4 Written Schemes of Investigation

93. The Outline Marine WSI (see document 8.5) sets out the recommended AEZ for geophysical anomalies, provides information about areas of archaeological potential and where further geotechnical works may provide evidence of archaeological interest. The Outline Marine WSI also sets out adaptive mitigation for further works that will require archaeological input even when their main purpose is non-archaeological, so that the potential for information and efficiency is maximised.
94. The WSI will also provide a methodological approach to inform any subsequent geophysical survey campaigns as much as any geotechnical works to best support archaeological objectives necessary to steer the design of this proposed development.
95. Throughout the lifetime of the Project, the Marine WSI will evolve from the current Outline Marine WSI (see document 8.5) to the Draft Marine WSI, through to the final Agreed Marine WSI. These documents will be produced in line with The Crown Estate (TCE) guidance (2021). The mitigation set out in the Marine WSI will be discussed and agreed in consultation with the Archaeological Curators. Note that it is the implementation of this Marine WSI that constitutes the mitigation, rather than the document itself.

13.7.5 Archaeological Exclusion Zones

96. AEZs are recommended around all recorded wrecks and obstructions, as well as those assessed as high and medium archaeological potential identified in the geophysical assessment. Leaving marine heritage assets (as defined in document reference 6.3.13.1) *in situ* follows best archaeological practice, while impacts by the Project will be avoided through the implementation of buffers around the known extents of sites.
97. The final development layout of the Project will consider the locations of all AEZs. Where it is deemed that impacts cannot be avoided, measures to reduce, remedy or offset disturbances will be agreed.
98. AEZs have the potential to be amended (enlarged or reduced) or removed at a later date, subject to further data and review. Any changes to the AEZs which may occur will be agreed with the Archaeological Curators.

99. AEZs of 50m are recommended around anomalies of medium archaeological potential ~~(Table~~ (Table 13.4) and records for wrecks and obstructions which did not correlate with geophysical anomalies. For anomalies of high archaeological potential identified in the geophysical (Table 13.4) data AEZs of 100m are recommended. The extent of the AEZs is based around the visible extent of the anomaly, where it can be identified, or in the case of recorded anomalies not identified in the geophysical data and anomalies identified only in the MAG data the buffer can be based around the centre point of the recorded location.

100. For anomalies assessed as low archaeological potential no AEZs have been recommended at this time.

101. It is possible these low potential anomalies could represent material from wreck sites or other marine heritage assets of significance but are not currently identifiable as such. If these anomalies are likely to be impacted, they should be assessed on a case-by-case basis, in agreement with the Archaeological Curators. Further assessment may be in the form of investigation undertaken in conjunction with Remotely Operated Vehicles (ROV) or Unexploded Ordnance (UXO) surveys.

102. The methodology for assessing anomalies is set out in Section 8 of document 8.5.

13.7.6 Micrositing

103. Avoidance of Historic Environment receptors by micrositing where possible is recommended as best practice if there is potential for them to be impacted by the development.

13.7.7 Protocol for Archaeological Discoveries

104. There is potential for previously unknown sites or material of archaeological potential to be encountered during development works. As per the Outline Marine WSI, a Project specific PAD (document 8.5) will be adopted to ensure impacts to these unexpected discoveries can be reduced.

105. The PAD document acts as a safety net alongside other mitigation measures to ensure reactive and effective reporting of any unexpected finds of archaeological potential so that they can be investigated and assessed to avoid further impacts.

106. Temporary Exclusion Zones (TEZ) may be established around areas of possible archaeological potential until further investigation and assessment can be conducted.

13.7.8 Archaeological Assessment of Available Data

107. Offshore geophysical surveys (including UXO surveys) undertaken during the life of the Project will be subject to full archaeological review, where relevant. Archaeological review will be in consultation with Historic England. Any surveys undertaken will follow guidance on mitigation outlined in the Marine WSI in order to protect the current Historic Environment as well as any new material discovered.

108. Offshore geotechnical surveys prior to construction will be undertaken following early discussions with Historic England and will adhere to the Marine WSI. Areas with geoarchaeological potential that may be affected by development activities will be targeted during geotechnical sampling campaigns and the results of the geoarchaeological assessment will be presented in phased geoarchaeological reports including a deposit model inclusive of publication. The published results will aim to enhance the palaeogeographic knowledge and understanding of the area.

109. Specialist archaeological input will be incorporated, as a proactive measure, into the survey methodologies and techniques through to the identification of anomalies and subsequent avoidance strategies and mitigation.

110. The marine archaeology study area is of known importance for historic military and merchant activity as well as of for geoarchaeology. Any features assessed as having potential archaeological interest or significance will be avoided where possible or, where impacts cannot be avoided as recommended in the Marine WSI, will be further investigated and risk of impacts managed. Any locations of potential geoarchaeological interest or significance that may be affected by development activities will be targeted where possible during geotechnical works to contribute to the characterisation of the palaeoenvironment and deposit model. Additional archaeologically specific cores will also be collected.

13.7.9 Post-Construction Monitoring Plan

111. A post-construction monitoring plan will be produced within the Agreed Marine WSI (the iteration of the Outline Marine WSI (see document 8.5) which will be developed post-consent and pre-construction. The post-construction monitoring plan will monitor areas or sites deemed to be of high archaeological significance recommended for further investigation and outline proposed measures to avoid or monitor such areas or sites. It will outline how post-construction monitoring campaigns will collect and assess data in order to report on changes to marine archaeology and cultural heritage receptors that may have occurred during the construction phase.

13.8 Assessment Methodology

112. The assessment methodology for marine archaeology takes into consideration the following guidance document for offshore developments pertaining to marine archaeology:

- Standard and Guidance for Historic Environment Desk-Based Assessment, Chartered Institute for Archaeologists (CIfA) (2014a, 2014b and 2014c);
- Historic Environment Guidance for Offshore Renewable Energy Sector, Collaborative Offshore Wind Research into the Environment (COWRIE) (2007);
- Guidance for Assessment of Cumulative Impacts on the Historic Environment from Offshore Renewable Energy, COWRIE (2008);

- Our Seas – A shared resource: High level marine objectives, Department for Environment, Food and Rural Affairs (DEFRA) (2009);
- Code of Practice for Seabed Development, Joint Nautical Archaeology Policy Committee (JNAPC) (2006);
- Commercial Renewable Energy Development and the Historic Environment, Historic England Advice Note 15 (2021);
- Historic Seascape Characterisation (HSC): Demonstrating the Method, SeaZone (2011);
- National Historic Seascape Characterisation Consolidation, Land Use Consultants (LUC) (2017);
- Deposit Modelling and Archaeology: Guidance for Mapping Buried Deposits, Historic England (2020);
- Environmental Archaeology: A guide to the theory and practice of methods from sampling and recovery to post-excavation, English Heritage (2011);
- Marine Geophysical Data Acquisition, Processing and Interpretation, English Heritage (2013);
- Archaeological Written Schemes of Investigation for Offshore Wind Farm Projects, TCE (2021); and
- Protocol for Archaeological Discoveries: Offshore Renewables Projects, TCE (2014).

113. The assessment methodology for marine archaeology takes into consideration the following research frameworks for offshore developments pertaining to marine archaeology:

- The North Sea Prehistory Research Management Framework (NSPRMF), Research Framework Network (2023);
- East Midlands Historic Environment Research Framework (EMHERF), Research Framework Network (2022);
- A Maritime Archaeological Research Agenda for England, Research Framework Network (2022); and
- Rapid Coastal Zone Assessment for Yorkshire and Lincolnshire, Humber Field Archaeology (2022).

114. This section outlines the method used to assess the significance of effect on Historic Environment receptors up to MHWS. The criteria for determining this significance is assessed using both the magnitude of impact (Table 13.8) and the sensitivity (value) of those Historic Environment receptors (Table 13.9) as a result of potential impacts. Professional judgement based on the guidance set out by the Department for Culture, Media and Sport (2013) has also been applied. Section 13.9 and 13.11 outline the significance of effect on Historic Environment of each identified potential impact.

115. The magnitude of the impact is defined in Table 13.8.

Table 13.8: Impact Magnitude Definitions

Magnitude	Description/Reason
High	Adverse, major, and substantial or irreversible change to Historic Environment resulting in long term, permanent and significant alteration, inhibiting interpretation of some key characteristics, sub-features or components. While major impact is likely to be on a local level, loss of archaeological data may have implications on an international level.
	Beneficial impacts of High magnitude include large-scale enhanced understanding of the archaeological resource inversely proportional to the scale of the adverse effect, for example benefit through large area geophysical/geotechnical survey data released to public domain.
Medium	Adverse and moderate level of change to Historic Environment potentially resulting in long term, permanent and clear alteration, inhibiting interpretation of some key characteristics, sub-features, or components. While moderate impact is likely to be on a local level, loss of archaeological data may have implications on an international level.
	Beneficial impacts of Medium magnitude include the addition of key characteristics, features or elements, deriving from site-specific survey and investigations such as diver/ Remotely Operated Vehicles (ROV) or ground-truthing of Historic Environment leading to an enhancement of disseminated knowledge.
Low	Adverse, minor level of change to Historic Environment resulting in long term, permanent alteration, inhibiting interpretation of some key characteristics, sub-features, or components. While minor impact is likely to be on a local level, loss of archaeological data may have implications on an international level.
	Beneficial impacts of Low magnitude can include minor benefit to, or addition of, one or more key characteristics, features or elements through enhanced knowledge and understanding of Historic Environment not disseminated or made publicly available.
Negligible	Negligible level of change and indistinguishable from natural variation that do not change archaeological sites or materials, and do not affect key characteristics, sub-features, or components or their environment or context.
	There are no beneficial impacts of Negligible magnitude because it would not contribute to or enhanced knowledge.

116. The sensitivity (value)/importance of the receptor is defined in Table 13.9.

Table 13.9: Sensitivity (value) of the Environment

Sensitivity	Description/Reason
High	High importance and rarity of an international/national scale. Unique with regards to period, rarity, level of documentation, group value, condition, vulnerability, diversity, and/or archaeological potential.

Sensitivity	Description/Reason
	Examples include; designated and non-designated heritage assets, protected wreck sites, aviation remains, palaeoenvironmental features or deposits with evidence of *in situ* finds.
Medium	Medium importance and rarity of a regional scale with limited potential for substitution. Regionally rare with regards to period, rarity, level of documentation, group value, condition, vulnerability, diversity, and/or archaeological potential. Examples include; non-designated live wreck sites, geophysical anomalies of high and medium potential, recorded wrecks not confirmed by survey, palaeoenvironmental features or deposits.
Low	Low importance and rarity, local scale. Low or no recognised value with regards to period, rarity, level of documentation, group value, condition, vulnerability, diversity, and/or archaeological potential. Examples include; fouls and obstructions, geophysical anomalies of low potential.
Negligible	Very low to no archaeological importance and rarity, local scale. The nature of the receptor is in very poor condition and survival and is therefore not considered a receptor. Examples include; dead wrecks, dead fouls or obstructions, geophysical anomalies of negligible potential such as cables.

117. Assessment of the significance of potential effects on Historic Environment is described in Table 13.10.

Table 13.10: Matrix to Determine Effect Significance

		Magnitude of Impact			
		Negligible	*Low*	*Medium*	*High*
Sensitivity (value) of Receptor	*Negligible*	Negligible (Not significant)	Negligible (Not significant)	Minor (Not significant)	Minor (Not significant)
	Low	Negligible (Not significant)	Minor (Not significant)	Minor (Not significant)	Moderate (Significant)
	Medium	Minor (Not significant)	Minor (Not significant)	Moderate (Significant)	Major (Significant)
	High	Minor (Not significant)	Moderate (Significant)	Major (Significant)	Major (Significant)

13.8.1 Assumptions and Limitations

118. While the geophysical data received to date has predominantly been of good quality and suitable for archaeological interpretation (further defined in Section 2.4 of document reference 6.3.13.1), there were limitations within the Offshore ECC with the Sub Bottom profile data. Due to the high confidence in the interpretation presented in the GeoXYZ report (2023), this was used alongside core data to understand the Sub Bottom profile of the Offshore ECC. The Phase One Geoarchaeological report demonstrates that data gaps were filled by the assessment of cores (Annexe F and G, document reference 6.3.13.1). There is currently no geophysical data available for the compensation areas; however, the areas identified, whilst reduced from PEIR, remain sufficient to enable micrositing of infrastructure following post-application surveys, which will inform the final site location, with mitigation measures applied as outlined in the WSI to manage the inherent uncertainty of these areas.

119. The Project is aware of the importance of full assessment of the proposed development area to reduce uncertainties and the risk of later design modifications. Archaeological advice will be built into all subsequent survey planning and commissioning.

120. At this time there have been no offshore geotechnical surveys undertaken for archaeological assessment~~,~~; however, these are planned post-application. Geoarchaeological sub-sampling will be included and informed by the results of the sub-bottom data analysis and previous geoarchaeological assessment of the area. Geoarchaeological sampling for the pre-construction engineering campaign was undertaken in 2022 and 2023 and the results of the archaeological assessment of a sample of those Vibrocores are presented in Annexe F and G, document reference 6.3.13.1.

13.9 Impact Assessment

13.9.1 Construction

121. Activities associated with the construction phase that have the potential to impact Historic Environment receptors directly or indirectly are considered within this section. The magnitude of all outlined impacts on Historic Environment has been assessed according to the criteria outlined in Table 13.8 and is taking into account the embedded mitigations as outlined in Table 13.7. The assumed MDS design scenario table (Table 13.6), demonstrates that potential direct and indirect impact during the construction phase is possible within the marine archaeology study area and outlines relevant parameters.

122. If, as a result of the construction phase activities, any Historic Environment receptors are subject to increased sedimentation that covers and so protects the receptor, the Historic Environment might benefit from the conditions which could provide a higher level of preservation *in situ* and therefore a beneficial magnitude of impact.

123. The sensitivity (value) of the Historic Environment receptors is assessed in document reference 6.3.13.1. This impact assessment takes into account both the impact of magnitude (Table 13.8) and the sensitivity (value) (Table 13.9) of those receptors as a result of potential impacts during the construction phase. Professional judgement based on the guidance set out by the Department for Culture, Media and Sport (2013) has also been applied, as per document reference 6.3.13.1.

124. The sensitivity (value) of the known Historic Environment potentially impacted during the construction phase are detailed in Table 13.11.

Table 13.11: Historic Environment Receptor Sensitivity (value): Construction Phase

No.	Historic Environment	Receptor Sensitivity (value)
~~23~~21	High potential anomalies	High
~~166~~146	Medium potential anomalies	High to Medium
~~2,228~~1,669	Low potential anomalies	High to Low
10	High interest (archaeological term) known wrecks	High
3	Medium interest (archaeological term) known wrecks	High/Medium
3	Low interest (archaeological term) known wrecks	High/Medium

No.	Historic Environment	Receptor Sensitivity (value)
~~22~~20	Unknown interest (archaeological term) known wrecks	Unknown
8	Channels, valleys and deposits of geoarchaeological potential	High to Low

125. This section presents the assessment of impacts arising from the construction phase of the Project.

Impact 1: Direct impact of sediment removal containing undisturbed archaeological contexts during seabed preparation ahead of construction activities leading to the total or partial loss of Historic Environment

126. Direct impact of sediment removal containing undisturbed archaeological contexts during seabed preparation ahead of construction activities leading to the total or partial loss of the Historic Environment.

Magnitude of Impact

127. Impacts of sediment removal on Historic Environment may lead to direct impact and total or partial loss of Historic Environment. If a direct impact occurs, it will generally be local, major, and adverse or irreversible and result in a permanent change to the receptor meaning high magnitude of impact as detailed in Table 13.10. As such, the magnitude of sediment removal containing undisturbed archaeological contexts during seabed preparation ahead of construction activities, if they were to occur, would be high adverse.

Sensitivity (value) of the Receptor

128. The sensitivity (value) of the Historic Environment potentially impacted by sediment removal activities and identified within the marine archaeology study area ranges from negligible to high as defined in Table 13.11. The sensitivity (value) of the known Historic Environment potentially impacted by sediment removal is detailed in Table 13.13. For example, a previously unknown military aircraft crash site would have high sensitivity while an anomaly confirmed through ROV or diver assessment to be modern debris would have negligible sensitivity.

Significance of Effect

129. With regards to activities associated with the construction works, any of the sources of direct impact listed above have the potential to destroy entire receptors as well as damaging a receptor or its relationship with the wider environment. Once a receptor is damaged or destroyed, or its context is altered, it is not possible to reinstate lost data. Therefore, without mitigation, the effects on the archaeological receptors would be major adverse.

130. As per the embedded mitigation outlined in Table 13.7, locations on the seabed of potential and confirmed Historic Environment receptors are informed by the archaeological assessment of geophysical and geotechnical data and AEZs have been recommended (see document 8.5).

131. Mitigation by avoidance aims to ensure that there is no direct, indirect or permanent impact on Historic Environment within the marine archaeology study area meaning a negligible magnitude of impact as defined in Table 13.8.

132. Where avoidance is not possible or in case of not yet located Historic Environment (including within the ANS and biogenic reef areas) further mitigation and archaeological works are detailed in the Outline Offshore Archaeological WSI (see document 8.8). Following the application of appropriate mitigation, the magnitude would be reduced to **low** to **negligible adverse** which is **not significant** in EIA terms.

133. In some cases, the application of appropriate mitigation, such as an archaeological investigation of seabed anomalies prior to impact ~~or the implementation of a PAD~~ could lead to effects of minor to moderate beneficial significance, which is a significant beneficial effect in EIA terms. For example, discovering a wreck of interest and being able to share it with the wider public would be moderate beneficial.

Impact 2: Direct impact by penetration of foundations leading to the total or partial loss of Historic Environment

134. Direct impact by penetration of foundations leading to the total or partial loss of Historic Environment.

Magnitude of Impact

135. Impacts of penetration during installation activities on Historic Environment may lead to direct impact and total or partial loss of Historic Environment. If a direct impact occurs it will generally be local, major, and adverse or irreversible and result in a permanent change to the receptor meaning high adverse impact of magnitude as detailed in Table 13.8.

Sensitivity (value) of the Receptor

The sensitivity (value) of the Historic Environment potentially impacted by penetration during installation activities and identified within the marine archaeology study area is considered to be negligible to high as defined in Table 13.9. The sensitivity (value) of the known Historic Environment potentially impacted by penetration during installation activities is detailed in Table 13.11. Archaeological sites and material beneath the shallow seabed sediments comprise potential palaeogeographic receptors which can range in size from individual artefacts or artefact scatters through to palaeolandscapes and due to their age and international importance, can have high sensitivity, although features covering large areas may be of lower sensitivity while modern debris would have low sensitivity.

Significance of Effect

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

137. As per embedded mitigation outlined in Table 13.7 locations on the seabed of potential and confirmed Historic Environment receptors are informed by the archaeological assessment of geophysical and geotechnical data and AEZs have been recommended (see document 8.5).

138. Mitigation by avoidance aims to ensure that there is no direct, indirect, or permanent impact on Historic Environment within the marine archaeology study area meaning a negligible magnitude of impact as defined in Table 13.8.

139. Where avoidance is not possible or in case of not yet located Historic Environment (including within the ANS and biogenic reef areas) , further mitigation and archaeological works such as a PAD, detailed in the Outline Offshore Archaeological WSI (see document 8.8). Following the application of appropriate mitigation, the magnitude would be reduced to **low** to **negligible adverse** which is **not significant** in EIA terms.

140. In some cases, the application of appropriate mitigation, such as archaeological investigation of bore hole logs and vibrocores prior to impact could lead to effects of medium to major beneficial significance which is a significant beneficial effect in EIA terms. For example, providing details about the prehistoric landscape and being able to share it with the wider public would be major beneficial.

Impact 3: Direct impact by compression of foundations leading to the total or partial loss of Historic Environment

141. Direct impact by compression of foundations leading to the total or partial loss of Historic Environment. This is no longer an impact that will occur in the ORBA but remains unchanged within the remainder of the array area.

Magnitude of Impact

142. Impacts of compression during installation activities on Historic Environment may lead to direct impact and total or partial loss of Historic Environment. If a direct impact occurs from a foundation with long-term presence, it will be high adverse as detailed in Table 13.8. Compression effects from works undertaken on archaeological receptors such as soft wooden shipwrecks would also be high adverse.

Sensitivity (value) of the Receptor

143. The sensitivity (value) of the Historic Environment potentially impacted by compression during installation activities and identified within the marine archaeology study area is considered to be negligible to high as defined in Table 13.9. The sensitivity (value) of the known Historic Environment potentially impacted by penetration during installation activities is detailed in Table 13.11. For example, an unknown medieval wooden shipwreck would have high sensitivity while an anomaly confirmed through ROV or diver assessment to be modern debris would have negligible sensitivity.

Significance of Effect

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

145. As per embedded mitigation outlined in Table 13.7 locations on the seabed of potential and confirmed Historic Environment receptors are informed by the archaeological assessment of geophysical and geotechnical data and AEZs have been recommended (see document 8.5).

146. Mitigation by avoidance aims to ensure that there is no direct, indirect or permanent impact on Historic Environment within the marine archaeology study area meaning a negligible magnitude of impact as defined in Table 13.8.

147. Where avoidance is not possible or in case of not yet located Historic Environment (including within the ANS and biogenic reef areas) , further mitigation and archaeological works are detailed in the Outline Offshore Archaeological WSI (see document 8.8), and associated documents to ensure negligible magnitude of impact as defined in Table 13.8. Following the application of appropriate mitigation, the magnitude would be reduced to **low** to **negligible adverse** which is **not significant** in EIA terms.

148. In some cases, the application of appropriate mitigation, such as archaeological investigation of seabed anomalies prior to impact could lead to effects of moderate beneficial significance which is a significant beneficial effect in EIA terms. For example, discovering a wreck of interest and being able to share it with the wider public would be moderate beneficial.

Impact 4: Direct impact by penetration leading to disturbance of stratigraphic context containing archaeological material from the combined weight of the WTGs or Offshore Platforms leading to total or partial loss of Historic Environment

149. Impact 4: Direct impact by penetration leading to disturbance of stratigraphic context containing archaeological material from the combined weight of the WTGs or Offshore Platforms leading to total or partial loss of Historic Environment.

Magnitude of Impact

150. Impacts by penetration from combined weight on Historic Environment may lead to direct impact and total or partial loss of marine archaeology receptors. If a direct impact occurs, it will generally be local, major and adverse or irreversible and result in a permanent change to the receptor meaning high impact of magnitude as detailed in Table 13.8.

Sensitivity (value) of the Receptor

151. The sensitivity (value) of the Historic Environment potentially impacted by penetration from combined weight and identified within the marine archaeology study area is considered to be negligible to high as defined in Table 13.9. The sensitivity (value) of the known Historic Environment potentially resulting from penetration caused by combined weight is detailed in . For example, an unknown medieval wooden shipwreck would have high sensitivity, whereas a large palaeolandscape feature may have lower sensitivity due to the comparatively smaller area being impacted.

Significance of Effect

152. As per embedded mitigation outlined in Table 13.7 locations on the seabed of potential and confirmed Historic Environment receptors are informed by the archaeological assessment of geophysical and geotechnical data and AEZs have been recommended (see document 8.5).

153. Mitigation by avoidance aims to ensure that there is no direct, indirect, or permanent impact on Historic Environment within the marine archaeology study area meaning a negligible magnitude of impact as defined in Table 13.8.

154. Where avoidance is not possible or in case of not yet located Historic Environment (including within the ANS and biogenic reef areas) , further mitigation and archaeological works are detailed in the Outline Offshore Archaeological WSI (see document 8.8), and associated documents to ensure negligible magnitude of impact as defined in Table 13.8.

155. Without mitigation, the effects on the archaeological receptors could be major adverse. Following the application of appropriate mitigation, such as the proposed archaeological assessment of geotechnical data, as outlined in more detail in the mitigation section (0), the magnitude would be reduced to **low** to **negligible adverse** which is **not significant** in EIA terms.

156. In some cases, the application of appropriate mitigation, such as archaeological investigation of palaeolandscapes prior to impact and publication of results could lead to effects of moderate beneficial significance which is a significant beneficial effect in EIA terms.

Impact 5: Direct impact by compression leading to disturbance of stratigraphic context containing archaeological material from the combined weight of the WTGs or Offshore Platforms leading to total or partial loss of Historic Environment

157. Direct impact by compression leading to disturbance of stratigraphic context containing archaeological material from the combined weight of the WTGs or Offshore Platforms leading to total or partial loss of Historic Environment. This is no longer an impact that will occur in the ORBA but remains unchanged within the remainder of the array area.

Magnitude of Impact

158. Impacts by compression from combined weight on Historic Environment may lead to direct impact and total or partial loss of marine archaeology receptors. If a direct impact occurs, it will generally be local, major and adverse or irreversible and result in a permanent change to the receptor meaning high adverse impact of magnitude as detailed in Table 13.8.

Sensitivity (value) of the Receptor

159. The sensitivity (value) of the Historic Environment potentially impacted by compression from combined weight and identified within the marine archaeology study area is considered to be negligible to high as defined in Table 13.9. The sensitivity (value) of the known Historic Environment potentially resulting from penetration caused by combined weight is detailed in Table 13.11. The sensitivity (value) of the known Historic Environment compression resulting from penetration caused by combined weight is detailed in Table 13.11. For example, an unknown medieval wooden shipwreck would have high sensitivity, whereas a large palaeolandscape feature may have lower sensitivity due to the comparatively smaller area being impacted.

Significance of Effect

160. As per embedded mitigation outlined in Table 13.7 locations on the seabed of potential and confirmed Historic Environment receptors are informed by the archaeological assessment of geophysical and geotechnical data and AEZs have been recommended (see document 8.5).

161. Mitigation by avoidance aims to ensure that there is no direct, indirect, or permanent impact on Historic Environment within the marine archaeology study area meaning a negligible magnitude of impact as defined in Table 13.7.

162. Where avoidance is not possible or in case of not yet located Historic Environment (including within the ANS and biogenic reef areas) , further mitigation and archaeological works are detailed in the Outline Offshore Archaeological WSI (see document 8.8), and associated documents to ensure negligible magnitude of impact as defined in Table 13.10.

163. Without mitigation, the effects on the archaeological receptors could be major adverse. Following the application of appropriate mitigation, such as the proposed archaeological assessment of geotechnical data, as outlined in more detail in the mitigation section (0) the magnitude would be reduced to **low** to **negligible adverse** which is **not significant** in EIA terms.

164. In some cases, the application of appropriate mitigation, such as archaeological investigation of palaeolandscapes prior to impact and publication of results could lead to effects of moderate beneficial significance which is a significant beneficial effect in EIA terms.

Impact 6: Direct impact by penetration of cable laying operations leading to total or partial loss of Historic Environment

165. Direct impact by penetration of cable laying operations leading to total or partial loss of Historic Environment.

Magnitude of Impact

166. Impacts of penetration effects as a result of cable laying operations on Historic Environment may lead to direct impact and total or partial loss of Historic Environment. If a direct impact occurs, it will generally be local major and adverse or irreversible and result in a permanent change to the receptor meaning high adverse impact of magnitude as detailed in Table 13.8.

Sensitivity (value) of the Receptor

167. The sensitivity (value) of the Historic Environment potentially impacted by cable laying operations and identified within the marine archaeology study area is considered negligible to high as defined in Table 13.9. The sensitivity (value) of the known Historic Environment potentially impacted by penetration effects as a result of cable laying operations is detailed in Table 13.11. For example, an unknown aircraft crash site would have high sensitivity while an anomaly confirmed through ROV or diver assessment to be modern debris would have negligible sensitivity.

Significance of Effect

168. Without mitigation, the effects on the high sensitivity archaeological receptors would be major adverse.

169. As per embedded mitigation outlined in Table 13.7 locations on the seabed of potential and confirmed Historic Environment receptors are informed by the archaeological assessment of geophysical and geotechnical data and AEZs have been recommended (see document 8.5).

170. Mitigation by avoidance aims to ensure that there is no direct, indirect, or permanent impact on Historic Environment within the marine archaeology study area meaning a negligible magnitude of impact as defined in Table 13.8.

171. Where avoidance is not possible or in case of not yet located Historic Environment (including within the ANS and biogenic reef areas) , further mitigation and archaeological works are detailed in the Outline Offshore Archaeological WSI (see document 8.8), and associated documents to ensure negligible magnitude of impact as defined in Table 13.8

172. Following the application of appropriate mitigation, the magnitude would be reduced to **low** to **negligible adverse** which is **not significant** in EIA terms.

173. In some cases, the application of appropriate mitigation, such as the excavation and publication of a previously unknown wreck site of archaeological importance could lead to effects of minor to moderate beneficial significance which is a significant beneficial effect in EIA terms.

Impact 7: Direct impacts by compression of cable laying operations leading to total or partial loss of Historic Environment

174. Direct impacts by compression of cable laying operations leading to total or partial loss of Historic Environment.

Magnitude of Impact

175. Impacts of compression effects as a result of cable laying operations on Historic Environment may lead to direct impact and total or partial loss of Historic Environment. If a direct impact occurs, it will generally be local major and adverse or irreversible and result in a permanent change to the receptor meaning high adverse impact of magnitude as detailed in Table 13.8.

Sensitivity (value) of the Receptor

176. The sensitivity (value) of the Historic Environment potentially impacted by compression of cable laying operations and identified within the marine archaeology study area is considered negligible to high as defined in Table 13.9. The sensitivity (value) of the known Historic Environment potentially impacted by penetration effects as a result of cable laying operations is detailed in Table 13.11. For example, an unknown aircraft crash site would have high sensitivity while an anomaly confirmed through ROV or diver assessment to be modern debris would have negligible sensitivity**.**

Significance of Effect

177. Without mitigation, the effects on the high sensitivity archaeological receptors would be major adverse.

178. As per embedded mitigation outlined in Table 13.7 locations on the seabed of potential and confirmed Historic Environment receptors are informed by the archaeological assessment of geophysical and geotechnical data and AEZs have been recommended (see document 8.5).

179. Mitigation by avoidance aims to ensure that there is no direct, indirect, or permanent impact on Historic Environment within the marine archaeology study area meaning a negligible magnitude of impact as defined in Table 13.8.

180. Where avoidance is not possible or in case of not yet located Historic Environment (including within the ANS and biogenic reef areas) , further mitigation and archaeological works are detailed in the Outline Offshore Archaeological WSI (see document 8.8), and associated documents to ensure negligible magnitude of impact as defined in Table 13.8.

181. Following the application of appropriate mitigation, the magnitude would be reduced to **low** to **negligible adverse** which is **not significant** in EIA terms.

182. In some cases, the application of appropriate mitigation, such as archaeological investigation of seabed anomalies prior to impact could lead to effects of moderate beneficial significance which is a significant beneficial effect in EIA terms. For example, discovering a wreck of interest and being able to share it with the wider public would be moderate beneficial.

Impact 8: Direct impacts by penetration effects of jack-up barges and anchoring of construction vessels during various activities leading to total or partial loss of Historic Environment

183. Direct impacts by penetration effects of jack-up barges and anchoring of construction vessels during various activities leading to total or partial loss of Historic Environment.

Magnitude of Impact

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

Sensitivity (value) of the Receptor

185. The sensitivity (value) of the Historic Environment potentially impacted by sediment removal activities and identified within the marine archaeology study area is considered to be negligible to high as defined in Table 13.9. The sensitivity (value) of the known Historic Environment potentially impacted by penetration effect from vessel operations is detailed in Table 13.11. For example, an unknown aircraft crash site would have high sensitivity while an anomaly confirmed through ROV or diver assessment to be modern debris would have negligible sensitivity.

Significance of Effect

186. Without mitigation, the effects on the high sensitivity archaeological receptors would be major adverse.

187. As per embedded mitigation outlined in Table 13.7 locations on the seabed of potential and confirmed Historic Environment receptors are informed by the archaeological assessment of geophysical and geotechnical data and AEZs have been recommended (see document 8.5).

188. Mitigation by avoidance aims to ensure that there is no direct, indirect, or permanent impact on Historic Environment within the marine archaeology study area meaning a negligible magnitude of impact as defined in Table 13.8.

189. Where avoidance is not possible or in case of not yet located Historic Environment (including within the ANS and biogenic reef areas) , further mitigation and archaeological works are detailed in the Outline Offshore Archaeological WSI (see document 8.8), and associated documents to ensure negligible magnitude of impact as defined in Table 13.8.

190. Following the application of appropriate mitigation, the magnitude would be reduced to **low** to **negligible adverse** which is not significant in EIA terms.

191. In some cases, the application of appropriate mitigation, such as archaeological investigation of seabed anomalies prior to impact could lead to effects of moderate beneficial significance which is a significant beneficial effect in EIA terms. For example, discovering a wreck of interest and being able to share it with the wider public would be moderate beneficial.

Impact 9: Direct impacts by compression effects of jack-up barges and anchoring of construction vessels during various activities leading to total or partial loss of Historic Environment

192. Direct impacts by compression effects of jack-up barges and anchoring of construction vessels during various activities leading to total or partial loss of Historic Environment.

Magnitude of Impact

193. Compression impacts as a result of vessel operations on Historic Environment may lead to direct impact and total or partial loss of Historic Environment. If a direct impact occurs, it will generally be local, major, and adverse or irreversible and result in a permanent change to the receptor meaning high adverse impact of magnitude as detailed in Table 13.8.

Sensitivity (value) of the Receptor

194. The sensitivity (value) of the Historic Environment potentially impacted by sediment removal activities and identified within the marine archaeology study area is considered to be negligible to high as defined in Table 13.9. The sensitivity (value) of the known Historic Environment potentially impacted by compression effect from vessel operations is detailed in Table 13.11. For example, an unknown medieval wooden shipwreck would have high sensitivity, whereas a large palaeolandscape feature may have lower sensitivity due to the comparatively smaller area being impacted.

Significance of Effect

195. Without mitigation, the effects on the high sensitivity archaeological receptors would be major adverse.

196. As per embedded mitigation outlined in Table 13.7 locations on the seabed of potential and confirmed Historic Environment receptors are informed by the archaeological assessment of geophysical and geotechnical data and AEZs have been recommended (see document 8.5).

197. Mitigation by avoidance aims to ensure that there is no direct, indirect, or permanent impact on Historic Environment within the marine archaeology study area meaning a negligible magnitude of impact as defined in Table 13.8.

198. Where avoidance is not possible or in case of not yet located Historic Environment (including within the ANS and biogenic reef areas) , further mitigation and archaeological works are detailed in the Outline Offshore Archaeological WSI (see document 8.8), and associated documents to ensure negligible magnitude of impact as defined in Table 13.8.

199. Following the application of appropriate mitigation, the magnitude would be reduced to **low** to **negligible adverse** which is **not significant** in EIA terms.

200. In some cases, the application of appropriate mitigation, such as archaeological investigation of seabed anomalies prior to impact could lead to effects of moderate beneficial significance which is a significant beneficial effect in EIA terms. For example, discovering a wreck of interest and being able to share it with the wider public would be moderate beneficial.

Impact 10: Indirect impacts causing disturbance of sediment containing potential Historic Environment (material and context) leading to the exposure of those Historic Environment to natural, chemical, or biological processes and indirectly causing or accelerating their loss

201. Indirect impacts causing disturbance of sediment containing potential Historic Environment (material and context) leading to the exposure of those Historic Environment to natural, chemical or biological processes and indirectly causing or accelerating their loss.

Magnitude of Impact

202. Magnitude of indirect impact on Historic Environment from sediment disturbance may lead to exposure of those Historic Environment to natural, chemical, or biological processes and indirectly cause or accelerate their loss. If an indirect impact occurs, it will generally be local, major, and adverse or irreversible and result in a permanent change to the receptor meaning high adverse impact of magnitude as detailed in Table 13.7.

Sensitivity (value) of the Receptor

203. The sensitivity (value) of the Historic Environment identified within the marine archaeology study area is considered to be negligible to high as defined in Table 13.9 The sensitivity (value) of the known Historic Environment potentially impacted by sediment disturbance is detailed in. For example, an unknown medieval wooden shipwreck would have high sensitivity while an anomaly confirmed through ROV or diver assessment to be modern debris would have negligible sensitivity.

Significance of Effect

204. Without mitigation, the effects on the high sensitivity archaeological receptors would be major adverse.

205. As per embedded mitigation outlined in Table 13.7 locations on the seabed of potential and confirmed Historic Environment receptors are informed by the archaeological assessment of geophysical and geotechnical data and AEZs have been recommended (see document 8.5).

206. Mitigation by avoidance aims to ensure that there is no direct, indirect, or permanent impact on Historic Environment within the marine archaeology study area meaning a negligible magnitude of impact as defined in Table 13.8.

207. Where avoidance is not possible or in case of not yet located Historic Environment (including within the ANS and biogenic reef areas) , further mitigation and archaeological works are detailed in the Outline Offshore Archaeological WSI (see document 8.8), and associated documents to ensure negligible magnitude of impact as defined in Table 13.8.

208. Following the application of appropriate mitigation, the magnitude would be reduced to **low** to **negligible adverse** which is **not significant** in EIA terms.

209. In some cases, the application of appropriate mitigation, such as archaeological investigation of seabed anomalies prior to impact could lead to effects of moderate beneficial significance which is a significant beneficial effect in EIA terms. For example, discovering a wreck of interest and being able to share it with the wider public would be moderate beneficial.

13.9.2 Operations and Maintenance

210. Activities associated with the operational phase that have the potential to impact Historic Environment receptors directly or indirectly are considered here. The magnitude of all outline impacts on Historic Environment has been assessed according to the criteria outlined in Table 13.8 and is taking into account the embedded mitigation as outlined in Table 13.7. The assumed maximum impact table (Table 13.6:), demonstrates that potential direct and indirect impact during the operational phase is possible within the marine archaeology study area and outlines relevant parameters.

211. If, as a result of the activities associated with the operational phase, any Historic Environment receptors are subject to increased sedimentation that covers and so protects the receptor, the Historic Environment might benefit from the conditions which could provide a higher level of preservation *in situ* and therefore a beneficial magnitude of impact.

212. The sensitivity (value) of the Historic Environment identified within the marine archaeology study area takes into account both the impact of magnitude (Table 13.8) and the sensitivity (value) of those receptors as a result of potential impact during the operational phase. Professional judgement based on the guidance set out by the Department for Culture, Media and Sport (2013) has also been applied. The sensitivity (value) of the known Historic Environment potentially impacted during the operation phase are detailed in Table 13.12.

213. This section presents the assessment of impacts arising from the operations and maintenance phase of the Project.

Table 13.12: Historic Environment Receptor Sensitivity (value): Operational Phase

No.	Historic Environment	Receptor Sensitivity (value)
~~23~~21	High potential anomalies	High
~~166~~146	Medium potential anomalies	High to Medium
~~2,228~~1,669	Low potential anomalies	High to Low
10	High interest (archaeological term) known wrecks	High
3	Medium interest (archaeological term) known wrecks	High/Medium
3	Low interest (archaeological term) known wrecks	High/Medium
~~22~~20	Unknown significance (archaeological term) known wrecks	Unknown

No.	Historic Environment	Receptor Sensitivity (value)
8	Channels, valleys and deposits of geoarchaeological potential	High to Low

Impact 12: Direct impact by penetration leading to disturbance effects of maintenance activities at WTGs, Offshore Platforms and along all cables leading to total or partial loss of Historic Environment

214. Direct impact by penetration leading to disturbance effects of maintenance activities at WTGs, Offshore Platforms and along all cables leading to total or partial loss of Historic Environment.

Magnitude of Impact

215. Direct impacts as a result of maintenance activities on Historic Environment may lead to direct impact and total or partial loss of Historic Environment. If a direct impact by penetration occurs, it will generally be local, major, and adverse or irreversible and result in a permanent change to the receptor, meaning high adverse magnitude of impact as detailed in Table 13.8.

Sensitivity (value) of the Receptor

~~215.~~216. The sensitivity (value) of the Historic Environment identified within the marine archaeology study area is considered to be negligible to high as defined in The sensitivity (value) of the known Historic Environment potentially impact by maintenance activities is detailed in Table 13.9. For example, an unknown medieval wooden shipwreck would have high sensitivity while an anomaly confirmed through ROV or diver assessment to be modern debris would have negligible sensitivity.

Significance of Effect

~~216.~~217. Without mitigation, the effects on the high sensitivity archaeological receptors would be major adverse.

~~217.~~218. As per embedded mitigations outlined in Table 13.7, locations on the seabed of potential and confirmed Historic Environment receptors are informed by the archaeological assessment of geophysical and geotechnical data and AEZs have been recommended (see document 8.5).

~~218.~~219. Mitigation by avoidance aims to ensure that there is no direct, indirect, or permanent impact on Historic Environment within the marine archaeology study area meaning a negligible magnitude of impact as defined in Table 13.8.

~~219.~~220. Where avoidance is not possible or in case of not yet located Historic Environment (including within the ANS and biogenic reef areas) , further mitigation and archaeological works are detailed in the Outline Offshore Archaeological WSI (see document 8.8), and associated documents to ensure negligible magnitude of impact as defined in Table 13.8.

~~220.~~221. Following the application of appropriate mitigation, the magnitude would be reduced to **low** to **negligible adverse** which is **not significant** in EIA terms.

~~221.~~222. In some cases, the application of appropriate mitigation, such as archaeological investigation of seabed anomalies prior to impact could lead to effects of moderate beneficial significance which is a significant beneficial effect in EIA terms. For example, discovering a wreck of interest and being able to share it with the wider public would be moderate beneficial.

Impact 13: Direct impact by compression leading to disturbance effects of maintenance activities at WTGs, Offshore Platforms and along all cables leading to total or partial loss of Historic Environment

~~222.~~223. Direct impact by compression leading to disturbance effects of maintenance activities at WTGs, Offshore Platforms and along all cables leading to total or partial loss of Historic Environment.

Magnitude of Impact

~~223.~~224. Direct impacts as a result of maintenance activities on Historic Environment may lead to direct impact and total or partial loss of marine archaeology receptors. If a direct impact by compression occurs, it will generally be local, major and adverse or irreversible and result in a permanent change to the receptor, meaning high adverse magnitude of impact as detailed in Table 13.10.

Sensitivity (value) of the Receptor

~~224.~~225. The sensitivity (value) of the Historic Environment identified within the marine archaeology study area is considered to be negligible to high as defined in Table 13.11. The sensitivity (value) of the known Historic Environment potentially impact by maintenance activities is detailed in Table 13.12. For example, an unknown medieval wooden shipwreck would have high sensitivity while an anomaly confirmed through ROV or diver assessment to be modern debris would have negligible sensitivity.

Significance of Effect

~~225.~~226. Without mitigation, the effects on the high sensitivity archaeological receptors would be major adverse.

~~226.~~227. As per embedded mitigations outlined in Table 13.7, locations on the seabed of potential and confirmed Historic Environment receptors are informed by the archaeological assessment of geophysical and geotechnical data and AEZs have been recommended (see document 8.5).

~~227.~~228. Mitigation by avoidance aims to ensure that there is no direct, indirect, or permanent impact on Historic Environment within the marine archaeology study area meaning a negligible magnitude of impact as defined in Table 13.8.

~~228.~~229. Where avoidance is not possible or in case of not yet located Historic Environment (including within the ANS and biogenic reef areas) , further mitigation and archaeological works are detailed in the Outline Offshore Archaeological WSI (see document 8.8), and associated documents to ensure negligible magnitude of impact as defined in Table 13.10.

~~229.~~230. Following the application of appropriate mitigation, the magnitude would be reduced to **low** to **negligible adverse** which is **not significant** in EIA terms.

~~230.~~231. In some cases, the application of appropriate mitigation, such as archaeological investigation of seabed anomalies prior to impact could lead to effects of moderate beneficial significance which is a significant beneficial effect in EIA terms. For example, discovering a wreck of interest and being able to share it with the wider public would be moderate beneficial.

Impact 14: Direct impacts by penetration effects of jack-up barges and anchoring of O&M vessels during various activities at WTGs, Offshore Platforms and along all cables leading to total or partial loss of Historic Environment

~~231.~~232. Direct impacts by penetration effects of jack-up barges and anchoring of O&M vessels during various activities at WTGs, Offshore Platforms and along all cables leading to total or partial loss of Historic Environment.

Magnitude of Impact

~~232.~~233. Direct impacts as a result of vessel activities on Historic Environment may lead to direct impact and total or partial loss of Historic Environment. If a direct impact occurs, it will generally be local, major, and adverse or irreversible and result in a permanent change to the receptor, meaning high adverse magnitude of impact as detailed in Table 13.8.

Sensitivity (value) of the Receptor

~~233.~~234. The sensitivity (value) of the Historic Environment identified within the marine archaeology study area is considered to be negligible to high as defined in Table 13.9. The sensitivity (value) of the known Historic Environment potentially impacted by vessel activities is detailed Table 13.12. For example, an unknown medieval wooden shipwreck would have high sensitivity while an anomaly confirmed through ROV or diver assessment to be modern debris would have negligible sensitivity.

Significance of Effect

~~234.~~235. Without mitigation, the effects on the high sensitivity archaeological receptors would be major adverse.

~~235.~~236. As per embedded mitigations outlined in Table 13.7, locations on the seabed of potential and confirmed Historic Environment receptors are informed by the archaeological assessment of geophysical and geotechnical data and AEZs have been recommended (see document 8.5).

~~236.~~237. Mitigation by avoidance aims to ensure that there is no direct, indirect, or permanent impact on Historic Environment within the marine archaeology study area meaning a negligible magnitude of impact as defined in Table 13.8.

~~237.~~238. Where avoidance is not possible or in case of not yet located Historic Environment (including within the ANS and biogenic reef areas) , further mitigation and archaeological works are detailed in the Outline Offshore Archaeological WSI (see document 8.8), and associated documents to ensure negligible magnitude of impact as defined in Table 13.8.

~~238.~~239. Following the application of appropriate mitigation, the magnitude would be reduced to **low** to **negligible adverse** which is **not significant** in EIA terms.

~~239.~~240. In some cases, the application of appropriate mitigation, such as archaeological investigation of seabed anomalies prior to impact could lead to effects of moderate beneficial significance which is a significant beneficial effect in EIA terms. For example, discovering an anchor of interest and being able to share it with the wider public would be moderate beneficial.

Impact 15: Direct impacts by compression effects of jack-up barges and anchoring of O&M vessels during various activities at WTGs, Offshore Platforms and along all cables leading to total or partial loss of Historic Environment

~~240.~~241. Direct impacts by compression effects of jack-up barges and anchoring of O&M vessels during various activities at WTGs, Offshore Platforms and along all cables leading to total or partial loss of Historic Environment.

Magnitude of Impact

~~241.~~242. Direct impacts as a result of vessel activities on Historic Environment may lead to direct impact and total or partial loss of Historic Environment. If a direct impact occurs, it will generally be local, major and adverse or irreversible and result in a permanent change to the receptor, meaning high adverse magnitude of impact as detailed in Table 13.8.

Sensitivity (value) of the Receptor

~~242.~~243. The sensitivity (value) of the Historic Environment identified within the marine archaeology study area is considered to be negligible to high as defined in Table 13.9. The sensitivity (value) of the known Historic Environment potentially impacted by vessel activities is detailed in Table 13.12. For example, an unknown medieval wooden shipwreck would have high sensitivity while an anomaly confirmed through ROV or diver assessment to be modern debris would have negligible sensitivity.

Significance of Effect

~~243.~~244. Without mitigation, the effects on the high sensitivity archaeological receptors would be major adverse.

~~244.~~245. As per embedded mitigations outlined in Table 13.7, locations on the seabed of potential and confirmed Historic Environment receptors are informed by the archaeological assessment of geophysical and geotechnical data and AEZs have been recommended (see document 8.5).

~~245.~~246. Mitigation by avoidance aims to ensure that there is no direct, indirect, or permanent impact on Historic Environment within the marine archaeology study area meaning a negligible magnitude of impact as defined in Table 13.8.

~~246.~~247. Where avoidance is not possible or in case of not yet located Historic Environment (including within the ANS and biogenic reef areas) , further mitigation and archaeological works are detailed in the Outline Offshore Archaeological WSI (see document 8.8), and associated documents to ensure negligible magnitude of impact as defined in Table 13.8.

~~247.~~248. Following the application of appropriate mitigation, the magnitude would be reduced to **low** to **negligible adverse** which is **not significant** in EIA terms.

~~248.~~249. In some cases, the application of appropriate mitigation, such as archaeological investigation of seabed anomalies prior to impact could lead to effects of moderate beneficial significance which is a significant beneficial effect in EIA terms. For example, discovering an anchor of interest and being able to share it with the wider public would be moderate beneficial.

Impact 16: Indirect impacts causing disturbance of sediment containing potential Historic Environment during maintenance activities leading to the exposure of those Historic Environment to natural, chemical, or biological processes and indirectly causing or accelerating their loss

~~249.~~250. Indirect impacts causing disturbance of sediment containing potential Historic Environment during maintenance activities leading to the exposure of those Historic Environment to natural, chemical, or biological processes and indirectly causing or accelerating their loss.

Magnitude of Impact

~~250.~~251. Magnitude of indirect impact on Historic Environment of sediment disturbance during maintenance activities may lead to exposure of those Historic Environment to natural, chemical, or biological processes and indirectly cause or accelerate their loss. If an indirect impact occurs, it will generally be local, major, and adverse or irreversible and result in a permanent change to the receptor meaning high adverse magnitude of impact as detailed in Table 13.8.

Sensitivity (value) of the Receptors

~~251.~~252. The sensitivity (value) of the Historic Environment identified within the marine archaeology study area is considered to be negligible to high as defined in Table 13.9. The sensitivity (value) of the known Historic Environment potentially impacted by sediment disturbance during maintenance activities is detailed in Table 13.12. For example, an unknown medieval wooden shipwreck would have high sensitivity while an anomaly confirmed through ROV or diver assessment to be modern debris would have negligible sensitivity.

Significance of Effect

~~252.~~253. Without mitigation, the effects on the high sensitivity archaeological receptors would be major adverse.

~~253.~~254. As per embedded mitigations outlined in Table 13.7, locations on the seabed of potential and confirmed Historic Environment receptors are informed by the archaeological assessment of geophysical and geotechnical data and AEZs have been recommended (see document 8.5).

~~254.~~255. Mitigation by avoidance aims to ensure that there is no direct, indirect, or permanent impact on Historic Environment within the marine archaeology study area meaning a negligible magnitude of impact as defined in Table 13.8.

~~255.~~256. Where avoidance is not possible or in case of not yet located Historic Environment (including within the ANS and biogenic reef areas) , further mitigation and archaeological works are detailed in the Outline Offshore Archaeological WSI (see document 8.8), and associated documents to ensure negligible magnitude of impact as defined in Table 13.8.

~~256.~~257. Following the application of appropriate mitigation, the magnitude would be reduced to **low** to **negligible adverse** which is **not significant** in EIA terms.

~~257.~~258. In some cases, the application of appropriate mitigation, such as archaeological investigation of seabed anomalies prior to impact could lead to effects of moderate beneficial significance which is a significant beneficial effect in EIA terms. For example, discovering a wreck of interest and being able to share it with the wider public would be moderate beneficial.

Impact 17: Indirect impacts causing scour effects as a result of the presence of WTGs, Offshore Platforms and the exposure of cables or the use of cable protection measures leading to the exposure of those Historic Environment to natural, chemical or biological processes causing or accelerating their loss

~~258.~~259. Indirect impacts causing scour effects as a result of the presence of WTGs, Offshore Platforms and the exposure of cables or the use of cable protection measures leading to the exposure of those Historic Environment to natural, chemical or biological processes causing or accelerating their loss.

Magnitude of Impact

~~259.~~260. Magnitude of indirect impact on Historic Environment of sediment disturbance as a result of scour may lead to exposure of those Historic Environment to natural, chemical or biological processes and indirectly cause or accelerate their loss. If an indirect impact occurs, it will generally be local, major, and adverse or irreversible and result in a permanent change to the receptor meaning high adverse magnitude of impact as detailed in Table 13.8.

Sensitivity (value) of the Receptor

~~260.~~261. The sensitivity (value) of the Historic Environment identified within the marine archaeology study area is considered to be negligible to high as defined in Table 13.9. The sensitivity (value) of the known Historic Environment potentially impacted by sediment disturbance as a result of scour is detailed in Table 13.12. For example, an unknown medieval wooden shipwreck would have high sensitivity while an anomaly confirmed through ROV or diver assessment to be modern debris would have negligible sensitivity.

Significance of Effect

~~261.~~262. Without mitigation, the effects on the high sensitivity archaeological receptors would be major adverse.

~~262.~~263. As per embedded mitigations outlined in Table 13.7, locations on the seabed of potential and confirmed Historic Environment receptors are informed by the archaeological assessment of geophysical and geotechnical data and AEZs have been recommended (see document 8.5).

~~263.~~264. Mitigation by avoidance aims to ensure that there is no direct, indirect, or permanent impact on Historic Environment within the marine archaeology study area meaning a negligible magnitude of impact as defined in Table 13.8.

~~264.~~265. Where avoidance is not possible or in case of not yet located Historic Environment (including within the ANS and biogenic reef areas) , further mitigation and archaeological works are detailed in the Outline Offshore Archaeological WSI (see document 8.8), and associated documents to ensure negligible magnitude of impact as defined in Table 13.8.

~~265.~~266. Following the application of appropriate mitigation, the magnitude would be reduced to **low** to **negligible adverse** which is not significant in EIA terms.

~~266.~~267. In some cases, the application of appropriate mitigation, such as archaeological investigation of seabed anomalies prior to impact could lead to effects of moderate beneficial significance which is a significant beneficial effect in EIA terms. For example, discovering an anchor of interest and being able to share it with the wider public would be moderate beneficial.

13.9.3 Decommissioning

~~267.~~268. Activities associated with the decommissioning phase that have the potential to impact marine archaeology and cultural heritage receptors directly or indirectly are considered here. The magnitude of all outlined impacts on Historic Environment has been assessed according to the criteria outlined in Table 13.8 and is taking into account the embedded mitigations as outlined in Table 13.7. The assumed maximum impact table (Table 13.6), demonstrates that potential direct and indirect impact during the operational phase is possible within the marine archaeology study area and outlines relevant parameters.

~~268.~~269. If, as a result of the activities associated with the decommissioning phase, any Historic Environment receptors are subject to increased sedimentation that covers and so protects the receptor, the Historic Environment might benefit from the conditions which could provide a higher level of preservation *in situ* and therefore a beneficial magnitude of impact.

~~269.~~270. The sensitivity (value) of the Historic Environment identified within the marine archaeology study area takes into account both the magnitude of impact (Table 13.8) and the sensitivity (value) of those receptors as a result of potential impacts during the operational phase. Professional judgement based on the guidance set out by the Department for Culture, Media and Sport (2013) has also been applied. The sensitivity (value) of the known Historic Environment potentially impacted during the decommissioning phase are detailed in Table 13.13.

~~270.~~271. This section presents the assessment of impacts arising from the decommissioning phase of the Project.

Table 13.13: Historic Environment Receptor Sensitivity (value): Decommissioning Phase

No.	Historic Environment	Receptor Sensitivity (value)
~~23~~21	High potential anomalies	High
~~166~~146	Medium potential anomalies	High to Medium
~~2,228~~1,669	Low potential anomalies	High to Low
10	High interest (archaeological term) known wrecks	High
3	Medium interest (archaeological term) known wrecks	High/Medium
3	Low interest (archaeological term) known wrecks	High/Medium
~~22~~20	Unknown significance (archaeological term) known wrecks	Unknown
8	Channels, valleys and deposits of geoarchaeological potential	High to Low

Impact 19: Direct impacts by penetration effects of jack-up barges and anchoring of decommissioning vessels leading to total or partial loss of Historic Environment

~~271.~~272. Direct impacts by penetration effects of jack-up barges and anchoring of decommissioning vessels leading to total or partial loss of Historic Environment.

Magnitude of Impact

~~272.~~273. Direct penetration impacts from decommissioning activities on Historic Environment may lead to direct impact and total or partial loss of Historic Environment. If a direct impact occurs, it will generally be local, major, and adverse or irreversible and result in a permanent change to the receptor, meaning **high adverse** magnitude of impact as detailed in Table 13.8.

Sensitivity (value) of the Receptor

~~273.~~274. The sensitivity (value) of the Historic Environment identified within the marine archaeology study area is considered to be negligible to high as defined in Table 13.9. The sensitivity (value) of the known Historic Environment potentially impacted by the decommissioning activities is detailed in Table 13.13. For example, an unknown medieval wooden shipwreck would have high sensitivity while an anomaly confirmed through ROV or diver assessment to be modern debris would have negligible sensitivity.

Significance of Effect

~~274.~~275. Without mitigation, the effects on the high sensitivity archaeological receptors would be major adverse.

~~275.~~276. As per embedded mitigations outlined in Table 13.7 locations on the seabed of potential and confirmed Historic Environment receptors are informed by the archaeological assessment of geophysical and geotechnical data and AEZs have been recommended (see document 8.5).

~~276.~~277. Mitigation by avoidance aims to ensure that there is no direct, indirect, or permanent impact on Historic Environment within the marine archaeology study area meaning a negligible magnitude of impact as defined in Table 13.8.

~~277.~~278. Where avoidance is not possible or in case of not yet located Historic Environment (including within the ANS and biogenic reef areas) , further mitigation and archaeological works are detailed in the Outline Offshore Archaeological WSI (see document 8.8), and associated documents to ensure negligible magnitude of impact as defined in Table 13.8.

~~278.~~279. Following the application of appropriate mitigation, the magnitude would be reduced to **low** to **negligible adverse** which is **not significant** in EIA terms.

~~279.~~280. In some cases, the application of appropriate mitigation, such as archaeological investigation of seabed anomalies prior to impact could lead to effects of moderate beneficial significance which is a significant beneficial effect in EIA terms. For example, discovering an anchor of interest and being able to share it with the wider public would be moderate beneficial.

Impact 20: Direct impacts by compression effects of jack-up barges and anchoring of decommissioning vessels leading to total or partial loss of Historic Environment

~~280.~~281. Direct impacts by compression effects of jack-up barges and anchoring of decommissioning vessels leading to total or partial loss of Historic Environment.

Magnitude of Impact

~~281.~~282. Direct compression impacts from decommissioning activities on Historic Environment may lead to direct impact and total or partial loss of Historic Environment. If a direct impact occurs, it will generally be local, major, and adverse or irreversible and result in a permanent change to the receptor, meaning high adverse magnitude of impact as detailed in Table 13.8.

Sensitivity (value) of the Receptor

~~282.~~283. The sensitivity (value) of the Historic Environment identified within the marine archaeology study area is considered to be negligible to high as defined in Table 13.11. The sensitivity (value) of the known Historic Environment potentially impacted by the decommissioning activities is detailed in Table 13.13. For example, an unknown medieval wooden shipwreck would have high sensitivity while an anomaly confirmed through ROV or diver assessment to be modern debris would have negligible sensitivity.

Significance of Effect

~~283.~~284. Without mitigation, the effects on the high sensitivity archaeological receptors would be major adverse.

~~284.~~285. As per embedded mitigations outlined in Table 13.7, locations on the seabed of potential and confirmed Historic Environment receptors are informed by the archaeological assessment of geophysical and geotechnical data and AEZs have been recommended (see document 8.5).

~~285.~~286. Mitigation by avoidance aims to ensure that there is no direct, indirect, or permanent impact on Historic Environment within the marine archaeology study area meaning a negligible magnitude of impact as defined in Table 13.8.

~~286.~~287. Where avoidance is not possible or in case of not yet located Historic Environment (including within the ANS and biogenic reef areas) , further mitigation and archaeological works are detailed in the Outline Offshore Archaeological WSI (see document 8.8), and associated documents to ensure negligible magnitude of impact as defined in Table 13.8~~**Error! Reference source not found.** .~~.

~~287.~~288. Following the application of appropriate mitigation, the magnitude would be reduced to **low** to **negligible adverse** which is not significant in EIA terms.

~~288.~~289. In some cases, the application of appropriate mitigation, such as archaeological investigation of seabed anomalies prior to impact could lead to effects of moderate beneficial significance which is a significant beneficial effect in EIA terms. For example, discovering an anchor of interest and being able to share it with the wider public would be moderate beneficial.

Impact 21: Indirect impacts creating draw-down of sediment into voids left by removed WTG foundations or Offshore Platforms leading to loss of sediment or destabilisation of archaeological sites and contexts indirectly exposing Historic Environment to natural, chemical, or biological processes and causing or accelerating loss of the same

~~289.~~290. Indirect impacts creating draw-down of sediment into voids left by removed WTG foundations or Offshore Platforms leading to loss of sediment or destabilisation of archaeological sites and contexts indirectly exposing Historic Environment to natural, chemical, or biological processes and causing or accelerating loss of the same.

Magnitude of Impact

~~290.~~291. Magnitude of indirect impact on Historic Environment from sediment disturbance as a result of draw-down effects may lead to exposure of those Historic Environment to natural, chemical or biological processes and indirectly cause or accelerate their loss. If an indirect impact occurs, it will generally be local, major, and adverse or irreversible and result in a permanent change to the receptor, meaning high adverse magnitude of impact as detailed in Table 13.8.

Sensitivity (value) of the Receptor

~~291.~~292. The sensitivity (value) of the Historic Environment identified within the marine archaeology study area is considered to be negligible to high as defined in Table 13.9. The sensitivity (value) of the known Historic Environment potentially impacted by sediment disturbance a s a result of draw-down effects is detailed in Table 13.13. For example, an unknown medieval wooden shipwreck would have high sensitivity while an anomaly confirmed through ROV or diver assessment to be modern debris would have negligible sensitivity.

Significance of Effect

~~292.~~293. Without mitigation, the effects on the high sensitivity archaeological receptors would be major adverse.

~~293.~~294. As per embedded mitigations outlined in Table 13.7, locations on the seabed of potential and confirmed Historic Environment receptors are informed by the archaeological assessment of geophysical and geotechnical data and AEZs have been recommended (see document 8.5).

~~294.~~295. Mitigation by avoidance aims to ensure that there is no direct, indirect, or permanent impact on Historic Environment within the marine archaeology study area meaning a negligible magnitude of impact as defined in Table 13.8.

~~295.~~296. Where avoidance is not possible or in case of not yet located Historic Environment (including within the ANS and biogenic reef areas) , further mitigation and archaeological works are detailed in the Outline Offshore Archaeological WSI (see document 8.8), and associated documents to ensure negligible magnitude of impact as defined in Table 13.8.

~~296.~~297. Following the application of appropriate mitigation, the magnitude would be reduced to **low** to **negligible adverse** which is **not significant** in EIA terms.

~~297.~~298. In some cases, the application of appropriate mitigation, such as archaeological investigation of seabed anomalies prior to impact could lead to effects of moderate beneficial significance which is a significant beneficial effect in EIA terms. For example, discovering an anchor of interest and being able to share it with the wider public would be moderate beneficial.

~~298.~~299. The cumulative MDS for the Project is outlined in Table 13.14.

Table 13.14: Cumulative MDS

Impact	Scenario	Justification
Impact 23: Direct impact of sediment removal containing undisturbed archaeological contexts or by penetration, compression, and disturbance of sediment leading to total or partial loss of Historic Environment	Tier 1: ■ Cables and Pipelines ■ Military, Aviation and Radar ■ Aggregates and Disposal ■ Oil and Gas ■ Offshore Energy Tier 3: ■ Carbon Capture Storage	Intrusive seabed activities as well as vessel operations during the Project phases, along with cumulative activities undertaken by the projects listed in Table 13.15 have the potential to contribute direct impacts on Historic Environment.
Impact 24: Indirect impact causing disturbance of sediment containing potential Historic Environment (material and contexts) exposing the receptors to natural, chemical or biological processes and causing or accelerating loss of the same.	Tier 1: ■ Cables and Pipelines ■ Military, Aviation and Radar ■ Shipping ■ Aggregates and Disposal ■ Oil and Gas ■ Offshore Energy Tier 3: ■ Carbon Capture Storage	Seabed activities contributing to sediment movement or disturbance during the Project phases, cumulatively with activities undertaken by the projects listed in Table 13.15 have the potential to contribute indirect impacts on Historic Environment.
Impact 25: Indirect impacts of seabed infrastructure preventing access to Historic Environment (material and context) which creates physical barriers and no-go zones that could inhibit further research and interpretation of the above.	Tier 1: ■ Cables and Pipelines ■ Aggregates and Disposal ■ Oil and Gas ■ Offshore Energy Tier 3: ■ Carbon Capture Storage	Lack of access to marine archaeological receptors cumulatively with the projects listed in Table 13.15 have the potential to prevent further research opportunities.
~~Impact 26: Indirect impact causing changes to the Historic Seascape Character as a result of cumulative effects indirectly leading to changes to the perceived historic use of the seascape~~	~~Tier 1:~~ ~~■ Cables and Pipelines~~ ~~■ Military, Aviation and Radar~~ ~~■ Shipping~~ ~~■ Aggregates and Disposal~~ ~~■ Oil and Gas~~ ~~■ Offshore Energy~~	~~Indirect impact on the Historic Seascape Character during all project phases cumulatively with activities undertaken by the Project listed in Table 13.15 have been considered. HSC has been used in this assessment as a measure to provide a contextual and regional approach to the marine archaeology study area. Historic seascapes cannot be physically destroyed or damaged but impacts on them can change their historical character and how the perceptions can accommodate change.~~

13.10 Cumulative Impact Assessment

~~299.~~300. The cumulative impact assessment for Marine and Intertidal Archaeology has been undertaken in accordance with the methodology provided in Volume 3, Appendix 5.1 Offshore Cumulative Effects Assessment (document reference 6.2.5.1).

~~300.~~301. The projects and plans selected as relevant to the assessment of impacts to marine and intertidal archaeology are based upon an initial screening exercise undertaken on a long list. Each project, plan or activity has been considered and scoped in or out on the basis of effect-receptor pathway, data confidence and the temporal and spatial scales involved within Zone of Influence (ZoI).

~~301.~~302. For Historic Environment, cumulative impacts may occur with other planned projects and developments within the marine archaeology study area.

~~302.~~303. A ZoI of 50km from the marine archaeology study area has been applied for the Cumulative Impacts Assessment (CIA) to ensure direct and indirect cumulative effects can be appropriately identified and assessed. The 50km ZoI corresponds with the minimum screening range carried out by the project (50-500km) provided in Volume 3, Appendix 5.1 Offshore Cumulative Effects Assessment (document reference 6.2.5.1) as well as following best practice as seen by other recent offshore developments.

~~303.~~304. The allocation of 'tiers' is described in detail in Volume 3, Appendix 5.1 and refers to the development stage of the projects assessed. For marine and intertidal archaeology Tier 1 has been adapted to include operational projects due to the potential impacts of the operational projects on Historic Environment receptors within the marine archaeology study area. Projects that are built and operational at the time of the collection of survey data are not included in the existing environment but are outlined within Table 13.15 because of the potential for sediment movement and scour.

- Tier 1 includes: operational projects, projects under construction; consented projects (not yet under construction); and projects with consent applications but not yet determined;
- Tier 2 includes: projects on the Inspectorate's Programme of Projects where a Scoping Report has been submitted; and
- Tier 3 includes: projects on the Inspectorate's Programme of Projects where a Scoping Report has not been submitted; projects identified in the relevant Development Plan; and projects identified in other plans and programmes which set the framework for further development consents/approvals, where such development is reasonably likely to come forward.

Table 13.15: Projects Considered Within the Marine and Intertidal Archaeology Cumulative Effect

Development Type	Project	Status	Data Confidence Assessment/Phase	Tier
Cables and Pipelines	▪ MH2 to Mercury Manifold ▪ MH1 to Mercury Manifold ▪ Gas Shearwater to Bacton Seal Line (Shell) ▪ Triton Knoll ▪ Excalibur to Lancelot Tee Gas Export (Perenco) ▪ Malory to Galahad Tee Gas Export (Perenco) ▪ Race bank OFTO ▪ Lincs ▪ Inner Dowsing ▪ Lancelot to Bacton Gas Export (Perenco) ▪ Waveney to Lancelot Gas Line (Perenco) ▪ Gas Barque PB to Clipper PT (Shell) ▪ Lynn ▪ Esmond to Bacton Gas Export Line (Perenco) ▪ Lincs OFTO ▪ Gas Barque PL to Clipper PM (Shell)	Active/In Operation	High - Third party project details published in the public domain and confirmed as being 'accurate' by TCE.	Tier 1

Development Type	Project	Status	Data Confidence Assessment/Phase	Tier
	▪ Meg Clipper PM to Barque PL (Shell) ▪ Dudgeon OFTO ▪ Hornsea 1 OFTO ▪ Hornsea Project 2 OFTO ▪ Anglia Yd to Anglia YM Gas Line (Ithaca) ▪ Gas Clipper PT to Bacton (Shell) ▪ Glycol Bacton to Clipper PT (Shell) ▪ Gas Export Carrack QA to Clipper PR (Shell) ▪ Meg Clipper PR to Carrack QA (Shell) ▪ Clipper South to Clipper (Ineos) ▪ Gas Galleon PG to Clipper PM (Shell) ▪ Meg Line Clipper PM to Skiff (Shell) ▪ Gas Skiff to Clipper PM (Shell) ▪ Gas Galleon PN to Clipper PN (Shell) ▪ Meg Clipper PN to Galleon PN (Shell) ▪ Methanol Galleon PG to Clipper PM (Shell)			

Development Type	Project	Status	Data Confidence Assessment/Phase	Tier
	▪ Sheringham Shoal OFTO ▪ Newsham to West Sole Gas Line (Perenco) ▪ West sole to Easington Gas Line (Perenco) ▪ Seven Seas to Newsham Gas Export (Spirit) ▪ West sole to Easington Gas Line (Perenco) ▪ Hyde to West Sole Bravo Gas Line (Perenco) ▪ Babbage Skid to WSB Tee ▪ Babbage export top West Sole (Neo) ▪ Helvellyn (Alpha Petroleum) ▪ Humber Gateway OFTO ▪ Rough 47/3B Import/Export (Centrica) ▪ Ceres to Marcury Export (Spirit) ▪ Eris to Mercury Export (Spirit) ▪ Mercury to Neptune (Perenco) ▪ Rough 47/8A Export (Centrica) ▪ Johnston J5 Export (Harbour) ▪ JFE Production (Harbour)			

Development Type	Project	Status	Data Confidence Assessment/Phase	Tier
	▪ Wenlock Service Pipeline (Alpha Petroleum) ▪ Wenlock Gas (Alpha Petroleum) ▪ Johnston Export (Harbour) ▪ Johnston Methanol (Harbour) ▪ Ravenspurn North Export (Perenco) ▪ Ravenspurn North ST3 to RNCP (Perenco) ▪ Ravenspurn North ST-2 Infield (Perenco) ▪ Apollo to Minerva (Perenco) ▪ Neptune to Cleeton (Perenco) ▪ Cleeton CP to Ravenspurn A (Perenco) ▪ Newsham VCS to Manifold ▪ Blythe to Thames Tie-In Gas Export ▪ NSTA Pipeline: 16" Gas Barque PB - Clipper PT ▪ PL28 Tee to West Sole Bravo Pipeline ▪ West Sole Charlie to PL937 Tee ▪ Viking link ▪ Elgood to Blythe Gas			

Development Type	Project	Status	Data Confidence Assessment/Phase	Tier
~~Cables and Pipelines~~	~~Viking link~~	~~Complete/In Operation Active~~	~~Medium - Third party project details published in the public domain but not confirmed as being 'accurate'~~	~~Tier 1~~
Cables and Pipelines	Hornsea 3 Transmission Asset	Construction~~Consented~~	High - Third party project details published in the public domain and confirmed as being 'accurate' by TCE	Tier 1
Cables and Pipelines	Hornsea Project 4 (HOW04) OFTO	Consented	High - Third party project details published in the public domain and confirmed as being 'accurate' by the developer.	Tier 1
Cables and Pipelines	Elgood to Blythe Gas ~~(IOG)~~ ~~Elgood to Blythe Gas (IOG)~~ Blythe to Thames Tie-In Gas Export Thames Export ~~(IOG PLC)~~	In Planning	High - Third party project details published in the public domain and confirmed as being 'accurate' by TCE	Tier ~~1~~2
Cables and Pipelines	Peterhead to South Humber (E4L5) South East Scotland to South Humber Eastern Green Link 3 (EGL3) Scoping Route Eastern Green Link 4 (EGL4) Scoping Route	Proposed	Medium - Third party project details published in the public domain but not confirmed as being 'accurate' EGL 3 and 4 Scoping Report and Opinion has been published.	Tier 2

Development Type	Project	Status	Data Confidence Assessment/Phase	Tier
Military, Aviation and Radar	▪ D323D SOUTHERN MDA ▪ D323D SOUTHERN MDA ▪ D307 DONNA NOOK ▪ D207 HOLBEACH ▪ D323F SOUTHERN MDA	Active	High - Third party project details published in the public domain and confirmed as being 'accurate' by the developer.	Tier 1
Shipping	▪ Grimsby ▪ Boston	Active	High - Third party project details published in the public domain and confirmed as being 'accurate' by the developer.	Tier 1
Aggregates and Disposal	▪ Westminster Gravels (515/2) ▪ Westminster Gravels (515/1) ▪ DEME Building Materials Ltd (484) ▪ CEMEX UK Marine Ltd (514/1) ▪ Hanson Aggregates Marine Ltd (106/2) ▪ Hanson Aggregates Marine Ltd (106/3) ▪ Hanson Aggregates Marine Ltd (106/1) ▪ Van Oord Ltd (481/1) ▪ Tarmac marine Ltd (481/1) ▪ Van Oord Ltd (481/2) ▪ Tarmac Marine Ltd (481/2) ▪ DEME Building Materials Ltd (506) ▪ Hanson Aggregates Marine Ltd (400)	Operation	High - Third party project details published in the public domain and confirmed as being 'accurate' by the developer.	Tier 1

Development Type	Project	Status	Data Confidence Assessment/Phase	Tier
	▪ Tarmac Marine Ltd (197) ▪ Hanson Aggregates Marine Ltd (1805) (application submitted but not yet approved) ▪ Tarmac Marine Ltd (493) ▪ CEMEX UK Marine Ltd (514/2) ▪ CEMEX UK Marine Ltd (514/1) ▪ DEME Building Materials Ltd (483) ~~▪ Tarmac Marine Ltd (4100)~~ ~~▪ DEME Building Materials Ltd (484)~~			
Aggregates and Disposal	▪ Hornsea Disposal Area 1 ▪ CEMEX UK Marine Ltd (514/3) ▪ Well Beneficial use site2 ▪ Wells Outer Harbour B1 ▪ Wells outer harbour site A ▪ Wells outer harbour site C ▪ HUMBER 1A ~~▪ Sunk Dredge Channel Window C~~ ▪ Humber 2 ▪ Boston Deep ▪ West Stones ▪ Boston 7	Open	High - Third party project details published in the public domain and confirmed as being 'accurate' by the developer.	Tier 1

Development Type	Project	Status	Data Confidence Assessment/Phase	Tier
Oil and Gas	~~ATP – Wenlock NUI~~ ~~BP EXPLORATION - Amethyst A2D~~ CENTRICA ~~– Rough~~STORAGE HOLDINGS– ROUGH BD CENTRICA ~~– Rough~~STORAGE HOLDINGS– ROUGH BP CENTRICA ~~– Rough~~STORAGE HOLDINGS– ROUGH CD ~~CONCOPHILLIPS – Anglia YD~~ ~~EXXONMOBIL – Excalibur EA~~ ~~EXXONMOBIL – Lancelot~~ ENI UK LIMITED - 48/29B ENI UK LIMITED - 48/29C INEOS INDUSTRIES - CLIPPER SOUTH IOG PLC - BLYTHE JACKET ITHACA ENERGY - ANGLIA A ~~EXXONMOBIL – Malory~~ ~~GDF BRITAIN – Anglia A~~ NEO ENERGY ~~– Babbage~~GROUP – BABBAGE PERENCO ~~– Excalibur~~OIL & GAS – EXCALIBUR EA	Active	Medium - Third party project details published in the public domain but not confirmed as being 'accurate'	Tier 1

Development Type	Project	Status	Data Confidence Assessment/Phase	Tier
	▪ PERENCO ~~– Hoton~~OIL & GAS – GALAHAD ▪ PERENCO ~~- Hyde~~OIL & GAS - HOTON ▪ PERENCO ~~- Neptune~~OIL & GAS – LANCELOT A ▪ PERENCO ~~– Ravenspurn North CC~~OIL & GAS – MALORYPERENCO OIL & GAS NEPTUNE ▪ PERENCO ~~– Ravenspurn North CCW~~OIL & GAS – RAVENSPURN NORTH CC ▪ PERENCO ~~– Ravenspurn North ST2~~OIL & GAS – RAVENSPURN NORTH CCW ▪ PERENCO ~~– Ravenspurn South A~~OIL & GAS – WAVENEY ~~▪ PERENCO – Waveney~~ ▪ ~~PERENCO – West Sole~~OIL & GAS – WEST SOLE A (6 LEG) ▪ PERENCO OIL & GAS – WEST SOLE A (8 LEG) ▪ PERENCO ~~– West Sole~~OIL & GAS – WEST SOLE A ~~(8LEG)~~PP ▪ PERENCO ~~– West Sole~~OIL & GAS – WEST SOLE A ~~PP~~SP			

Development Type	Project	Status	Data Confidence Assessment/Phase	Tier
	▪ PERENCO ~~– West Sole A SP~~OIL & GAS – WEST SOLE B ▪ PERENCO ~~– West Sole B~~OIL & GAS – WEST SOLE C ▪ PERENCO ~~– West Sole C~~OIL & GAS – AMETHYST A1D ~~▪ PETROFAC – 48/29C~~ ~~▪ RWE – Clipper South~~ ▪ SHELL ~~– Clipper~~PLC – CLIPPER PH ▪ SHELL~~ UK – Barque~~ – BARQUE PB ▪ SHELL ~~UK – Barque~~PLC – BARQUE PL ▪ SHELL ~~UK – Clipper~~PLC – CLIPPER PC ▪ SHELL ~~UK – Clipper~~PLC – CLIPPER PM ▪ SHELL ~~UK – Clipper~~PLC – CLIPPER PR ▪ SHELL ~~UK – Clipper~~PLC – CLIPPER PT ▪ SHELL ~~UK – Clipper~~PLC – CLIPPER PW ▪ SHELL ~~UK – Galleon~~PLC – GALLEON PG ▪ SHELL ~~UK – Galleon~~PLC – GALLEON PN			

Development Type	Project	Status	Data Confidence Assessment/Phase	Tier
	▪ SHELL ~~UK – Skiff~~PLC – SKIFF PS ▪ WALDORF PRODUCTION - WENLOCK NUI			
Offshore Energy	▪ Triton Knoll ▪ Dudgeon ▪ Hornsea Project One (HOW01) ▪ Hornsea Project Two (HOW02) ▪ Race Bank ▪ Sheringham Shoal ▪ Lincs ▪ Humber Gateway ▪ Inner Dowsing ▪ Lynn	Active/In Operation	High - Third party project details published in the public domain and confirmed as being 'accurate' by TCE	Tier 1
Offshore Energy	▪ Dudgeon Extension ▪ Sheringham Shoal Extension ▪ Hornsea Project Four (HOW04)	Consented~~Under Examination~~	High - Third party project details published in the public domain and confirmed as being 'accurate' by TCE	Tier 1
~~Offshore Energy~~	~~▪ Hornsea Project Four (HOW04)~~	~~Consented~~	~~High - Third party project details published in the public domain and confirmed as being 'accurate' by TCE~~	~~Tier 1~~
~~Carbon Capture Storage~~	~~▪ Endurance~~	~~Area for Lease~~	~~Medium - Third party project details published in the public domain but not confirmed as being 'accurate'~~	~~Tier 3~~
~~Carbon Capture Storage~~	~~▪ SNS Area 3~~ ~~▪ SNS Area 4~~	~~Licensing Round Area~~	~~Medium - Third party project details published in the public domain but not confirmed as being 'accurate'~~	~~Tier 3~~

Development Type	Project	Status	Data Confidence Assessment/Phase	Tier
	~~SNS Area 6~~ ~~SNS Area 8~~			

13.10.1 Cables and Pipelines

~~304.~~305. There are ~~66~~74 developments associated with Cables and Pipelines; ~~64~~72 considered Tier 1 and 2 considered Tier 2, within the ZoI as outlined in Table 13.15.

~~305.~~306. The construction of these developments can cause both direct and indirect impacts from penetration and compression, as well as disturbance of seabed sediments and cumulative sediment changes during all the Project phases. The long term or permanent presence of subsea cables and pipelines may also result in the loss or accumulation of sediment over time.

~~306.~~307. In addition, maintenance operations of subsea cables and pipelines, if undertaken, may alter or destabilise Historic Environment or archaeological sites and contexts. Including palaeoenvironmental information and exposing such material to natural, chemical, or biological processes, and causing or accelerating loss of the same.

~~307.~~308. There is currently limited detail on archaeological data and impact assessments undertaken ahead of the installation of the subsea cables and pipelines detailed in Table 13.15 and therefore it is not possible to make a comprehensive assessment of the significance of their effect. However, given that construction activities do not overlap and disturbance from O&M of the Project is expected to be short term and localised within the marine archaeology study area no direct or indirect cumulative impacts on Historic Environment receptors within the marine archaeology study area are expected.

13.10.2 Military, Aviation and Radar

~~308.~~309. There are five site associated with Military, Aviation and Radar within the ZoI, as outlined in Table 13.15. All Military, Aviation and Radar developments are currently active and are therefore considered to be in Tier 1.

~~309.~~310. Activities at the Military, Aviation and Radar sites can include bombing, live firing, air firing, demolition of UXO, high energy manoeuvres and the use of unmanned aircraft systems.

~~310.~~311. Some of the Military, Aviation and Radar activities have the potential to cause seabed disturbance and the cumulative sediment changes during all Project phases could result in either the loss or accumulation of sediment. This disturbance has the potential to alter or destabilise Historic Environment receptors within the marine archaeology study area, including palaeoenvironmental material and expose such material to natural, chemical, or biological processes, causing or accelerating loss of the same.

~~311.~~312. It should be noted that a marine licence is not required for activities carried out in defence of the realm by or on behalf of naval, military or air forces of The Crown (including reserve forces and the Royal Fleet Auxiliary) and a visiting force. The exemption does not apply to constructing, altering, and improving works or dredging and disposal of waste, where an impact assessment should be undertaken ahead of any intrusive works. There is therefore currently limited detail on archaeological data and impact assessments undertaken ahead of activities carried out by The Crown and how they would potentially have a cumulative impact on marine archaeological or cultural heritage receptors.

~~312.~~313. The Military, Aviation and Radar activity areas outlined in Table 13.14 do not have spatially overlapping boundaries, therefore, no direct cumulative impacts on Historic Environment receptors within the marine archaeology open study area have been identified or are expected.

13.10.3 Shipping

~~313.~~314. There are two working ports within the ZoI; Grimsby and Boston as outlined in Table 13.15, both of which are designated as active and are therefore in Tier 1.

~~314.~~315. Cumulative sediment changes from port related activities such as dredging, during all Project phases and activities within the port area could result in either the loss or accumulation of sediment. This disturbance could alter or destabilise Historic Environment receptors within the marine archaeology study area. Including palaeoenvironmental material and expose such material to natural, chemical, or biological processes, causing or accelerating loss of the same.

~~315.~~316. No direct or indirect cumulative impacts on Historic Environment receptors within the marine archaeology study area are expected as a result of shipping due to no overlapping spatial boundaries.

13.10.4 Aggregates and Disposal

~~316.~~317. There are ~~33~~30 aggregate dredging areas and spoil disposal areas (all Tier 1), ~~22~~18 are in operation, with the other 11 being open to operation when needed, within the ZoI, as outlined in Table 13.15.

~~317.~~318. Indirect impacts from cumulative sediment changes during all the Project phases and the presence of active aggregate production areas and sea disposal sites in the locality, as set out in Table 13.14 may result in loss or accumulation of sediment, thereby altering or destabilising Historic Environment receptors within the marine archaeology study area, including palaeoenvironmental material, and exposing such material to natural, chemical, or biological processes, causing or accelerating loss of the receptor.

~~318.~~319. Despite the intrusive nature of dredging operations and disposal activities on the seafloor, no direct or indirect cumulative impacts on Historic Environment receptors within the marine archaeological study area are expected as there is no spatial overlap with aggregate production areas and the Project.

~~319.~~320. The British Marine Aggregate Producers Association (BMAPA) ensures that proportionate planning is undertaken which provides a framework to enable delivery of a 'licence to operate' for all dredging activities and operations. A Guidance Note is produced and agreed which considers the sensitivity (value) of heritage assets within proposed and active dredging areas (TCE, 2017). The Guidance Note also ensures that known and unlocated Historic Environment receptors are addressed at every stage of marine aggregate development and production.

~~320.~~321. There is potential for cumulative temporary increases in Suspended Sediment Concentration and seabed levels as a result of the Project's foundation installation and spoil disposal at licensed disposal grounds. Sediment plume interaction generally has the potential to occur if the activities generating the sediment plumes are located within one spring tidal excursion ellipse from one another and occur at the same time.

~~321.~~322. Cumulative sediment regime changes from the aggregate dredging areas and spoil disposal areas has the potential to affect the burial or exposure of Historic Environment receptors within the marine archaeology study area due to the proximity of some sites.

13.10.5 Oil and Gas

~~322.~~323. There are ~~39~~37 Oil and Gas development areas present within the ZoI (all Tier 1), as outlined in Table 13.15.

~~323.~~324. Active and decommissioned well heads and other infrastructure related to the oil and gas industry are located within the array area and Offshore ECC. Guidelines have been recently drafted to promote the consideration of Historic Environment for offshore gas and oil, however historically this was not a requirement (Department for Business, Energy & Industrial Strategy, 2022). The Project will adhere to all 500m safety zone around sub-sea installations established under the Petroleum Act 1987 which will avoid direct impacts cumulatively with oil and gas activities. Further, full consideration has been given to oil and gas activities in Volume 3, Appendix 15.1: Navigational Risk Assessment (document reference: 6.2.15.1) and Volume 1, Chapter 18: Marine Infrastructure and Other Users (document reference: 6.1.18).

~~324.~~325. Direct or indirect impacts from penetration, compression, and disturbance or cumulative sediment changes during all Project phases and the presence of Oil and Gas developments as outlined in Table 13.14 may result in the loss or accumulation of sediment over time. This disturbance could alter or destabilise Historic Environment or archaeological sites and contexts. Including palaeoenvironmental material and expose such material to natural, chemical, or biological processes, causing or accelerating loss of the same.

~~325.~~326. Indirect impacts from sediment plumes from operation and maintenance activities are generally short-lived, with major maintenance works infrequent. Any impacts from operational oil and gas activities are therefore likely to be short-lived and of localised extent, with limited opportunity to overlap with Project related activities (further outlined in Volume 1, Chapter 7: Marine Physical Processes (document reference: 6.1.7)).

~~326.~~327. Further, cumulative impacts of oil and gas developments may prevent access to Historic Environment (material and context) by creating physical barriers or imposing no-go zones that could inhibit further research and interpretation opportunities over a large swath of the seabed. Embedded mitigation for such events is the agreement of project specific Outline Marine WSI (see document 8.5) which must outline how potential impacts will be offset by data gathering and archaeological assessments.

~~327.~~328. Acknowledging the spatial overlap, no cumulative impacts on Historic Environment receptors are expected because of applied safety zones around established structures, offset by data gathering and no indirect impacts from sediment plumes which are deemed to be localised and short-lived.

13.10.6 Offshore Energy

~~328.~~329. There are 13 Offshore Energy developments within the ZoI (10 of these are operational at the time of writing and the remaining ~~3are~~1 is in ~~pre-application through to~~the construction ~~stages~~phase and 2 have been consented (all Tier 1)), as outlined in Table 13.15.

~~329.~~330. Offshore Energy developments normally consist of subsea cables and permanent structures on the seabed. It is expected that the construction phases of all Offshore Energy developments, as well as the O&M phases, have the potential to cause seabed disturbance as cables and foundation structures require regular planned and unplanned maintenance.

~~330.~~331. Therefore, cumulative sediment changes during all Project phases could result in the loss or accumulation of sediment. This disturbance could alter or destabilise Historic Environment or archaeological sites and contexts. Including palaeoenvironmental material and expose such material to natural, chemical, or biological processes, causing or accelerating loss of the same.

~~331.~~332. Further, cumulative impacts of large-scale projects may prevent access to Historic Environment receptors (material and context) by creating physical barriers or imposing no-go zones that could inhibit further research and interpretation opportunities over a large swath of the seabed. Mitigation for such event is the agreement of project specific Outline Marine WSI (see document 8.5) which must outline how potential impacts will be offset by data gathering and archaeological assessments.

333. The total coverage of the offshore windfarm would impede direct access below the infrastructure for a finite number of years. The lack of access will be offset by the gathering of information (including geophysical and geotechnical surveys) along the planned export cable route and within the WTG area, the precise locations will be outlined in forthcoming Method Statements as required by the WSI. Any gathered data in preparation for the works will be shared as required.

~~332.~~334. All developments have undergone EIA, and suitable mitigation measures have been implemented. Mitigation measures have included AEZs around known offshore archaeology and cultural heritage receptors, geophysical and geotechnical surveys, and protocols for unexpected discoveries. ~~Therefore, any~~Potential cumulative impacts ~~from existing~~are, therefore, predicted to be of local spatial extent, long term duration, continuous and ~~under construction Offshore Wind Farm (OWFs) would be low to negligible and not significant~~limited reversibility.

335. The magnitude of impact of cumulative effects as a result offshore windfarms is therefore expected to be avoided or indistinguishable from natural variation (low to negligible), meaning not significant in EIA terms.

13.10.7 Carbon Capture Storage

~~333.~~336. There are no Carbon Capture Storage developments within the ZoI, however ~~one is noted as having an "Area for Lease" while four are~~there are 5 noted as "Licensing Round Area" as outlined in Table 13.15.

~~334.~~337. Carbon Capture Storage developments are required, as a part of the application process to undertake a marine archaeology impact assessment, however, these are not yet available in the public domain.

13.10.8 Cumulative Assessment Summary

~~335.~~338. The embedded mitigation, as outlined in Table 13.7 aims to avoid and mitigate direct, indirect, and permanent impact on Historic Environment (known or unlocated) within the marine archaeology study area and ensure that archaeological input is of paramount importance throughout the life of the Project.

~~336.~~339. Considering the magnitude of the cumulative effects during all phases of the Project and the other outlined developments (Table 13.15) as well as receptor sensitivity (value) (Table 13.9) within the significance of effect matrix Table 13.10 on Historic Environment potentially affected by the cumulative effects, the magnitude of impact is assessed as negligible and the sensitivity (value) of the receptor as negligible to high. The significance of effect within the array area, Offshore ECC and associated 1 km buffer has therefore been assessed as minor to negligible and the effect is consequently considered **not significant** in EIA terms.

13.11 Inter-Relationships

~~337.~~340. The inter-relationships assessment considers likely significant effects from multiple impacts and activities from the construction, O&M and decommissioning phases on the same receptor, or group of Historic Environment.

~~338.~~341. The greatest potential for direct spatial impact on Historic Environment is likely to occur during contact with the seabed during both the construction and decommissioning phases. The individual impacts were assigned a significance of **negligible** due to the implementation of embedded mitigation measures.

~~339.~~342. While there is potential for some disturbance within the operational phase, these activities will apply the mitigation measures in Table 13.7. Impact on archaeological and cultural heritage receptors are therefore during the O&M phase not considered to contribute to inter-relationships.

13.12 Transboundary Effects

~~340.~~343. Due to the localised nature of any potential impacts on known Historic Environment, transboundary impacts will not occur and have been scoped out from all further consideration within the EIA.

~~341.~~344. However, it should be noted that should wrecks or aircrafts of non-British nationality be impacted by the Project further archaeological investigations may be warranted (see Volume 3, Chapter 13.1 and document 8.5) and further discussion on protection of non-British Historic Environment should include the pertinent organisation(s) in the country of relevance.

~~342.~~345. There is also a potential for palaeochannels and palaeolandscapes within the North Sea to stretch beyond international boundaries. The impact on submerged landscapes in those cases is expected to be local within the marine archaeology study area and will be mitigated and offset by archaeological assessment of available geophysical and geotechnical data.

13.13 Conclusions

~~343.~~346. Table 13.16 presents a summary of the assessment of significant effect on the Historic Environment within the array area (including the ORBA), Offshore ECC and associated 1 km buffer.

Table 13.16: Summary of effects for Offshore Archaeology and Cultural Heritage within the array area, Offshore ECC and associated 1 km buffer

Description of Impact	Effect	Additional Mitigation Measures	Residual Impact
Construction			
Impact 1: Direct impact of sediment removal containing undisturbed archaeological contexts during seabed preparation.	Total or partial loss of the Historic Environment	Not Applicable – no additional mitigation identified	No significant adverse residual effects
Impact 2: Direct impact by penetration of foundations	Total or partial loss of Historic Environment	Not Applicable – no additional mitigation identified	No significant adverse residual effects
Impact 3: Direct impact by compression of foundations.	Total or partial loss of Historic Environment	Not Applicable – no additional mitigation identified	No significant adverse residual effects
Impact 4: Direct impact by penetration from the combined weight of the Wind Turbine Generators (WTGs) or Offshore Platforms.	Disturbance of stratigraphic context containing archaeological material leading to the total or partial loss of Historic Environment	Not Applicable – no additional mitigation identified	No significant adverse residual effects
Impact 5: Direct impact by compression from the combined weight of	Disturbance of stratigraphic context containing archaeological material leading to the	Not Applicable – no additional mitigation identified	No significant adverse residual effects

Description of Impact	Effect	Additional Mitigation Measures	Residual Impact
the WTGs or Offshore Platforms.	total or partial loss of Historic Environment		
Impact 6: Direct impact by penetration of cable laying operations.	Total or partial loss of Historic Environment	Not Applicable – no additional mitigation identified	No significant adverse residual effects
Impact 7: Direct impacts by compression of cable laying operations.	Total or partial loss of Historic Environment	Not Applicable – no additional mitigation identified	No significant adverse residual effects
Impact 8: Direct impacts by penetration effects of jack-up barges and anchoring of construction vessels during various activities.	Total or partial loss of Historic Environment	Not Applicable – no additional mitigation identified	No significant adverse residual effects
Impact 9: Direct impacts by compression effects of jack-up barges and anchoring of construction vessels during various activities.	Total or partial loss of Historic Environment	Not Applicable – no additional mitigation identified	No significant adverse residual effects
Impact 10: Indirect impacts causing disturbance of sediment containing potential Historic Environment (material and context) during construction activities.	Exposure of Historic Environment to natural, chemical or biological processes and indirectly causing or accelerating loss	Not Applicable – no additional mitigation identified	No significant adverse residual effects
~~Impact 11: Indirect impacts causing changes to the Historic Seascape Character as a result of construction and survey vessel activities and the addition of cables, foundations, Offshore Platforms and WTGs.~~	~~Changes to the perceived historic use of the seascape during the construction phase~~	~~Not Applicable – no additional mitigation identified~~	~~No significant adverse residual effects~~
Operation and Maintenance			

Description of Impact	Effect	Additional Mitigation Measures	Residual Impact
Impact 12: Direct impact by penetration leading to disturbance effects of maintenance activities at WTGs, Offshore Platforms and along all cables.	Total or partial loss of Historic Environment	Not Applicable – no additional mitigation identified	No significant adverse residual effects
Impact 13: Direct impact by compression leading to disturbance effects of maintenance activities at WTGs, Offshore Platforms and along all cables.	Total or partial loss of Historic Environment	Not Applicable – no additional mitigation identified	No significant adverse residual effects
Impact 14: Direct impacts by penetration effects of jack-up barges and anchoring of Operation and Maintenance (O&M) vessels during various activities at WTGs, Offshore Platforms and along all cables.	Total or partial loss of Historic Environment	Not Applicable – no additional mitigation identified	No significant adverse residual effects
Impact 15: Direct impacts by compression effects of jack-up barges and anchoring of O&M vessels during various activities at WTGs, Offshore Platforms and along all cables.	Total or partial loss of Historic Environment	Not Applicable – no additional mitigation identified	No significant adverse residual effects
Impact 16: Indirect impacts causing disturbance of sediment containing potential Historic Environment (material and context) during maintenance activities.	Exposure of Historic Environment to natural, chemical or biological processes and indirectly causing or accelerating loss	Not Applicable – no additional mitigation identified	No significant adverse residual effects

Description of Impact	Effect	Additional Mitigation Measures	Residual Impact
Impact 17: Indirect impacts causing scour effects as a result of the presence of WTGs, Offshore Platforms and the exposure of cables or the use of cable protection measures.	Exposure of Historic Environment to natural, chemical or biological processes and indirectly causing or accelerating loss	Not Applicable – no additional mitigation identified	No significant adverse residual effects
~~Impact 18: Indirect impacts causing changes to the Historic Seascape Character as a result of O&M vessel activities and the presence of the completed windfarm.~~	~~Changes in the perceived historic use of the seascape during the operation phase~~	~~Not Applicable – no additional mitigation identified~~	~~No significant adverse residual effects~~
Decommissioning			
Impact 19: Direct impacts by penetration effects of jack-up barges and anchoring of decommissioning vessels.	Total or partial loss of Historic Environment	Not Applicable – no additional mitigation identified	No significant adverse residual effects
Impact 20: Direct impacts by compression effects of jack-up barges and anchoring of decommissioning vessels.	Total or partial loss of Historic Environment	Not Applicable – no additional mitigation identified	No significant adverse residual effects
Impact 21: Indirect impacts creating draw-down of sediment into voids left by removed WTG foundations or Offshore Platforms leading to loss of sediment or destabilisation of archaeological sites.	Exposure of Historic Environment to natural, chemical or biological processes and indirectly causing or accelerating loss	Not Applicable – no additional mitigation identified	No significant adverse residual effects
~~Impact 22: Indirect impacts causing changes to the Historic Seascape Character as~~	~~Changes to the perceived historic use of the seascape during the decommissioning phase~~	~~Not Applicable – no additional mitigation identified~~	~~No significant adverse residual effects~~

Description of Impact	Effect	Additional Mitigation Measures	Residual Impact
~~a result of decommissioning activities and the removal of windfarm components.~~			
Cumulative			
Impact 23: Direct impact of sediment removal containing undisturbed archaeological contexts or by penetration, compression, and disturbance of sediment.	Total or partial loss of Historic Environment	Not Applicable – no additional mitigation identified	No significant adverse residual effects
Impact 24: Indirect impact causing disturbance of sediment containing potential Historic Environment (material and contexts).	Exposure of Historic Environment to natural, chemical or biological processes and indirectly causing or accelerating loss	Not Applicable – no additional mitigation identified	No significant adverse residual effects
Impact 25: Indirect impacts of seabed infrastructure preventing access to Historic Environment (material and context) which creates physical barriers and no-go zones that could inhibit further research and interpretation of the above.	Loss of access to archaeological and geoarchaeological material	Not Applicable – no additional mitigation identified	No significant adverse residual effects
~~Impact 26: Indirect impact causing changes to the Historic Seascape Character as a result of cumulative effects.~~	~~Changes to the perceived historic use of the seascape~~	~~Not Applicable – no additional mitigation identified~~	~~No significant adverse residual effects~~

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