FIVE ESTUARIES OFFSHORE WIND FARM

ENVIRONMENTAL STATEMENT

VOLUME 6, PART 2, CHAPTER 11: OFFSHORE ARCHAEOLOGY AND CULTURAL HERITAGE

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TABLES

FIGURES

DEFINITION OF ACRONYMS

Term	Definition
AEZ	Archaeological Exclusion Zone
BP	Before Present
DCO	Development Consent Order
dML	Deemed Marine Licence
ECC	Export Cable Corridor
EIA	Environmental Impact Assessment
ES	Environmental Statement
HLC	Historic Landscape Characterisation
HSC	Historic Seascape Characterisation
MAG	Magnetometer
MMO	Marine Management Organisation
MBES	Multi-Beam Echo Sounder
NRHE	National Record of the Historic Environment
nT	Nanotesla
PAD	Protocol for Archaeological Discoveries
PAS	Portable Antiquities Scheme
PEIR	Preliminary Environmental Information Report
RLB	Red Line Boundary
SSS	Side Scan Sonar
SBP	Sub-Bottom Profiler
UKHO	United Kingdom Hydrographic Office
UHRS	Ultra-High Resolution Seismic
VE	Five Estuaries Offshore Wind Farm (the Project)
VE OWFL	Five Estuaries Offshore Wind Farm Limited
WSI	Written Schemes of Investigation
WTG	Wind Turbine Generator

GLOSSARY OF TERMS

Term	Definition
Archaeological Exclusion Zone	A spatially defined zone around a known marine 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.
Before Present	Time scale referring to the 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. It is subdivided into the Early, Middle and Late Bronze Age.
Development Consent Order	An order made under the Planning Act 2008 granting development consent for a Nationally Significant Infrastructure Project (NSIP) from the Secretary of State (SoS) for Business, Energy and Industrial Strategy (BEIS).
Decommissioning	The period during which a development and its associated processes are removed from active operation.
Deemed Marine Licence	If a Development Consent Order (DCO) is granted, this will include provision deeming a marine licence to have been issued under Part 4 of the Marine and Coastal Access Act 2009.
Early Medieval	Archaeological period lasting from AD 410 to 1066. This dates from the breakdown of Roman rule in Britain to the Norman invasion in 1066 and is to be used for monuments of post Roman, Saxon and Viking date.
Early Prehistoric	Archaeological period lasting from 52,000 to 6,000 BP. For monuments which are characteristic of the Palaeolithic to Mesolithic but cannot be specifically assigned.
Export Cable Corridor	The area(s) where the export cables will be located. Refer to either the offshore or onshore ECC.
Environmental Impact Assessment	The process of evaluating the likely significant environmental effects of a proposed project or development over and above the existing circumstances (or 'baseline').
Environmental Statement	The documents that collate the processes and results of the EIA.
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.

Term	Definition
Historic England	The public body that champions and protects England's historic places.
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.
Impact	The changes resulting from an action.
Intertidal	The area of the shoreline which is covered at high tide and uncovered at low tide.
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.
Last Glacial Maximum	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 a magnetic field at a particular location.
Marine Archaeology Study Area	Defined as the ES Order Limits up to MHWS and surrounded by a 1 km buffer.
Marine Heritage Receptors	Physical resources such as shipwrecks, remains of aircraft, archaeological sites, archaeological finds, and material including prehistoric deposits as well as archival documents and oral accounts recognised as of historical/ archaeological or cultural significance.
Marine Written Schemes of Investigation	The specific Written Schemes of Investigation (WSI) formed to set out the agreement between client, the appointed archaeologists, contractors, and relevant stakeholders which details the methods to mitigate the effects on all the known and potential marine heritage receptors within the development area. This will develop throughout the life of the project beginning with the Outline Marine WSI through to the Draft Marine WSI and final Agreed Marine WSI.
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

Term	Definition
	Neolithic; marks the beginning of a move from a hunter gatherer society towards food producing society.
Marine Management Organisation	MMO is an executive non-departmental public body, sponsored by the Department for Environment, Food & Rural Affairs. The MMO license, regulate and plan marine activities in the seas around England so that they are carried out in a sustainable way.
Multi-Beam Echo Sounder	A type of sonar used to map the seabed by emitting acoustic waves in a fan shape beneath its transceiver. The time it takes for the sound 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 Record of the Historic Environment	National database of known wrecks, aircraft, obstructions, Fishermen's fasteners and reported losses held by Historic England. Currently (September 2022) being developed into the National Marine Heritage Record (NMHR).
Neolithic	Archaeological period lasting from 6,000-4,200 BP. This period follows on from the Palaeolithic and the Mesolithic and is succeeded by the Bronze Age. This period is characterised by the practice of a farming economy and extensive monumental constructions.
Nanotesla	Measurement describing the magnetic field (flux) of ferrous materials as measures by a magnetometer (one nanotesla equals 10−9 tesla).
Offshore	The sea further than two miles from the coast.
Offshore Wind Farm	An offshore wind farm is a group of wind turbines in the same location (offshore) in the sea which are used to produce electricity.
Outline Marine Written Schemes of Investigation	Outline Marine WSI, specific for the offshore area and developed during the EIA process to 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).
Protocol for Archaeological Discoveries	A document detailing how unexpected finds made during the lifetime of the proposed development should be reported.
Palaeolithic	Archaeological period lasting from 52,000-12,000 BP. The period is defined by the practice of hunting and gathering and the use of knapped (chipped) flint tools. This period is

Term	Definition
	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 within this date range is used where known.
Preliminary Environmental Information Report	The PEIR is written in the style of a draft Environmental Statement (ES) and forms the basis of statutory consultation. Following that consultation, the PEIR documentation has been updated into the final ES (this document) that accompanies the application for the Development Consent Order (DCO).
Order Limits	The extent of development including all works, access routes, cable corridors, visibility splays and discharge points.
Receiver of Wreck	Official of the British Government whose main task is to administer the law in relation to Wreck and Salvage.
Roman period	Archaeological period lasting from AD 43-410. Traditionally begins with the Roman invasion 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 sea floor morphology from both sides of the vessel track to produce an image of the sea floor.
Sub-Bottom Profiler	An acoustic system used to determine physical properties of the sea floor and to image and characterise geological information a few metres below the sea floor.
United Kingdom Hydrographic Office database	Database of known wrecks and obstructions held and maintained by the UKHO.
Ultra-High Resolution Seismic	An acoustic system used to image submerged and buried features in shallow water.
Written Schemes of Investigation	A document forming the agreement between the client, the appointed archaeologists, contractors, and the relevant

Term	Definition
	stakeholders. The document sets out methods to mitigate the effects on all the known and potential marine heritage receptors within the development area. For Offshore Archaeology and Cultural Heritage, a Marine WSI will be developed.

11 OFFSHORE ARCHAEOLOGY AND CULTURAL HERITAGE

11.1 INTRODUCTION

11.1.1 This chapter identifies the offshore archaeology and cultural heritage of relevance to the Five Estuaries Offshore Wind Farm (hereafter, VE) proposed development within the marine archaeology study area (as defined within Section 11.4).

11.1.2 This chapter further describes the potential impacts from the construction, operation, and decommissioning of the offshore and intertidal components up to Mean High Water Springs (MHWS) of VE on marine heritage receptors and sets out the scope and methods of the Environmental Impact Assessment (EIA).

11.1.3 Potential impacts of the onshore components of VE on cultural heritage assets are described separately in Volume 6, Part 3, Chapter 7: Onshore Archaeology and Cultural Heritage.

11.1.4 This chapter and the associated annexes should be read alongside the following chapters of the Environmental Statement (ES):

- Volume 6, Part 1, Chapter 3: Environmental Impact Assessment Methodology;
- Volume 6, Part 2, Chapter 1: Offshore Project Description;
- Volume 6, Part 2, Chapter 2: Marine Geology, Oceanography and Physical Processes;
- Volume 6, Part 2, Chapter 10: Seascape, Landscape and Visual Impact Assessment; and
- Volume 6, Part 3, Chapter 7: Onshore Archaeology and Cultural Heritage.

11.1.5 The annexes to this chapter include:

- Volume 6, Part 5, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report which comprises a desk-based study of the environmental baseline for offshore archaeology and cultural heritage within the marine archaeology study area, as well as an archaeological assessment of geophysical data; and
- Volume 9, Report 19: Outline Marine Written Schemes of Investigation which forms an umbrella document for further surveys, investigations and assessments required throughout the life of the project and sets out archaeological actions and mitigation.

11.2 STATUTORY AND POLICY CONTEXT

11.2.1 This section was drafted by Maritime Archaeology Ltd. 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).

11.2.2 Archaeology and cultural heritage fall under the jurisdiction of Historic England seaward of mean low water springs (MLWS), and Essex County Council landward of MLWS.

11.2.3 The following legislation, guidance and best practice has been consulted as part of this assessment. A more detailed explanation of the legislation and national policy relevant to VE can be found in Volume 6, Part 1, Chapter 2: Policy and Legislation.

Table 11.1: 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 granting and enforcement of conditions on marine licences.	VE will need to consider and comply with the requirements of the adopted Marine Policy Statement and East Inshore and East Offshore Marine Plans (HM Government, 2014) as they relate to the impact of the proposed development on marine heritage. The mitigation will be secured through the deemed grant of a marine licence (including conditions thereon) pursuant to the Act. The significance of marine heritage receptors within the marine archaeology study area is presented in Volume 6, Part 5, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report. The mitigation is presented in Table 11.2.
Merchant Shipping Act 1995	The Receiver of Wreck administers the Merchant Shipping Act 1995, in the UK in relation to wreck and salvage. The Receiver is responsible for processing incoming reports of wreck and cargo.	VE may cause impacts on objects associated with wrecks. If any material is recovered during works associated with VE which fall within the definition of 'wreck', the

Legislation/ Policy	Key Provisions	Section Where Comment Addressed
		Receiver of Wreck must be notified and will seek to identify the original owner, as detailed in Volume 9, Report 19: Outline Marine Written Schemes of Investigation.
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.	Heritage features regarded as of special interest or significance may become designated within the VE area. There are currently no protected wreck sites identified within the VE marine archaeology study area as presented in Section 3.2 of Volume 6, Part 5, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report.
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 a 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.

Legislation/ Policy	Key Provisions	Section Where Comment Addressed
		There are several reported aircraft losses with unspecified locations within the VE marine archaeology study area. These must be considered in all pre-construction survey data analysis and investigations and will require a licence under this Act before any works that may impact them can commence. Geophysical anomaly MA0029 correlates with the location of one of these charted and reported aircraft losses, as detailed in Section 3.4 of Volume 6, Part 5, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report. This site is assumed to become an automatically protected place under this Act even if the physical remains have not been confirmed as an aircraft.
Burial Act 1857	The Act requires a licence to be granted prior to the removal of human remains from deliberately deposited contexts.	The DCO disapplies the requirement to get a separate licence and instead sets out a process which is equivalent to that

Legislation/ Policy	Key Provisions	Section Where Comment Addressed
		which would be conditioned under such a licence, under Article 18 (see Volume 3: Draft Development Consent Order: Article 18: Removal of Human Remains). If human remains are discovered during works associated with VE, they will be protected under the DCO. The actions required where human remains are found are further detailed in the Section 8.9 of Volume 9, Report 19: Outline Marine Written Schemes of Investigation.
The Treasure Act 1996	The Act is supplemented by the Treasure (Designation) Order 2002. Finders of gold and silver objects (over 300 years old) and some base metal assemblages (prehistoric) as defined in the Act are required to report such finds by contacting the Coroner and delivering the items for handover as per the Coroner's instructions.	Should any relevant material be found during works associated with VE, advice from the Coroner must be sought and their instructions adhered to as detailed in Section 7.4 of Volume 9, Report 19: Outline Marine Written Schemes of Investigation.
The Treasure (Designation) Order 2002	Finders of gold and silver objects (over 300 years old) and some base metal assemblages (prehistoric) as defined in the Act are required to report such finds by contacting the Coroner and delivering the items for handover as per the Coroner's instructions.	Should any relevant material be found during works associated with VE, advice from the Coroner must be sought and their instructions adhered to as detailed in Section 7.4 of Volume 9, Report 19: Outline

Legislation/ Policy	Key Provisions	Section Where Comment Addressed
		Marine Written Schemes of Investigation.
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.
East Inshore and East Offshore Marine Plans (HM Government, 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 not possible to minimise or mitigate compromise or harm to the heritage asset"* Policy SOC3:	All known and unknown marine heritage receptors in the marine zone that may be affected by the proposed VE development and their archaeological significance have been described in detail in Volume 6, Part 5, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report and summarised in Section 11.11. Potential impact on the marine heritage receptors of the proposed development is discussed in Sections 11.12 to 11.19. Mitigation to avoid or offset any impacts as a result of VE is detailed in Volume 9, Report 19: Outline Marine Written Schemes of Investigation and summarised in Section 11.11.

Legislation/ Policy	Key Provisions	Section Where Comment Addressed
	"Proposals that may affect the terrestrial and marine character of an area should demonstrate, in order of preference: *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"*	
South East Inshore Marine Plan (HM Government, 2021)	Objective 5: *"People appreciate the diversity of the marine environment, its seascapes, its natural and cultural heritage and its resources and can act responsibly"* SE-HER-1: *"Proposals that demonstrate they will conserve and enhance the significance of heritage assets will be supported. Where proposals may cause harm to the significance of heritage assets, proponents must demonstrate that they will, in order of preference:* *a) avoid* *b) minimise*	All known and unknown marine heritage receptors in the marine zone that may be affected by the proposed VE development and their archaeological significance have been described in detail in Volume 6, Part 5, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report and summarised in Section 11.7. Potential impact on the marine heritage receptors of the proposed development is discussed in Sections 11.12 to 11.19. Mitigation to avoid or offset any impacts as a

Legislation/ Policy	Key Provisions	Section Where Comment Addressed
	c) mitigate *- any harm to the significance of heritage assets. If it is not possible to mitigate, then public benefits for proceeding with the proposal must outweigh the harm to the significance of heritage assets"*	result of VE is detailed in Volume 9, Report 19: Outline Marine Written Schemes of Investigation and summarised in Section 11.11.
UK Marine Policy Statement (HM Government, 2011)	Paragraph 2.6.6. Historic environment *"The historic environment includes 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"*	As 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, all available evidence to identify the significance of the heritage assets within the marine archaeology study area is presented in Volume 6, Part 5, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report. The recommended mitigation is presented in Section 11.11.

Legislation/ Policy	Key Provisions	Section Where Comment Addressed
Overarching National Policy Statement for Energy (EN-1). November 2023.	Paragraph 5.9.9 *"The applicant should undertake an assessment of any likely significant heritage impacts of the proposed development as part of the EIA and describe these along with how the mitigation hierarchy has been applied in the ES (see Section 4.3). This should include consideration of heritage assets above, at, and below the surface of the ground. Consideration will also need to be given to the possible impacts, including cumulative, on the wider historic environment. The assessment should include reference to any historic landscape or seascape character assessment and associated studies as a means of assessing impacts relevant to the proposed project."*	All known and unknown marine heritage receptors in the marine zone that may be affected by the proposed VE development and their archaeological significance have been described in detail in Volume 6, Part 5, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report and summarised in Section 11.7. Potential impact on the marine heritage receptors of the proposed development is discussed in Sections 11.12 to 11.19.

Legislation/ Policy	Key Provisions	Section Where Comment Addressed
	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 their significance. As a minimum, the applicant should have consulted the relevant Historic Environment Record[235] (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."* *" [235] Historic Environment Records (HERs) are information services that seek to provide access to comprehensive and dynamic resources relating to the historic environment of a defined geographic area for public benefit and use. HERs are 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 requesting data through the relevant archaeological trust who hold the copyright. Historic England and Cadw hold additional information about heritage assets in English or*	All known and unknown marine heritage receptors in the marine zone that may be affected by the proposed VE development and their archaeological significance have been described in detail in Volume 6, Part 5, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report and summarised in Section 11.7. Potential impact on the marine heritage receptors of the proposed development is discussed in Sections 11.12 to 11.19.

Legislation/ Policy	Key Provisions	Section Where Comment Addressed
	Welsh waters. Historic England or Cadw should also be consulted, where relevant."	
	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 assets (marine heritage receptors) and the archaeological potential within the marine archaeology study area have been considered and assessed in Volume 6, Part 5, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report and summarised in Section 11.7.

Legislation/ Policy	Key Provisions	Section Where Comment Addressed
	heritage asset, accurate representative visualisations may be necessary to explain the impact.[236]" *"[236] 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/ For projects in Wales, relevant guidance is given in The Setting of Historic Assets in Wales. See https://cadw.gov.wales/advicesupport/placemaking/heritage-impact-assessment/setting-historic-assets"*	
	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 on the marine heritage identified within the ES Order Limits was undertaken according to the methodology outlined in Section 11.10. Table 11.16 outlines the maximum design scenario and relevant activities that may impact marine archaeological heritage receptors. Sections 11.12 to 11.19 further details how marine archaeological heritage receptors may be affected.
	Paragraph 5.9.13 *"The applicant is encouraged, where opportunities exist, to prepare proposals which can make a positive contribution to*	As detailed in Volume 9, Report 19: Outline Marine Written Schemes of Investigation, which is secured

Legislation/ Policy	Key Provisions	Section Where Comment Addressed
	the historic environment, and to consider how their scheme takes account of the significance of heritage assets affected. This can include, where possible: > *enhancing, through a range of measures such a sensitive design, the significance of heritage assets or setting affected* > *considering where required the development of archive capacity which could deliver significant public benefits* > *considering how visual or noise impacts can affect heritage assets, and whether there may be opportunities to enhance access to, or interpretation, understanding and appreciation of, the heritage assets affected by the scheme"*	through (Table 11.17) the DCO, positive contributions to knowledge and enhancement of understanding of the historic environment can be realised through data gathering, interpretation and publication. The works will contribute to current research frameworks in the region and will be further detailed in forthcoming Method Statements.
	Paragraph 5.9.14 *"Careful consideration in preparing the scheme will be required on whether the impacts on the historic environment will be direct or indirect, temporary, or permanent."*	The significance of the known marine heritage receptors within the offshore zone and potential impact on known and unknown marine heritage receptors identified has been undertaken according to the methodology outlined in Section 11.10. The results of the assessments, including the heritage significance of the known marine heritage receptors as well as the potential to locate marine heritage receptors of significance during works are detailed in Volume 6,

Legislation/ Policy	Key Provisions	Section Where Comment Addressed
		Part 5, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report and summarised in Section 11.7.
	Paragraph 5.9.17 *"Where the loss of the whole or part of a heritage asset's significance is justified, the Secretary of State will require the applicant to record and advance understanding of the significance of the heritage asset before it is lost (wholly or in part). The extent of the requirement should be proportionate to the asset's importance and significance and the impact. The applicant should be required to publish this evidence and to deposit copies of the reports with the relevant Historic Environmental Record. They should also be required to deposit the archive generated in a local museum or other public repository willing to receive it."*	While this provision is not directly applicable to marine archaeology or marine heritage receptors, positive contributions to knowledge and understanding of the historic environment can be realised through data gathering, interpretation and publication. The mitigation measures for the archaeological assessment of data as outlined in (Table 11.17) and Volume 9, Report 19: Outline Marine Written Schemes of Investigation and secured through the DCO, ensure data will be gathered, assessed and published. The works will contribute to current research frameworks in the region and will be further detailed in forthcoming relevant Method Statements, which will consider relevant research frameworks to reflect and enhance the ongoing research in the area.

Legislation/ Policy	Key Provisions	Section Where Comment Addressed
	Paragraph 5.9.18 *"Where appropriate, the Secretary of State will impose requirements on the Development Consent Order to ensure that the work is undertaken in a timely manner, in accordance with a written scheme of investigation that complies with the policy in this NPS and which has been agreed in writing with the relevant local authority, and to ensure that the completion of the exercise is properly secured."*	While this provision is not directly applicable to marine archaeology or marine heritage receptors, the mitigation measures for the archaeological assessment of data as outlined in (Table 11.17) and Volume 9, report 19: Outline Marine Written Schemes of Investigation, are secured through the DCO. Positive contributions to knowledge and understanding of the historic environment can be realised through data gathering, interpretation and publication. The works will contribute to current research frameworks in the region and will be further detailed in forthcoming relevant Method Statements, which will consider relevant research frameworks to reflect and enhance the ongoing research in the area.
	Paragraph 5.9.19 *"Where the loss of significance of any heritage asset has been justified by the applicant on the merits of the new development and the significance of the asset in question, the Secretary of State should consider:*	No impact on marine archaeological and cultural heritage receptors is expected to lead to harm or total loss of significance. AEZs (as per Table 11.17) have been applied to all known wrecks and obstructions,

Legislation/ Policy	Key Provisions	Section Where Comment Addressed
	> *imposing a requirement in the Development Consent Order* > *requiring the applicant to enter into an obligation."*	and anomalies of high and medium archaeological potential. The commitment to avoid all known marine archaeological and cultural heritage receptors and to further investigate the area of impacts ensuring that unknown marine archaeological and cultural heritage receptors are located, and impact mitigated will ensure preservation *in situ* (see Volume 9, Report 19: Outline Marine Written Schemes of Investigation). Where marine archaeological and cultural heritage 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 and relevant stakeholders.
	Paragraph 5.9.20 *"That will prevent the loss occurring until the relevant part of the development has commenced, or it is reasonably certain that the relevant part of the development is to proceed."*	No impact on marine archaeological and cultural heritage receptors is expected to lead to harm or total loss of significance. However, where marine archaeological and

Legislation/ Policy	Key Provisions	Section Where Comment Addressed
		cultural heritage receptors may be 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 and relevant stakeholders.
	Paragraph 5.9.21 *"Where there is a high probability (based on an adequate assessment) that a development site may include, as yet undiscovered heritage assets with archaeological interest, the Secretary of State will consider requirements to ensure appropriate procedures are in place for the identification and treatment of such assets discovered during construction."*	Mitigations relevant to marine archaeological and cultural heritage receptors are set out in Table 11.17 and detail how data will be collected and assessed to ensure that as yet undiscovered marine archaeological and cultural heritage receptors are identified. Should unidentified marine archaeological and cultural heritage receptors be located during project works, a Protocol for Archaeological Discoveries (PAD) (see Appendix A of Volume 9, Report 19: Outline Marine Written Schemes of Investigation) is implemented as per mitigation (Table 11.17). The mitigation is secured through the DCO.

Legislation/ Policy	Key Provisions	Section Where Comment Addressed
	Paragraph 5.9.22 "*In determining applications, the Secretary of State should seek to identify and assess the particular significance of any heritage asset that may be affected by the proposed development, including by development affecting the setting of a heritage asset (including assets whose setting may be affected by the proposed development), taking account of:* > *relevant information provided with the application and, where applicable, relevant information submitted during the examination of the application* > *any designation records, including those on the National Heritage List for England[237] , or included on Cof Cymru[238] for Wales.* > *historic landscape character records* > *the relevant Historic Environment Record(s), and similar sources of information* > *representations made by interested parties during the examination process* > *expert advice, where appropriate, and when the need to understand the significance of the heritage asset demands it"* "[237] *See https://historicengland.org.uk/listing/the-list/*	The significance of the known marine archaeological and cultural heritage receptors within the offshore zone and potential impact on known and unknown marine archaeological and cultural heritage receptors identified has been undertaken according to the methodology outlined in Section 11.4. The results of the assessments, including setting in the context of Historic Seascape Characterisation (HSC), are detailed in Volume 6, Part 5, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report and are summarised in Section 11.7.

Legislation/ Policy	Key Provisions	Section Where Comment Addressed
	[238] *See https://cadw.gov.wales/advice-support/cof-cymru"*	
	Paragraph 5.9.24 *"In considering the impact of a proposed development on any heritage assets, the Secretary of State should consider the particular nature of the significance of the heritage assets and the value that they hold for this and future generations. This understanding should be used to avoid or minimise conflict between their conservation and any aspect of the proposal."*	While generally no active conservation strategy is proposed, Archaeological Exclusion Zones (AEZ) (as per mitigation in Table 11.17) have been applied to all known wrecks and obstructions and anomalies of high and medium archaeological potential identified in the geophysical data. The commitment to avoid all known marine archaeology marine heritage receptors and to further investigate the area of impacts ensuring that unknown marine heritage receptors are located, and impact mitigated will ensure preservation *in situ*, as further detailed in Volume 9, Report 19: Outline Marine Written Schemes of Investigation. Where known receptors require further intrusive investigation or where they cannot be preserved *in situ*, reporting and conservation strategies will be clearly outlined in the relevant Method Statements produced ahead of any such works.

Legislation/ Policy	Key Provisions	Section Where Comment Addressed
	Paragraph 5.9.25 *"The Secretary of State should consider the desirability of sustaining and, where appropriate, enhancing the significance of heritage assets, the contribution of their settings and the positive contribution that their conservation can make to sustainable communities, including to their quality of life, their economic vitality, and to the public's enjoyment of these assets. [239]"* *"[239] This can be by virtue of: heritage assets having an influence on the character of the environment and an area's sense of place; heritage assets having a potential to be a catalyst for regeneration in an area, particularly through leisure, tourism and economic development; heritage assets being a stimulus to inspire new development of imaginative and high quality design; and the mixed and flexible patterns of land use in historic areas that are likely to be, and remain, sustainable"*	This provision is not directly applicable to marine archaeological and cultural heritage receptors, the mitigation measure for the archaeological assessment of data as outlined in Table 11.17 and Volume 9, Report 19: Outline Marine Written Schemes of Investigation is secured through the DCO. Positive contributions to knowledge and understanding of the historic environment can be realised through data gathering, interpretation and publication. The works will contribute to current research frameworks in the region and will be further detailed in forthcoming relevant Method Statements, which will consider relevant research frameworks to reflect and enhance the ongoing research in the area.
	Paragraph 5.9.26 *"The Secretary of State should also consider the desirability of the new development making a positive contribution to the character and local distinctiveness of the historic environment. The consideration of design should include*	As detailed in Volume 9, Report 19: Outline Marine Written Schemes of Investigation which is secured through mitigation (Table 11.17) and is secured through the DCO, positive contributions to knowledge

Legislation/ Policy	Key Provisions	Section Where Comment Addressed
	scale, height, massing, alignment, materials, use and landscaping (for example, screen planting).”	and enhancement of understanding of the historic environment can be realised through data gathering, interpretation and publication. The works will contribute to current research frameworks in the region and will be further detailed in forthcoming Method Statements.
	Paragraph 5.9.27 *“When considering the impact of a proposed development on the significance of a designated heritage asset, the Secretary of State should give great weight to the asset’s conservation. The more important the asset, the greater the weight should be. This is irrespective of whether any potential harm amounts to substantial harm, total loss, or less than substantial harm to its significance.”*	No impact on marine archaeological and cultural heritage receptors is expected to lead to harm or total loss of significance. AEZs (as per Table 11.17) have been applied to all known wrecks and obstructions, and anomalies of high and medium archaeological potential. The commitment to avoid all known marine archaeological and cultural heritage receptors and to further investigate the area of impacts ensuring that unknown marine archaeological and cultural heritage receptors are located, and impact mitigated will ensure preservation *in situ* (see Volume 9, Report 19: Outline Marine Written Schemes of Investigation). Where marine archaeological and cultural heritage receptors are directly impacted or
	Paragraph 5.9.28 *“The Secretary of State should give considerable importance and weight to the desirability of preserving all heritage assets. Any harm or loss of significance of a designated heritage asset (from its alteration or destruction, or from development within its setting) should require clear and convincing justification.”*	
	Paragraph 5.9.30 *“Substantial harm to or loss of significance of assets of the highest significance, including Scheduled Monuments; Protected Wreck Sites; Registered Battlefields; grade I and II**	

Legislation/ Policy	Key Provisions	Section Where Comment Addressed
	Listed Buildings; grade I and II Registered Parks and Gardens; and World Heritage Sites, should be wholly exceptional."*	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 and relevant stakeholders.
	Paragraph 5.9.31 *" Where the proposed development will lead to substantial harm to (or total loss of significance of) a designated heritage asset the Secretary of State should refuse consent unless it can be demonstrated that the substantial harm to, or loss of, significance is necessary to achieve substantial public benefits that outweigh that harm or loss, or all the following apply:* > *the nature of the heritage asset prevents all reasonable uses of the site* > *no viable use of the heritage asset itself can be found in the medium term through appropriate marketing that will enable its conservation* > *conservation by grant-funding or some form of not for profit, charitable or public ownership is demonstrably not possible* > *the harm or loss is outweighed by the benefit of bringing the site back into use"*	
	Paragraph 5.9.32 *" Where the proposed development will lead to less than substantial harm to the significance of the designated heritage asset, this harm should be weighed against the*	As detailed in Volume 9, Report 19: Outline Marine Written Schemes of Investigation which is secured (Table 11.17) in the DCO, positive contributions to knowledge and

Legislation/ Policy	Key Provisions	Section Where Comment Addressed
	public benefits of the proposal, including, where appropriate securing its optimum viable use."	enhancement of understanding of the historic environment can be realised through data gathering, interpretation and publication. The works will contribute to current research frameworks in the region and will be further detailed in forthcoming Method Statements.
	Paragraph 5.9.33 *" In weighing applications that directly or indirectly affect non-designated heritage assets, a balanced judgement will be required having regard to the scale of any harm or loss and the significance of the heritage asset."*	No impact on marine archaeological and cultural heritage receptors is expected to lead to harm or total loss of significance. AEZs (as per Table 11.17) have been applied to all known wrecks and obstructions, and anomalies of high and medium archaeological potential. The commitment to avoid all known marine archaeological and cultural heritage receptors and to further investigate the area of impacts ensuring that unknown marine archaeological and cultural heritage receptors are located, and impact mitigated will ensure preservation *in situ* (see Volume 9, Report 19: Outline Marine Written Schemes of Investigation). Where marine archaeological and cultural heritage receptors are directly impacted or

Legislation/ Policy	Key Provisions	Section Where Comment Addressed
		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 and relevant stakeholders.
	Paragraph 5.9.35 *" Where there is evidence of deliberate neglect of, or damage to, a heritage asset, the Secretary of State should not take its deteriorated state into account in any decision.[240] "* *"[240] Historic Environment Good Practice Advice in Planning 2 provides further advice on managing significance in decision-taking in the historic environment, available online at: See https://historicengland.org.uk/imagesbooks/publications/gpa2-managing-significance-in-decision-taking/"*	All known wreck sites, their archaeological significance, condition, and vulnerability, where known, is described in Section 3 of Volume 6, Part 5, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report .
	Paragraph 5.9.36 *"When considering applications for development affecting the setting of a designated heritage asset, the Secretary of State should give appropriate weight to the desirability of preserving the setting such assets and treat favourably applications that preserve those elements of the setting that make a positive contribution to, or better reveal the significance of, the asset. When considering applications that do not do this, the Secretary of State should give great weight*	The significance of the known marine archaeological and cultural heritage receptors within the offshore zone and potential impact on known and unknown marine archaeological and cultural heritage receptors identified has been undertaken according to the methodology outlined in Section 11.4. The results of the

Legislation/ Policy	Key Provisions	Section Where Comment Addressed
	to any negative effects, when weighing them against the wider benefits of the application. The greater the negative impact on the significance of the designated heritage asset, the greater the benefits that will be needed to justify approval.[241]" *"[241] See the Infrastructure Planning (Decisions) Regulations 2010"*	assessments, including setting in the context of Historic Seascape Characterisation (HSC), are detailed in Volume 6, Part 5, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report and are summarised in Section 11.7.
National Policy Statement for Renewable Energy Infrastructure (EN-3). November 2023	Paragraph 2.8.167 *"The marine historic environment can be affected by offshore wind farm and offshore transmission development in two principal ways:* > *from direct effects arising from of the physical siting of the development itself such as the installation of wind turbine foundations and electricity cables or the siting of plant required during the construction phase of development; and* > *from indirect changes to the physical marine environment (such as scour, coastal erosion or sediment deposition) caused by the proposed infrastructure itself or its construction (see the policy on physical environment at paragraphs 2.8.111 of this NPS)."*	No impact on marine archaeological and cultural heritage receptors is expected to lead to harm or total loss of significance from direct or indirect impacts brought about by the construction, operation, maintenance or decommissioning of VE OWF. As per Table 11.17, mitigation strategies have been applied to all avoid impact at all stages of the Project. Volume 9, Report 19: Outline Marine Written Schemes of Investigation forms a working strategy to outline how these mitigation methodologies will be implemented throughout the lifetime of the Project.
	Paragraph 2.8.168	Ongoing consultation with Historic England has contributed to the

Legislation/ Policy	Key Provisions	Section Where Comment Addressed
	"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 Commercial Renewable Energy Development and the Historic Environment: Historic England Advice Note 15 (Historic England 2021) Historic Environment Guidance for the Offshore Renewable Energy Sector (Wessex Archaeology 2007) Archaeological Written Schemes of Investigation for Offshore Wind Farm Projects (The Crown Estate and Wessex Archaeology 2021)"*	steering of this Chapter and the accompanying annexes (Volume 6, Part 5, Annex 11.1: Marine Archaeology and Cultura; Heritage Technical Report and Volume 9, Report 19: Outline Marine Written Schemes of Investigation). A summary of can be seen in Table 11.2.
	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 marine archaeological and cultural heritage receptors are discussed in Section 11.12, Section 11.13 and Section 11.14. Mitigation to avoid or offset any impacts as a result of the Project is detailed in Volume 9, Report 19: Outline Marine Written Schemes of Investigation and Table 11.17.
	Paragraph 2.8.170	

Legislation/ Policy	Key Provisions	Section Where Comment Addressed
	"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."	Volume 6, Part 5, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report 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 11.7.
	Paragraph 2.8.171 *"These studies should consider any geotechnical or geophysical surveys that have been undertaken to aid the wind farm and/or offshore transmission design."*	
	Paragraph 2.8.172 *"Whilst it should be possible for a development project to avoid designated heritage assets, the knowledge currently available about the historic environment in the inshore and offshore areas is limited, as much of the seafloor around our coasts and at sea has yet to be mapped or explored fully."*	AEZs as per Table 11.17 have been applied to all known wrecks and obstructions and anomalies of high and medium archaeological potential identified in the geophysical data, as outlined Section 11.8. Further investigations, including geophysical and geotechnical surveys and the inclusion of archaeological objectives in all relevant surveys, as well as the application of the PAD when works occur without an archaeologist present will help ensure further identification and protection of heritage assets. The mitigations are further detailed in Table 11.17.
	Paragraph 2.8.173 *"Applicants are required to determine how any known heritage assets might best be avoided."*	

Legislation/ Policy	Key Provisions	Section Where Comment Addressed
	Paragraph 2.8.174 *"The applicant will be expected to conduct all necessary examination and assessment exercises using a variety of survey techniques to plan the development so as to optimise opportunities for avoidance."*	Volume 6, Part 5, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report 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 11.8.
	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."*	Mitigations relevant to marine archaeological and cultural heritage receptors are set out in Table 11.17 and detail how data will be collected and assessed to ensure that as yet undiscovered marine archaeological and cultural heritage 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 and relevant stakeholders (see Volume 9, Report 19: Outline Marine Written Schemes of Investigation).

Legislation/ Policy	Key Provisions	Section Where Comment Addressed
		The mitigations are secured through the DCO.
	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 marine archaeological and cultural heritage receptors as a result of project activities are discussed in Table 11.17. Specific Project surveys 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.
	Paragraph2.8.177 *"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.
	Paragraph 2.8.252 *"The avoidance of important heritage assets to ensure their protection in situ, is the most effective form of protection."*	AEZs as per Table 11.17 have been applied to all known wrecks and obstructions and anomalies of

Legislation/ Policy	Key Provisions	Section Where Comment Addressed
	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."*	high and medium archaeological potential identified in the geophysical data, as outlined in Section 11.8. The mitigations are further detailed in Table 11.17.
	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."*	
	Paragraph 2.8.255 *"The ability of the applicants to microsite specific elements of the proposed development during the construction phase should be an important consideration by the Secretary of State when assessing the risk of damage to archaeology."*	Where possible, all intrusive activities will be routed and microsited to avoid any identified marine archaeological and cultural heritage receptors with AEZs as per mitigation outlined in Table 11.17, and best practice. This commitment and further mitigation are detailed in Volume 9, Report 19: Outline Marine Written Schemes of Investigation.
	Paragraph 2.8.256 *" Where requested by the applicant, the Secretary of State should consider granting consents which allow for micrositing/microrouting (see paragraphs 2.8.76 above) within a specified tolerance."*	
	Paragraph 2.8.257 *"To ensure a programme of archaeological works have been secured, an outline WSI, covering the entirety of the defined project area and full duration of the project, that complies with*	

Legislation/ Policy	Key Provisions	Section Where Comment Addressed
	the policy in this NPS, should be submitted within the application."	
	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."*	
	Paragraph 2.8.325 *"The Secretary of State should be satisfied that any proposed offshore wind farm 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."*	Volume 6, Part 5, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report presents and details the archaeological DBA and the archaeological assessment of geophysical data collected to date. The results are further summarised in Section 11.8. AEZs (as per Table 11.17) have been applied to all known wrecks and obstructions and anomalies of high and medium archaeological potential identified in the geophysical data, as outlined in Section 11.8. The mitigations are further detailed in Table 11.17.

11.3 CONSULTATION

11.3.1 Consultation has been undertaken between the Applicant, Historic England, Essex County Council, and the Marine Management Organisation (MMO) via the offshore archaeology and cultural heritage Expert Topic Group (ETG), discussing the offshore archaeology and cultural heritage and general approaches to the offshore assessment.

11.3.2 In addition, Section 42 responses were received in June 2023 (Table 11.2). The key issues arising from Section 42 concerned the assessment of Historic Seascape Characterisation (HSC), the correct implementation of both WSI and Protocol for Archaeological Discoveries (PAD) documents and the importance of inclusion of archaeological objectives when conducting survey campaigns. The comments have been included in the table below, with the exception of those which were agreed and required no further action.

11.3.3 Following Section 42, and prior to ES submission, an ETG meeting was held in September 2023 to discuss the Section 42 comments with the curators and the actions moving forward. As no representatives from the offshore curators for Historic England were available an additional ETG was held with a representative from Historic England Marine Planning in October 2023 where actions moving forward following the Section 42 comments were presented.

11.3.4 It should be noted that previous consultation from Scoping has been included in the table below to provide an overall context of discussions, however key issues that have been addressed and Sections that are referred to may no longer be relevant.

Table 11.2: Summary of consultation relating to Offshore Archaeology and Cultural Heritage

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
11/08/2021 Pre-Scoping ETG	> Historic England raised the point in relation to mitigation and recognising the difference between adaptive/ further mitigation. > The importance of geotechnical surveys in the area to establish information about the palaeogeographic potential of the area was raised. > The importance of specialist archaeological input in the identification of anomalies within the geophysical data and subsequent mitigation (including investigation) was raised. > Updates to the HSC guidance had been made and should be incorporated into the assessment.	The EIA takes into account the mitigation and apply further adaptive mitigation where required to minimise the risk to marine heritage receptors. The current mitigation proposed is outlined in Section 11.11 and further detailed in Section 6 of Volume 9, Report 19: Outline Marine Written Schemes of Investigation. Geotechnical surveys are planned post consent and will be preceded by a Method Statement including archaeological objectives. This is outlined in the proposed mitigation (Section 11.11) and detailed in Section 8.4 of Volume 9, Report 19: Outline Marine Written Schemes of Investigation. The identification of anomalies of possible archaeological interest in the survey data recommended to be protected by AEZs has been in addition to any confirmation of known (charted) wrecks. The assessment methodology is detailed in Section 11.4 of this chapter and Section 2.4 of Volume 6, Part 5, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report.

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
		Recommendations for further investigation are covered in Section 8.4 of Volume 9, Report 19: Outline Marine Written Schemes of Investigation. The most recent relevant guidance has been used to inform the HSC assessment (detailed in Section 3.7 of Volume 6, Part 5, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report and summarised in Section 11.7 of this document).
22/08/21 Geophysical Method Statement reply from Historic England	> Historic England concurred with the aims and objectives set out in the Method Statement and that the archaeological assessments of these data will be included within the draft PEIR which should be made available for consultation in 2023. > It was noted that the specifications for the surveys systems to be employed were not specified, but were to include: > Echo Sounder (Multibeam system) > Side scan sonar > Magnetometer; and > Sub-Bottom Profiler and that the data was to be suitable for archaeological assessment. > Historic England highlighted that readily identifiable wreck	The archaeological assessment of the geophysical data is outlined in Sections 11.8 and 11.9, and discussed in full in Volume 6, Part 5, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report. The specifications for the geophysical survey systems are described in Section 2.4 of Volume 6, Part 5, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report and its suitability for archaeological assessment was graded as 'good' as defined by the parameters set out in the same section. The archaeological potential of the identified geophysical anomalies (Table 11.12) refers to the likelihood that they may be of archaeological interest or

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
	sites (e.g., UKHO charter wrecks) do not necessarily imply anomalies of 'high' archaeological potential, whereas other anomalies encountered which merit subsequent investigation may prove to be of very high archaeological potential. > It was recommended that completed technical reports as a result of other consented developments, such as adjacent offshore wind farms, that are now held by national or local archives were utilised in the corroboration of desk-based sources of information and the interpretation of geophysical data. > It was recommended that mitigation options should consider dedicated data capture that examines the palaeoenvironmental potential and data requirements to produce sedimentary deposit model(s). And that a geotechnical data method statement would determine whether AEZ present a viable mitigation strategy. > It was noted that it was proposed that the archaeological assessment of geophysical data (a technical report) would be submitted to Historic England for 'approval', however the role of Historic England at this stage of the pre-application project development was to provide advice (as per the Evidence	significance. This is clarified further in Section 2.6 of Volume 6, Part 5, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report. The archaeological significance of recorded and identified wrecks is determined by the criteria for the assessment of archaeological significance, as set out by the Department for Culture Media and Sport (DCMS 2013) (Section 3.3 of Volume 6, Part 5, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report). Reports from adjacent offshore wind farms have been included in the marine archaeology baseline (Table 11.3) and to inform the archaeological assessment of geophysical data outlined in Sections 11.8 and 11.9, and further detailed in Volume 6, Part 5, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report. The archaeological assessment of available data is included in the proposed mitigation measures (Section 11.11 and Table 11.17 of this document) and detailed in Sections 6.5 and 8.4 of Volume 9, Report 19: Outline Marine Written

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
	Plan Process), and that such information could be shared through an ETG, and reporting could be used to inform the PEIR and accompanying Outline Marine WSI.	Schemes of Investigation. Geotechnical surveys will occur pre-construction should consent be obtained. These will be informed by the geoarchaeological assessment of geophysical data and baseline data (see Section 11.9 of this document and Section 4.3 of Volume 6, Part 5, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report). Mitigation for deposits of geoarchaeological potential is defined in Section 5.5 of Volume 6, Part 5, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report and Section 8.4 of Volume 9, Report 19: Outline Marine Written Schemes of Investigation. The archaeological assessment of the geophysical data collected has been compiled in Volume 6, Part 5, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report and used to inform this chapter and the mitigation set out in Volume 9, Report 19: Outline Marine Written Schemes of Investigation. The information attained during the baseline assessment has been shared with Historic England during the ETG

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
		meetings listed below and all three of these documents will be shared with Historic England for their advice during the PEIR submission.
7/12/2021 Post-Scoping ETG	> The question of whether the WSI and PAD would be included as part of the PEIR was raised. > The importance of thorough archaeological assessment of the geophysical data as seemingly minor anomalies identified on/ within the seabed could represent presently unknown archaeology sites was reiterated. Historic England also noted that a detailed WSI is required to explain the survey methodologies and techniques to identify heritage assets so that risks can be managed. > Historic England emphasised the importance of the geoarchaeological potential and palaeolandscapes in this area and that field work would be essential to furthering this understanding.	An Outline Marine WSI and PAD are accompanying this ES chapter and can be found in Volume 9, Report 19: Outline Marine Written Schemes of Investigation. All geophysical anomalies were cross-checked against known records to contribute to their interpretation. The methodology for archaeological assessment of geophysical data is detailed in Section 11.8 of this chapter and Section 2.4 of Volume 6, Part 5, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report. Recommendations for further investigation are covered in Section 8.4 of Volume 9, Report 19: Outline Marine Written Schemes of Investigation. Geotechnical surveys are planned post consent and will be preceded by a Method Statement, including archaeological objectives, which will be submitted for review and agreement to Historic England prior to commencement. This is outlined in the proposed mitigation (Section 11.11) and detailed in Section 8.4

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
		of Volume 9, Report 19: Outline Marine Written Schemes of Investigation.
Scoping Opinion, 2021 - PINS on behalf of SoS	The Scoping Report states that the proposed study area represents an industry standard. The Inspectorate notes that many of the potential impacts from the proposed development result from changes to marine physical processes. It is not clear why the study area to be used for the assessment is different to that proposed for the assessments of physical processes in Chapter 7 of the Scoping Report. The ES should provide a justification for the extent of the study area used in the assessment which addresses this point.	The area defined as the marine archaeology study area is used for the baseline assessment and is a buffer of 1 km around the Order Limits This is used because of the uncertainty of positions of historical ship losses during the baseline assessment. The Order Limits have been used for the impact assessment at PEIR. Is clarified in Section 11.4 and references to Volume 6, Part 2, Chapter 2: Marine Geology, Oceanography and Physical Processes will be made where relevant.
Scoping Opinion, 2021 - PINS on behalf of SoS	The marine archaeological and cultural heritage chapter of the Scoping Report refers to a geographic scope within the intertidal zone up to Mean High Water Springs. The onshore cultural heritage chapter includes the intertidal zone down to Mean Low Water Springs. The Scoping Report states that this 'intertidal overlap' is to ensure there is total coverage of the offshore area of search between the two chapters. The ES should ensure that there is no 'double counting' of onshore heritage and marine heritage receptors and that there is consistency between the assessments.	Continued liaison with the onshore cultural heritage authors will occur to ensure that no double counting will occur where there is an overlap of marine heritage receptors (most recently the pre-meet for the Pre-PEIR ETG, 18 October 2022).
Scoping Opinion, 2021 - PINS on behalf of SoS	The assessment should consider the following additional data sources:	These data sources have been included in Section 11.7 and Section 3.7 of

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
	> National Historic Seascape Characterisation Consolidation (Land Use Consultants, 2018). > Sturt, Fraser and Dix, Justin K., EMU Ltd (2009) The Outer Thames Estuary Regional Environmental Characterisation (09/J/1/06/1305/0870) London, GB. ALSF/MEPF (DEFRA) 145pp.	Volume 6, Part 5, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report where the Historic Seascape Characterisation is assessed, and Section 11.9 of this chapter Section 4.3 of Volume 6, Part 5, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report where the geoarchaeological characterisation of the marine archaeological study area is considered.
Scoping Opinion, 2021 - PINS on behalf of SoS	The Scoping Report proposes to undertake archaeological assessments of available marine geophysical and geotechnical survey data, and based on known marine heritage receptors, establish Archaeological Exclusion Zones. No new surveys are explicitly proposed within the scope of the ES. The production of an Outline Marine Written Schemes of Investigation (WSI) is proposed to outline the methodological approach to the post-consent mitigation measures. The baseline environment should be established with agreement from relevant stakeholders. Desk-based sources of information should be corroborated with survey work. The Inspectorate recommends that a WSI is developed at the early stage of survey commissioning to set out methodological approaches for survey data analysis, such as geophysical, geotechnical, and visual inspection techniques. Following the analysis, any proposed mitigation	Volume 9, Report 19: Outline Marine Written Schemes of Investigation (the Outline Marine WSI) has been produced to accompany this Offshore Archaeology and Cultural Heritage Chapter and made available for comment to ensure appropriate survey and mitigation can be established and agreed. The methodological approach and mitigation measures outlined in Section 11.10 and Section 11.11 (respectively) of this chapter are further detailed in the Outline Marine WSI.

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
	measures should be outlined in an archaeological mitigation strategy.	
Scoping Opinion, 2021 - PINS on behalf of SoS	The ES should take into consideration the following additional guidance: > Gribble, J. and Leather, S. for EMU Ltd. (2011) Offshore Geotechnical Investigations and Historic Environment Analysis: Guidance for the Renewable Energy Sector. Commissioned by COWRIE Ltd (project reference GEOARCH-09).	This guidance has been referred to in the planned phased approach undertaken for the geoarchaeological assessment of geophysical data and in the specification of the geophysical survey Method Statement. At this stage no geotechnical surveys have been undertaken; however, this guidance will be included when these data assessments occur.
Scoping Opinion, 2021 - PINS on behalf of SoS	The Inspectorate notes that an initial study area of 50 km around the array areas and offshore AoS has been proposed which may be subject to revision as the proposed development progresses. The ES must clearly describe the final extent of the study area and explain how it reflects the zone of influence for the proposed development.	The marine archaeology study area is defined within Section 11.4, the 50 km zone of influence applied in the cumulative impact assessment is detailed in Section 11.15.
Scoping Opinion, 2021 - PINS on behalf of SoS	It is not clear from the wording in the Scoping Report if the ES will deal with transboundary impacts on marine archaeology or not. The ES should either include an assessment of transboundary effects or provide a justification as to why these would not arise.	Transboundary effects are discussed in Section 11.18 of this chapter.
Scoping Opinion, 2021 - Historic England	We confirm that historic environment represents a potentially significant issue in EIA terms, for both onshore and offshore elements, and confirm our view the historic environment should be 'scoped in' to the assessment. We agree that 'marine archaeological and cultural heritage'	As agreed, all impacts are 'scoped in' for assessment. These are detailed in Sections 11.12 to 11.19 of this chapter.

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
	receptors are fully scoped into the EIA exercise, including any Preliminary Environmental Information Report (PEIR), for this proposed project.	
Scoping Opinion, 2021 - Historic England	To assist any further planning of the proposed NFOW project we offer the following link to the Historic England Advice Note 15 Commercial Renewable Energy Development and the Historic Environment (2021): https://historicengland.org.uk/images-books/publications/commercial-renewableenergy- development-historic-environment-advice-note-15/	This guidance has been referred to as part of the assessment methodology for this chapter and Volume 6, Part 5, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report.
Scoping Opinion, 2021 - Historic England	We note that para. 16.4.7 mentions the seascape character assessment published by the MMO and we add that the MMO seascape data does include Historic Seascape Characterisation (HSC) data as a means to derive a sense of character. It is important to add that the effectiveness of HSC as a means to understand how seascape can accommodate change will depend on how the available methodology is used.	The HSC baseline and its ability to accommodate change has been outlined in Section 11.7 of this chapter and further detailed with reference to the narrative of examples of character types within the region surrounding VE, perceptions of these characters and their vulnerability to change in Section 3.7 of Volume 6, Part 5, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report.
Scoping Opinion, 2021 - Historic England	We note Chapter 17 relating to marine archaeology and cultural heritage that has been submitted in the Scoping Report. On the basis of the information presented in the Scoping Report, we concur with the statement made in para. 17.5.3 that no impacts have been scoped out for the assessment of marine archaeology and cultural heritage.	As agreed, all impacts are 'scoped in' for assessment. These are detailed in Section 11.12 to Section 11.19 of this chapter.

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
Scoping Opinion, 2021 - Historic England	We note Table 17.1 includes 'England's Historic Seascapes Marine HLC Pilot Study: Southwold to Clacton', which was produced in 2007 with a summary that states it is a 'Description of palaeolandscape and marine archaeological potential.' The appropriate Historic Seascape Characterisation (HSC) reference to be used, however, is the National Historic Seascape Characterisation Consolidation (Land Use Consultants, 2018). This provides the methodological approach to be used for HSC in any PEIR subsequently produced (as mentioned in 17.6.1).	This has been updated and the relevant guidance has been used to complete the HSC assessment in Section 3.7 of Volume 6, Part 5, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report, and Section 11.7 of this chapter.
Scoping Opinion, 2021 – Historic England	It is also important that the applicant is aware that HSC is not a means to describe per se. HSC is a means to derive a perception of historic character based on disparate spatial data in different spatial dimensions as relevant to the marine environment. Consequently, a key aspect of its inclusion within an Environmental Statement is to determine how perceptions of historic character may accommodate change as proposed by the development project in question.	The HSC baseline and its ability to accommodate change has been outlined in Section 11.7 of this chapter and further detailed with reference to the narrative of examples of character types within the region surrounding VE, perceptions of these characters and their vulnerability to change in Section 3.7 of Volume 6, Part 5, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report.
Scoping Opinion, 2021 - Historic England	We also recommend that the following reference is used and added: > Sturt, Fraser and Dix, Justin K., EMU Ltd (2009) The Outer Thames Estuary Regional Environmental Characterisation (09/J/1/06/1305/0870) London, GB. ALSF/MEPF (DEFRA) 145pp.	This is referred to in the description of the baseline in Section 11.7 and Section 3.2 of Volume 6, Part 5, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report and where the geoarchaeological data is assessed in Section 11.9 and Section 4.3 of Volume

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
		6, Part 5, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report.
Scoping Opinion, 2021 - Historic England	Table 17.2 contains useful information regarding the possibility of encountering known and unknown elements of the historic environment, which is particularly relevant for the location of this proposed development. For example, archaeological materials associated with merchant trade conducted over centuries; periods of warfare, such as mentioned in para. 17.4.14 regarding a battle in the Second Anglo-Dutch Wars in July 1666; and aviation losses (allied and enemy), especially from the Second World War. Paragraph 17.5.1 should be expanded to include Gribble, J. and Leather, S. for EMU Ltd. (2011) Offshore Geotechnical Investigations and Historic Environment Analysis: Guidance for the Renewable Energy Sector. Commissioned by COWRIE Ltd (project reference GEOARCH-09).	Reference to the examples of known losses and sites has been included in the baseline review (Section 3 of Volume 6, Part 5, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report). Reference to the 2011 COWRIE guidance has also been included in both this chapter and Volume 6, Part 5, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report and will be utilised when it comes to the geoarchaeological assessment of geotechnical data.
Scoping Opinion, 2021 - Historic England	We note para. 17.4.10 states that, although there are no recorded peats at the landfall site, peat has been recorded in adjacent areas. There is, therefore, the potential for peat to be present which is of archaeological interest, and this will need to be assessed.	The potential for peat within the marine archaeology study area is detailed in Section 4.3 of Volume 6, Part 5, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report and outlined in Section 11.9 this chapter.
Scoping Opinion, 2021 - Historic England	We note the detail provided in Table 17.5 regarding the direct and indirect impacts that may occur during the construction, operation and decommissioning of the proposed development. We are pleased this	The impacts scoped into the assessment for offshore archaeology and cultural heritage are further detailed in Section 11.12 to Section 11.19 of this chapter.

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	has included the potential for physical damage, compression and scour of archaeological deposits.	
Scoping Opinion, 2021 - Historic England	Paragraph 17.5.6 states that the mitigation measures adopted will focus on the implementation of Archaeological Exclusion Zones (AEZs), the development of a Written Schemes of Investigation (WSI) and Protocol for Archaeological Discoveries (PAD) and the commitment to undertake a full archaeological review of geophysical and geotechnical data, which is welcomed. Regarding the proposed approach to assessment, however, we consider it important that the following matters are clarified, below.	These mitigation measures are further detailed in Table 11.17 and Section 11.11 of this chapter.
Scoping Opinion, 2021 - Historic England	The Scoping Report implies that marine archaeological materials ('marine heritage receptors') '…will be identified during the archaeological assessment of geophysical and geotechnical data ahead of PEIR…' (Table 17.5). The use of AEZs or 'appropriate buffer areas' are identified as a mitigation mechanism to inform the project design stage (17.5.6 and Table 17.5). It is important to note that the primary purpose of a marine archaeological WSI is to set out methodological approaches for survey data analysis, such as geophysical, geotechnical, and visual inspection techniques. The use of the WSI is most effectively employed at the early stage of survey commissioning to maximise the potential for data acquisition that supports archaeological analysis and interpretation.	Volume 9, Report 19: Outline Marine Written Schemes of Investigation has been produced to accompany this chapter and will be developed throughout the project in accordance with The Crown Estate's 2021 guidance and in consultation with Historic England. Further data acquisition, such as post-consent geotechnical surveys will be preceded by a specific Method Statement presented to the Archaeological Curators for agreement.

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
Scoping Opinion, 2021 – Historic England	Subject to any agreed programme of analysis (supported by detailed Method Statements), it may be that sites, features and/ or other anomalies of possible or known archaeological interest should be protected *in situ* by adopting an avoidance strategy. In this case, it will be necessary to identify AEZs. The extent to which it is possible to inform any subsequent PEIR is dependent on what survey work is conducted to corroborate desk-based sources of information, e.g., UK Hydrographic Office and Historic England records (as listed in Appendix B and C).	Any programme of analysis will be preceded by a programme specific Method Statement. Archaeological analysis of these programmes will also include reference to desk-based resources and will then inform recommended AEZs and any further survey work (also to be preceded by Method Statements).
Scoping Opinion, 2021 – Historic England	Furthermore, the use of a PAD is solely a means to deal with a situation when consented works are being conducted and previously unknown marine archaeological marine heritage receptors are discovered, so that key stakeholders take the necessary action with minimum of delay. The cross-reference to a marine WSI should be to ensure that agreed methodologies for examination are conducted to assist determination of archaeological interest.	The supplementary role of the PAD as a 'safety net' which enables unexpected or incidental finds to be reported and further investigated or avoided through a Temporary Exclusion Zone (TEZ) has been further detailed in Section 11.11 of this chapter and throughout Volume 9, Report 19: Outline Marine Written Schemes of Investigation.
Scoping Opinion, 2021 - Historic England	We note the reference to 'designed-in measures' (17.5.4). We would recommend that the EIA explains how an 'Outline Marine WSI' will be designed to inform any and all programmes of survey investigation, as may occur after consent (should permission be obtained) and prior to any defined phase of 'construction' as may require the production of a 'final' WSI (as mentioned in para. 17.5.6).	Volume 9, Report 19: Outline Marine Written Schemes of Investigation has been produced to accompany this chapter and will be developed throughout the project in accordance with The Crown Estate 2021 guidance and in consultation with Historic England. Further data acquisition, such as the forthcoming geotechnical

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
		surveys will be preceded by a specific Method Statement presented to the Archaeological Curators for agreement.
Scoping Opinion, 2021 - Historic England	It is essential that the commissioning of any pre-construction surveys is informed by the methodological approach contained within a WSI. It is insufficient if the Outline WSI is only used to indicate the presence of AEZs, especially if primarily based on low-resolution geophysical survey data and/ or other pre-existing survey data and reports. In this regard, we welcome the statement made in para. 17.5.7 and the agreement of a methodological approach with advisors, such as Historic England.	The role of the WSI as a mitigation is included in Section 11.11 of this chapter. Clarifications have been made to demonstrate that the Outline Marine WSI does not only indicate the presence of AEZ's but outlines general methodologies for further archaeological works which will be detailed in any associated Method Statements. This approach is demonstrated in Volume 9, Report 19: Outline Marine Written Schemes of Investigation.
Scoping Opinion, 2021 - Historic England	We note para. 17.5.12 regarding determination of cumulative impacts (e.g., other offshore wind farms as shown in Figure 14.7), and we look forward to receiving further details about this aspect of the assessment exercise during pre-application.	The environmental assessment of the cumulative impacts is outlined in Section 11.15.
Scoping Opinion, 2021 - Historic England	In reference to 'potential transboundary impacts', para. 17.5.20 mentions the possibility that '…paleochannels and palaeolandscapes…stretch beyond international boundaries.' Although we appreciate the logic that impact is expected to be within the proposed VE OWFL project area, we are interested in the remark regarding mitigation based on '…archaeological assessments of available geophysical and geotechnical data.' It is important	Any forthcoming geotechnical surveys will be informed by the geoarchaeological assessment of geophysical data (Section 11.9 of this chapter and Section 4.3 of Volume 6, Part 5, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report) with targeted cores for archaeological assessment

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
	that the EIA explains the methodological approach which underpins an effective mitigation programme based on geoarchaeological processing of survey data. We recommend this is clarified.	to be included in the sampling. Section 11.11 describes the mitigation which will ensure full archaeological review of geotechnical data where relevant in consultation with Historic England.
Scoping Opinion, 2021 - Historic England	It is also important that research questions are included in the EIA as demonstrated by the following references: North Sea Prehistory Research and Management Framework (H. Peeters *et al*., 2009) and People and the Sea: a maritime archaeological research agenda for England (J. Ransley *et al.*, 2013).	Relevant research frameworks have been included in Section 5.8 of Volume 9, Report 19: Outline Marine Written Schemes of Investigation which will inform the research questions including in the forthcoming Method Statements for geotechnical campaigns.
Scoping Opinion, 2021 - Historic England	Paragraph 17.6.1 states, 'archaeological assessments of available marine geophysical and geotechnical survey data'. We consider it important to explain that the maximum benefit is for survey campaigns to be commissioned inclusive of archaeological objectives, especially to inform early-stage planning. We are aware that developers are keen to maximise benefits from survey campaigns and that it is good practice for engineers, geo-scientists, and archaeological consultants to coordinate accordingly.	Future surveys will be subject to full archaeological review where relevant in consultation with Historic England. Archaeological objectives will be included in geotechnical sampling campaigns and any other survey works where this is deemed beneficial. These objectives and the role of the ongoing geophysical and geotechnical campaigns throughout the lifetime of the project as a mitigation is included in Section 11.11 of this chapter. Geophysical surveys undertaken to date were completed in consultation with Historic England (Maritime Archaeology, 2021)

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
Scoping Opinion, 2021 - Historic England	We would recommend a joined-up approach to the assessment so that the geoarchaeologists and geophysicists can be included in the design of these elements of the assessment to maximise opportunities, reduce the need for duplication of effort, and to ensure that the information obtained is also suitable for archaeological assessments. In particular, we would recommend that the line spacings used in the different geophysical campaigns are revised so that they are in accordance with that recommended in Historic England document 'Marine Geophysics' (2013).	All future geophysical and geotechnical works will be preceded by a Method Statement which will include archaeological objectives.
Scoping Opinion, 2021 - Historic England	We would also recommend that the geoarchaeologist is given direct access to the core sequences rather than just the core logs. For example, providing isolated physical samples are likely to be of limited use compared with having direct access to geotechnical core material on extraction and at time of cutting and prior to any destructive testing. It is essential that maximum value is obtained from any such analysis and, therefore, we recommend that geo-archaeological considerations and requirements are built into the planning of any geotechnical survey campaign. A continuous sequence of deposits is needed to examine deposit characteristics and interfaces between them, i.e., to record and assess continuous core sequences rather than isolated deposits, as this allows for greater reliability and confidence in the resulting conclusions. We look forward to	The post-consent geotechnical campaign will include cores collected specifically for archaeological assessments which will be detailed in a specific Method Statement. The commitment to including archaeological objectives in geophysical and geotechnical campaigns is detailed in Section 8.4 of Volume 9, Report 19: Outline Marine Written Schemes of Investigation.

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
	seeing the WSIs for the proposed mitigation strategies in due course.	
03/08/2022 PEIR phase Topic specific meeting	Topic specific meeting with Historic England to outline data gaps in the archaeological assessment of geophysical data.	Section 11.6 details the areas where data is currently yet to be assessed.
02/11/2022 Pre-PEIR ETG	Presented how the key comments from the Scoping Opinion were addressed through the Chapter, technical report and Outline Marine WSI documents produced for PEIR. It was highlighted that identified anomalies which correspond to records would benefit from further investigation to increase the confidence in their identification.	Further archaeological works are detailed in Section 6.8 of Volume 9, Report 19: Outline Marine Written Schemes of Investigation. All recorded wreck and obstructions will be avoided through AEZs, and further investigations will occur through pre-construction surveys and continued archaeological interpretation of relevant data.
Section 42, 2023 – Essex County Council	The extent, nature, and significance of the archaeological remains, both onshore and offshore, has not yet been fully determined and it is uncertain that avoidance will be a practical option given the engineering requirements of the proposed works. The Applicant would be required to conclusively demonstrate that there is potential to avoid impact on any significant concentrations of archaeological remains where preservation would be the most appropriate mitigation strategy. Prior to the DCO application ECC would expect the results of all desk based assessments and geophysical surveys to be combined in order to identify any concentrations of archaeology which may be difficult to avoid through design. Any areas where there is little or no opportunity	Full geophysical data coverage of the proposed development area has been assessed (Section 11.8 of this document and Section 4 of Volume 6, Part 5, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report). No trial trenching is expected for offshore archaeology.

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
	through design to avoid these archaeologically sensitive areas would need to be evaluated through a programme of trial trenching prior to the submission of the DCO to ensure that a suitable mitigation strategy, including preservation can be proposed.	
Section 42, 2023 – Essex County Council	Commitment to avoid heritage receptors is preferable, the success of this will depend on the accuracy in the identification of Archaeological Exclusion Zones and the practicality of avoiding these by design. This information should be clearly presented in the ES to ensure there is flexibility in design to achieve the mitigation proposed.	Agreed, avoidance is the preferred mitigation and feature specific AEZs will be applied to the seen extent of all anomalies of archaeological potential identified in the geophysical data and all recorded losses. Figure 11.19 and Figure 11.20 have been included to present all AEZ within the marine archaeology study area. The mitigation measures detailed in Section 11.11 outline VE's commitment to continued survey work and the micrositing around AEZs.
Section 42, 2023 – Essex County Council	There are a number of maps depicting the Archaeological Exclusion Zones. It would be beneficial to overlay all AEZ's onto one map to determine where there may be design issues where mitigation by avoidance is not feasible and to identify areas at the earliest opportunity where further investigation may be required to understand the nature and significance of the marine heritage assets that may be impacted upon by the development.	Figure 11.18, Figure 11.19 and Figure 11.20 have been included to present all AEZ within the marine archaeology study area.

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
Section 42, 2023 – Essex County Council	The Mitigation methods listed (other than avoidance) include geotechnical campaign and archaeological watching briefs. Any AEZs within the intertidal zone could be of high significance and there would be potential for more traditional 'land-based' archaeological investigation techniques to be proposed should a direct impact be identified. The potential for archaeological evaluation within the intertidal zone should be explored and considered as a mitigation method. Clarification is needed on how the offshore fieldwork will be presented, and results fed back into the site deposit model. More information on methods of publication is required, should this be appropriate and proposals for outreach and enhanced public understanding should be included as part of the mitigation.	As per Section 4 of Volume 9, report 19: Outline Marine Written Schemes of Investigation archaeological evaluation of the intertidal area will be included as a mitigation where the potential for impact is identified. As per Section 8.3 of Volume 9, Report 19: Outline Marine Written Schemes of Investigation all archaeological works will be preceded by a work-specific Method Statement and followed by a report of the results. Enhanced public understanding will be incorporated into the mitigation strategies, including detail of potential publication and dissemination of results from works that may feed into deposit models and framework questions.
Section 42, 2023 – Essex County Council	Table 4, Page 22 - Table 4 states London Clay -sometimes referred to as Till. London Clay is not a till deposit. This needs to be amended.	The reference to 'Till' has been removed.
Section 42, 2023 – Essex County Council	8.7.1 - The WSI indicates that Post-Fieldwork Assessment is currently not expected. Provisions should be made for the need for post-fieldwork assessment in the case where archaeological evaluation or archaeological watching briefs may be required.	Section 8.7 of Volume 9, Report 19: Outline Marine Written Schemes of Investigation has been amended to include details for Post-Fieldwork Assessment.

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
Section 42, 2023 – Essex County Council	8.7.4 - The spot-dating of all pottery from any investigation. Specialists may be required for identification of any ceramic finds, named specialists should be included in the WSI. In addition, a flint specialist would be required to identify any flint artefacts.	Noted, named specialists have been included in Section 8.7 of Volume 9, Report 19:Outline Marine Written Schemes of Investigation.
Section 42, 2023 – Essex County Council	11.2 - No archive is suggested	Noted, suggested archives have been included in Section 8.13 of Volume 9, Report 19: Outline Marine Written Schemes of Investigation.
Section 42, 2023 – Historic England	HE note in the Scoping Opinion (listed in Table 11.2), published by the Planning Inspectorate, that potential impacts could result from changes to marine physical processes, resulting from the proposed development. Consequently, a justification should be provided about why the study area used for the archaeological assessment was different to that proposed for the assessments of physical processes.	The 1 km buffer study area has been used for the desk based assessment. A study area in line with Volume 6, Part 2, Chapter 2: Marine Geology, Oceanography and Physical Processes has been assessed for impacts, however, it was concluded that there would be no impact beyond the Order Limits. These differentiations have been clarified in Section 11.4 and links to the appropriate Chapters and Sections have been included, where appropriate.
Section 42, 2023 – Historic England	In response to the direction that the ES should provide a justification for the extent of the study area used in the assessment, HE note the Applicant has focussed on the use of a 1 km buffer around the Red Line Boundary (RLB) in the baseline assessment in consideration of 'uncertainty of positions of historical ship losses'. While such an approach can support the desk-based review of	The 1 km buffer study area has been used for the desk based assessment. A study area in line with Volume 6, Part 2, Chapter 2: Marine Geology, Oceanography and Physical Processes has been assessed for impacts, however, it was concluded that there would be no

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
	known charted vessel losses, it does not necessarily take account of changes to dynamic seabed conditions that may cause archaeological materials (known and unknown) to be either buried or exposed.	impact beyond the RLB/ Order Limits. These differentiations have been clarified in Section 11.4 and links to the appropriate Chapters and Sections have been included, where appropriate. Additionally, the mitigation measure to employ archaeological assessment of geophysical and geotechnical survey data and (detailed in Section 11.15 and Section 6.5 of Volume 9, Report 19: Outline Marine Written Schemes of Investigation) will allow for greater confidence in the location of archaeological materials and the impacts of dynamic sediments on their exposure and reburial.
Section 42, 2023 – Historic England	HE agree with the impacts scoped in for assessment, as listed in Section 11.4.3 (construction, operations & maintenance and decommissioning) regarding direct and indirect impacts such as disturbance of sediment containing potential marine heritage receptors (material and contexts) leading to the exposure of those marine heritage receptors. On this basis, HE recommend that the findings of Marine Geology, Oceanography and Marine Processes chapter are incorporated into the discussions of indirect impacts on sediments (Volume 2, Chapter 2.02).	References to Volume 6, Part 2, Chapter 2: Marine Geology, Oceanography and Physical Processes have been referenced where relevant in the discussions in Sections 11.12, 11.13 and 11.14.
Section 42, 2023 – Historic England	In consideration of appropriateness of study areas, HE question why the	The 1 km buffer study area has been used for the desk

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
	marine archaeology study area encompasses the PEIR RLB plus a 1km buffer up to MHWS. They question whether or not this is sufficient for assessment of indirect effects on marine archaeological and cultural heritage receptors, as described in Section 11.4.5. The statement made in Section 11.4.6 that the marine archaeology study area may be reviewed and amended in the ES is welcomed vis. identification of additional constraints, to which HE add effects on sedimentary dynamics as described in Chapter 2.	based assessment. A study area in line with Volume 6, Part 2, Chapter 2: Marine Geology, Oceanography and Physical Processes has been assessed for impacts, however, it was concluded that there would be no impact beyond the RLB/ Order Limits. These differentiations have been clarified in Section 11.4 and links to the appropriate Chapters and Sections have been included, where appropriate.
Section 42, 2023 – Historic England	With regard to the inclusion of the North Sea Prehistory Research and Management Framework (NSPRMF) in Table 11.3, it is important to understand that while it does include a resource assessment (i.e., literature review) it also includes research questions and strategies. These are directly relevant and applicable in the production of any (outline) archaeological WSI. They should be used by this project, post consent and pre commencement.	The NSPRMF will be used to inform the research questions and strategies for ES in any forthcoming Method Statements. This has been further detailed in Section 5.7 of Volume 9, Report 19: Outline Marine Written Schemes of Investigation.
Section 42, 2023 – Historic England	HE are pleased that precautionary AEZs will be applied to each of the known assets. It is acknowledged that there are gaps in the data coverage that will be addressed post-PEIR (Section 11.6. 4), but the resolution of these studies will need to be carefully considered to ensure that previously unknown remains are identified.	The geophysical data assessment undertaken ahead of VE PEIR has been supplemented with the North Falls archaeological assessment results undertaken for the North Falls PEIR as seen in the public domain. The same survey vessel and specifications were used across both proposed development areas. This is further detailed in Volume 6, Part 5, Annex 11.1:

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
		Offshore Archaeology and Cultural Heritage Technical Report.
Section 42, 2023 – Historic England	HE are pleased that the archaeological potential of the intertidal zone is recognised (Section 11.7.20). However, it is stated that no offshore geotechnical surveys are planned and will be delivered post consent (subject to permission). They consider the detail of any (outline) WSI prepared for this project is crucial to demonstrate that mitigation measures are identified and ready to be implemented. Currently, HE are of the view that the Outline Marine WSI presented in Volume 4, Annex 11.2 does not offer this clarity. We recommend the document is revised.	The Mitigation Methods outlined in Section 11.11 have been secured through the DCO and include provisions to continue, under the WSI, to analyse the data from geophysical and geotechnical surveys in relation to archaeology whenever relevant and appropriate to do so. Volume 9, Report 19: Outline Marine Written Schemes of Investigation has been updated to provide clarity regarding how the proposed mitigation measures, in particular regarding geoarchaeology, will be implemented (Section 6.7 of Volume 9, Report 19: Outline Marine Written Schemes of Investigation).
Section 42, 2023 – Historic England	Section 11.8.5 describes 58 'High Potential Anomalies', as summarised in Table 11.8 based on geophysical data examination and also the identification of 98 'Medium Potential Anomalies' (Table 11.9) and 473 low potential anomalies. Figure 11.11 shows the distribution of the geophysical data. For clarity, HE recommend larger scale figures should be produced that include identification references. HE note the identification of anthropogenic or wreck debris (MA ID Refs: MA0602 and MA0297) 273m east from the recorded location of submarine	Larger scale figures have been appended to Volume 6, Part 5, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report to illustrate the high potential anomalies and high concentrations of potential archaeology within the RLB/ Order Limits and have been included in this chapter as Figure 11.4, Figure 11.5, Figure 11.6, Figure 11.7, Figure 11.8 and Figure 11.9.

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
	HMSM E6. They highlight the fact that HMSM E6, a Royal Navy submarine lost with all hands in December 1915 is a designated 'protected place' under the Protection of Military Remains Act 1986.	
Section 42, 2023 – Historic England	In Section 11.9 (Geoarchaeological Assessment of Geophysical Data), HE note it is stated in 11.9.3 that in the VE array areas, at this stage, there is less available evidence to indicate presence of palaeo-landscape features (e.g., channels). The Offshore ECC does cross locations, however, where geoarchaeological features have previously been mapped with MA3000, to MA3003 and MA3010 to MA3017 being identified of interest (Figure 11.12)	The areas of geoarchaeological potential within the Array and ECC have been expanded on and updated in Section 4.3 of Volume 6, Part 5, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report.
Section 42, 2023 – Historic England	HE agree with the approach set out in Section 11.10 (Key Parameters for Assessment), although they are mindful that structure placement and cable routes are yet to be confirmed. The maximum design parameters and the approach to identifying maximum possible effect are understood in the assessment provided vis. a worst-case scenario approach. However, HE recommend the ES includes depths of dredging required for the placement of gravity base jacket foundations.	The depths of dredging required for the placement of gravity base jacket foundations have been included in Table 11.16.
Section 42, 2023 – Historic England	HE would recommend that the geoarchaeologists are allowed direct access to the geotechnical cores as it is better to record and assess continuous core sequences rather than isolated deposits as this allows for greater reliability and confidence in the resulting conclusions.	Specialist archaeological input will be incorporated, as a proactive measure, into the survey methodologies and techniques detailed in any forthcoming Method Statements. This will include the collection of targeted archaeologically specific

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
		cores (Section 6.5 of Volume 9, Report 19: Outline Marine Written Schemes of Investigation).
Section 42, 2023 – Historic England	Regarding the use of AEZs, Section 11.11.6 states that 'All development and related activities that could impact the seabed are microsited within the boundaries of an AEZ'. HE would recommend this is clarified in the ES, as it appears to go counter to the purpose of AEZs.	Updated -this was a typo, micrositing will occur around AEZs not within them.
Section 42, 2023 – Historic England	HE note that the true extent of known sites at the time of the application may not be completely recorded and captured within prescribed AEZs until a high resolution UXO specification survey has been undertaken. This should be corroborated with detailed ground-truthing investigations (utilising onboard archaeological expertise), to assess any outlying geophysical anomalies.	As per Section 8.3 of Volume 9, Report 19: Outline Marine Written Schemes of Investigation specific Method Statements will be produced and agreed prior to any ground truthing. Section 6.7 of Volume 9, Report 19: Outline Marine Written Schemes of Investigation has been updated to specify that exclusion zones will be revised in line with the most recent data and in agreement with Historic England.
Section 42, 2023 – Historic England	In Section 11.12 overall, HE agree with the summary presented in Table 11.13 vis. archaeological receptor sensitivity (value), but they note the grouping of reported losses/ fishermen's fasteners/ obstructions/ dead wrecks (not identified in geophysical data). These are different 'receptors' and while some can be grouped as low/ negligible, e.g., 'dead' wrecks, they do not agree with the inclusion of 'fishermen's fasteners'. These could indicate the presence of very significant	Table 11.18, Table 11.19 and Table 11.20 of this document have been updated to state that the receptor sensitivity of fishermen's fasteners is 'High to Low', to acknowledge their currently unknown potential.

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
	archaeological sites and should be subject to targeted investigation.	
Section 42, 2023 – Historic England	Debris fields, for example, could be associated with vessels lost during the Anglo Dutch naval conflicts in the 17th Century, as alluded to in Volume 4, Annex 11.1, Section 3.2. Furthermore, we note the comment regarding such seabed features in Volume 4, Annex 11.1, Section 3.6 (Fishermen's Fasteners). HE would recommend, therefore, that subsequent, higher resolution investigations as may occur post consent (should permission be forthcoming) and should be accounted for within delivery of an archaeological WSI.	Section 6.8 of Volume 9, Report 19: Outline Marine Written Schemes of Investigation has been updated to include the provision for further high resolution surveys to investigate anomalies of uncertain significance and areas of high archaeological potential where they may be impacted. The mitigation measures detailed in Section 11.11, outline the commitment for all relevant data to undergo archaeological assessment to further ensure the effective assessment of anomalies within the Order Limits.
Section 42, 2023 – Historic England	Regarding the definition of Impacts 1, 2, 3, 4, 5, 6 and 7 (listed in Section 11.12) and the application of embedded mitigation, HE note that in all instances 'significance of effect has therefore been assessed as minor to negligible and the effect is consequently considered not significant in EIA terms'. This demonstrates the importance of ensuring embedded mitigation is directly included within the conditions of any draft DCO.	Following The Crown Estate's 2021 guidance Volume 9, Report 19: Outline Marine Written Schemes of Investigation forms the framework for the mitigation that will be submitted with the DCO application . Section 11.11 has been updated to describe the expectation that these mitigation measures will be secured through the DCO.
Section 42, 2023 – Historic England	In reference to Impact 7, HE appreciate the argument presented regarding 'sensitivity (value) of the Broad Historic Character Types' as summarised in Table 11.14. However, in the description of	Noted, the capacity for change in the HSC has been included in Section 11.7 and the impacts described in Section 11.12,

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
	'Perception of the Historic Seascape Character' (HSC), they are not immediately reconciled to the statements about 'Changes to Perception'. For example, it is stated that 'renewable energy would contribute to the existing perception of industry the HSC' (Table 11.14). In their view, the assessment provided in the ES should instead focus on the capacity for the existing historic character to accommodate change as presented by the proposed development.	Section 11.13 and Section 11.14.
Section 42, 2023 – Historic England	HE note a focus towards assessing HSC in reference to 'current public perception', which is not a primary factor in HSC. While it is accepted that there will be different perceptions of character, the HSC methodology is studious in not equating such matters to sensitive receptors, i.e., people. To do so, in our view, confuses matters with visual impact assessment criteria as are dealt with elsewhere in the EIA exercise. This approach appears to be demonstrated in Volume 4. Annex 11.1, Section 3.7.8, which states that the 'HSC uses the marine archaeology study area plus an additional 50 km buffer to define the maximum extent of significant visual effect and perceived impact'. HE recommend, therefore, that the approach to HSC is reassessed in the production of any ES. They also note the attention given to possible positive changes and subsequent unaffected access. In consideration of increased focus on security requirements for nationally significance infrastructure, particular	The approach to the HSC has been reassessed for ES, and the capacity for change in the HSC has been included in Section 11.7 and the impacts described in Section 11.12, Section 11.13 and Section 11.14.

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
	offshore wind farms, this assumption should be reassessed in the ES.	
Section 42, 2023 – Historic England	The heritage receptors that could be impacted by scour/ erosion were classed as being of 'negligible to very high' sensitivity (Section 11.13.30), while the overall level effect of scour has been assessed to be of minor adverse significance (Section 2.11.51). It was not clear, therefore, why the impacts are concluded to be only minor to negligible (Section 11.13.31).	The sensitivity (value) of the heritage receptors that could be impacted by scour/erosion are classed as being of 'negligible to very high' sensitivity (value) as defined in Table 11.5. While the overall level of the effect of scour on the surrounding environment has been assessed to be no greater than minor (adverse), as per the definitions outlined in Volume 6, Part 2 Chapter 2: Marine Geology, Oceanography and Physical Processes. Meaning that heritage receptors of all sensitivity (value) may be impacted but the level of impact of scour is assessed as no greater than minor (adverse).
Section 42, 2023 – Historic England	In Section 11.15 (Environmental Assessment: Cumulative Effects), HE note the statement made in 11.15.4 that a Zone of Influence (ZOI) of 50km from the marine archaeology study area has been applied for the Cumulative Effects Assessment (CEA). An explanation should be provided in the ES as to the selection of a 50km ZOI. Furthermore, we note the Cumulative Assessment Summary and the conclusion that the significance of effect is assessed as 'minor to negligible' and, therefore not significant in EIA terms. This is, again, entirely predicted on delivery of embedded mitigation as a formal consent requirement.	The area assessed for cumulative impacts has been updated and is based on the distance away from VE which suspended sediment plumes may be advected (and meaningfully interact with potentially sensitive receptors) which has been defined by a spring tidal excursion ellipse buffer around the Array Areas and Offshore ECC, see Volume 6, Part 2, Chapter 2: Marine Geology, Oceanography and Physical Processes.

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
Section 42, 2023 – Historic England	Section 11.17 (Transboundary Effects) mentions paleochannels and palaeo-landscapes within the North Sea to stretch beyond international boundaries. The impact on submerged landscapes in those cases is expected to be mitigated and offset by archaeological assessments of available geophysical and geotechnical data. However, appropriate reference would need to be made in the ES as to how this might actually be delivered.	The information gathered from surveys and how it will be used to inform a greater understanding of the palaeoenvironment and consequently offset impact has been expanded on in Section 11.9 of this document, and Section 4.3 and Section 5.5 of Volume 6, Part 5, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report.
Section 42, 2023 – Historic England	HE would advise the Applicant to access relevant national and international archaeological research frameworks (https://researchframeworks.org/). They encourage such consideration as part of the approach set out in Section 11.19 (Next Steps).	Noted and agreed, these will be included in the forthcoming ES and any Method Statements.
04/09/2023 Post-PEIR ETG, September 2023 – Essex and Tendring Councils	Will mitigation include preservation *in-situ*?	Preservation *in situ* is included in the Mitigation (Section 11.11) and is the preferred mitigation. Should avoidance not be possible for any reason the Volume 9, Report 19: Outline Marine Written Schemes of Investigation outlines that other mitigations strategies can be applied. These will always be undertaken on a case-to case basis and will be preceded by a Method Statement which will be submitted to Historic England, and relevant stakeholders will be informed.

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
04/09/2023 Post-PEIR ETG, September 2023 – Essex and Tendring Councils	There are currently gaps in the data that were not covered by the geophysical survey. The assessment is about providing all the relevant information on the same map. Have further geophysical surveys taken place? Will data gaps be clearly presented, as maps can be misleading if areas haven't been surveyed.	The gaps relevant to project design have been largely filled by data from the North Falls Offshore Wind Farm (2023), however there are still some small data gaps within the Proposed Order Limits. Further details on data coverage as well as remaining data gaps are covered in Section 11.6. In line with feedback about the density of some AEZ, larger scale figures have also been included in Volume 6, Part 5, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report to better illustrate the archaeological potential and areas of potential impact and within this chapter as Figure 11.18, Figure 11.19 and Figure 11.20.
04/09/2023 Post-PEIR ETG, September 2023 – Essex and Tendring Councils	There are some concerns for how paleo landscapes in terms of archaeology, can be mitigated/ compensated for and preserved in-situ as geotechnical samples have not yet been collected and assessed. As human activity will be on the sides of the channels, how are you going to identify and preserve potential paleo environments? It is hard to determine significance as the current information doesn't give significance. More information is needed to base any further decision now that the area is narrowed for the ECC. There is a worry that VE will have to run through archaeological	A geotechnical campaign will be undertaken pre construction and relevant results will be reported on to add to the archaeological record. The focus in the ES documents, as presented in the PEIR, has been to confirm where channel or valleys are located, within the areas of impact, by assessing geophysical data. The extent of this potential impact is based on the Maximum Design Scenario (presented in Table 11.16). This information will be utilised in the future

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
	areas as there will be no other design options.	geoarchaeological campaigns as outlined in Section 8.4 of Volume 9, Report 19: Outline Marine Written Schemes of Investigation and specified within the mitigation (Section 11.11 of this document and Section 6 of Volume 9, Report 19: Outline Marine Written Schemes of Investigation). The geoarchaeological assessment is a phased process and will lead to dissemination of the results and any relevant research as per the guidance in Offshore Geotechnical Investigations and Historic Environment Analysis (COWRIE, 2011). The mitigation will therefore not completely avoid deposits of geoarchaeological potential but offset the impact by data collection and research (Section 5.5 of Volume 6, Part 5, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report).
04/09/2023 Post-PEIR ETG, September 2023 – Onshore representative from Historic England	Geotechnical data can be used for archaeological data. More information upfront would be useful and what is currently missing is project specific information to reach a conclusion of significance.	Provisions have been included in Volume 9, Report 19: Outline Marine Written Schemes of Investigation, for the incorporating of archaeologically objectives and archaeologically specific cores to be

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
		collected during the forthcoming geotechnical campaigns (currently planned post-consent), seen in Section 6.5 and Section 8.4 of Volume 9, Report 19: Outline Marine Written Schemes of Investigation. Additional figures have also been included in Volume 6, Part 5, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report and Volume 9, Report 19: Outline Marine Written Schemes of Investigation to better illustrate the known potential for palaeolandscapes in the area and for where archaeologically specific cores may be collected.
04/09/2023 Post-PEIR ETG, September 2023 – Planning officer	The DCO is based on information predetermination. What happens if VE runs into an area of geoarchaeological potential that is impacted because the extent and significance is not yet understood from the available data?	The potential for palaeolandscapes within the study area has been assessed and mapped in a preliminary capacity through the sub-bottom profiling data and through baseline records in the area (detailed in Section 11.7 of this document and expanded on in Section 4.3 of Volume 6, Part 5, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report). This data will be used to inform the locations for archaeologically specific core samples taken during the geotechnical campaign currently planned post-consent and pre-

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
		development, as per mitigation (Section 11.11 of this document and Section 6 of Volume 9, Report 19: Outline Marine Written Schemes of Investigation) with all cores available for archaeological assessment to further build on the deposit model and phased analysis utilised to offset potential impacts of the development. The details of the archaeological understanding of the palaeolandscape potential in the area and the archaeological assessment of geotechnical surveys are included in Section 4.3 of Volume 6, Part 5, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report and Section 8.4 of Volume 9, Report 19: Outline Marine Written Schemes of Investigation, respectively.
05/10/2023 Post-PEIR ETG, October 2023 – Historic England	Historic England queried if the new online North Sea Prehistory Research and Management Framework be utilised? Historic England are keen to see how it is used and how information is added to it.	The NSPRMF will be used to inform the research questions and strategies for ES in any forthcoming Method Statements. This has been further detailed in Section 5.7 of Volume 9, Report 19: Outline Marine Written Schemes of Investigation.
05/10/2023 Post-PEIR ETG, October 2023 – Historic England	It should be noted there is a discrepancy between Essex County Council's remit and Historic England's remit and the difference in advice should be clarified.	Noted. While the jurisdiction of Historic England is seaward of mean low water springs (MLWS), and Essex County Council is landward of MLWS all issues raised

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
		and advice given by stakeholders have been addressed and incorporated where possible.
05/10/2023 Post-PEIR ETG, October 2023 – Historic England	Historic England queried if geotechnical surveys are planned to take place? It is important the WSI shows how the surveys will be planned post-consent.	Geotechnical surveys are currently planned post-consent and prior to construction across the ECC and the array as part of engineering works. Details for how these surveys will be planned and preliminary parameters for methodology are include in Section 5.7 of Volume 9, Report 19: Outline Marine Written Schemes of Investigation and will be fully detailed in survey specific Method Statements agreed with the relevant stakeholders prior to works commencing.
05/10/2023 Post-PEIR ETG, October 2023 – Historic England	Due to the dynamic conditions in this area, it will need to be adequately explained the determination of risk, in terms of what is buried and what is exposed and how that could change due to these conditions over time.	The potential for marine archaeology and cultural heritage within the Order Limits are detailed in Section 11.7 of this document and Section 3 of Volume 6, Part 5, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report. This, together with the archaeological assessment of geophysical data (described in Section 11.8 and further detailed in Section 4 of Volume 6, Part 5, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report) and the mitigation strategies

Date and consultation phase/ type	Consultation and key issues raised	Section where comment addressed
		(Table 11.17) will allow for archaeological potential to be monitored over time and mitigation measures to be implemented accordingly. Further, the potential impacts of the Project (Sections 11.12-11.19) refer to Volume 6, Part 2, Chapter 2: Marine Geology, Oceanography and Physical Processes to assess the potential for sediment movement and changes to the physical environment as impacted by the Project.
05/10/2023 Post-PEIR ETG, October 2023 – Historic England	Historic England queried if all geophysical data been processed?	All geophysical data collected on behalf of the Project has been assessed and is detailed in Section 11.8 and further detailed in Section 4 of Volume 6, Part 5, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report. Data collected on behalf of North Falls Offshore Wind Farm has been assessed on behalf of the respective project, and the results have been referred to and incorporated into the archaeological assessment for VE OWF, where relevant. The coverage of the respective surveys can be seen in Figure 11.3.

11.4 SCOPE AND METHODOLOGY

SCOPE OF THE ASSESSMENT

11.4.1 The Array Areas of VE will cover approximately 128 km^2. The Offshore ECC runs west from the southern array area at a length of up to 85 km, up to and including the intertidal zone as defined as ending at MHWS. The grid connection will be made between Frinton-on-Sea and Holland-on-Sea.

11.4.2 The marine archaeology study area is defined below and includes a 1 km buffer around the Offshore ECC and Array Areas up to MHWS (Figure 11.1).

IMPACTS SCOPED IN FOR ASSESSMENT

11.4.3 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 marine heritage receptors;
  - Impact 2: Direct impact by penetration, compression, and disturbance of piling foundations leading to the total or partial loss of marine heritage receptors;
  - Impact 3: Direct impact by penetration, compression, and disturbance of stratigraphic contexts containing archaeological material from the combined weight of the Wind Turbine Generators (WTG) and associated foundations leading to total or partial loss of marine heritage receptors;
  - Impact 4: Direct impact by penetration, compression, and disturbance of cable laying operations leading to total or partial loss of marine heritage receptors;
  - Impact 5: Direct impact by penetration, compression, and disturbance effects of jack-up barges and anchoring of construction vessels during construction activities leading to total or partial loss of marine heritage receptors within the Array areas;
  - Impact 6: Indirect impact causing disturbance of sediment containing potential marine heritage receptors (material and contexts) leading to the exposure of those marine heritage receptors to natural, chemical, or biological processes and indirectly causing or accelerating their loss; and
  - Impact 7: Indirect impacts causing changes to the Historic Seascape Character as a result of construction and survey vessel activities and the addition of cables, foundations and turbines indirectly leading to changes to the perceived historic use of the seascape during construction activities.

- Operation and maintenance:
  - Impact 8: Direct impact by penetration, compression, and disturbance effects of maintenance activities at WTG substation foundations and along inter-array cables and export cables leading to total or partial loss of marine heritage receptors;
  - Impact 9: Indirect impacts causing disturbance of sediment containing potential marine heritage receptors during maintenance activities leading to the exposure of those marine heritage receptors to natural, chemical, or biological processes and indirectly causing or accelerating their loss;
  - Impact 10: Direct impact by penetration, compression, and disturbance effects of jack-up barges and anchoring of operation and maintenance vessels during the operation and maintenance phase leading to total or partial loss of marine heritage receptors;
  - Impact 11: Indirect impacts causing scour effects as a result of the presence of WTG substation foundations and the exposure of inter-array and export cables or the use of cable protection measures leading to the exposure of those marine heritage receptors to natural, chemical, or biological processes and indirectly causing or accelerating their loss; and
  - Impact 12: Indirect impacts causing changes to the Historic Seascape Character as a result of operation and maintenance vessel activities and the presence of the completed wind farm indirectly leading to changes to the perceived historic use of the seascape during the operation phase.
- Decommissioning:
  - Impact 13: Direct impact by penetration, compression and disturbance effects of jack-up barges and anchoring of decommissioning vessels leading to total or partial loss of marine heritage receptors;
  - Impact 14: Indirect impacts creating draw-down of sediment into voids left by removed WTG foundations leading to loss of sediment or destabilization of archaeological sites and contexts indirectly leading to exposing marine heritage receptors within the Array areas to natural, chemical, or biological processes and causing or accelerating loss of the same; and
  - Impact 15: Indirect impacts causing changes to the Historic Seascape Character as a result of decommissioning activities and the removal of wind farm components indirectly leading to changes to the perceived historic use of the seascape during the decommissioning phase.
- Cumulative:
  - Impact 16: Direct cumulative impact of sediment removal containing undisturbed archaeological contexts during seabed preparation ahead of

construction activities leading to the total or partial loss of marine heritage receptors;

- Impact 17: Indirect cumulative impact causing disturbance of sediment containing potential marine heritage receptors (material and contexts) leading to the exposure of those marine heritage receptors to natural, chemical, or biological processes and indirectly causing or accelerating their loss;
- Impact 18: 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.

STUDY AREA

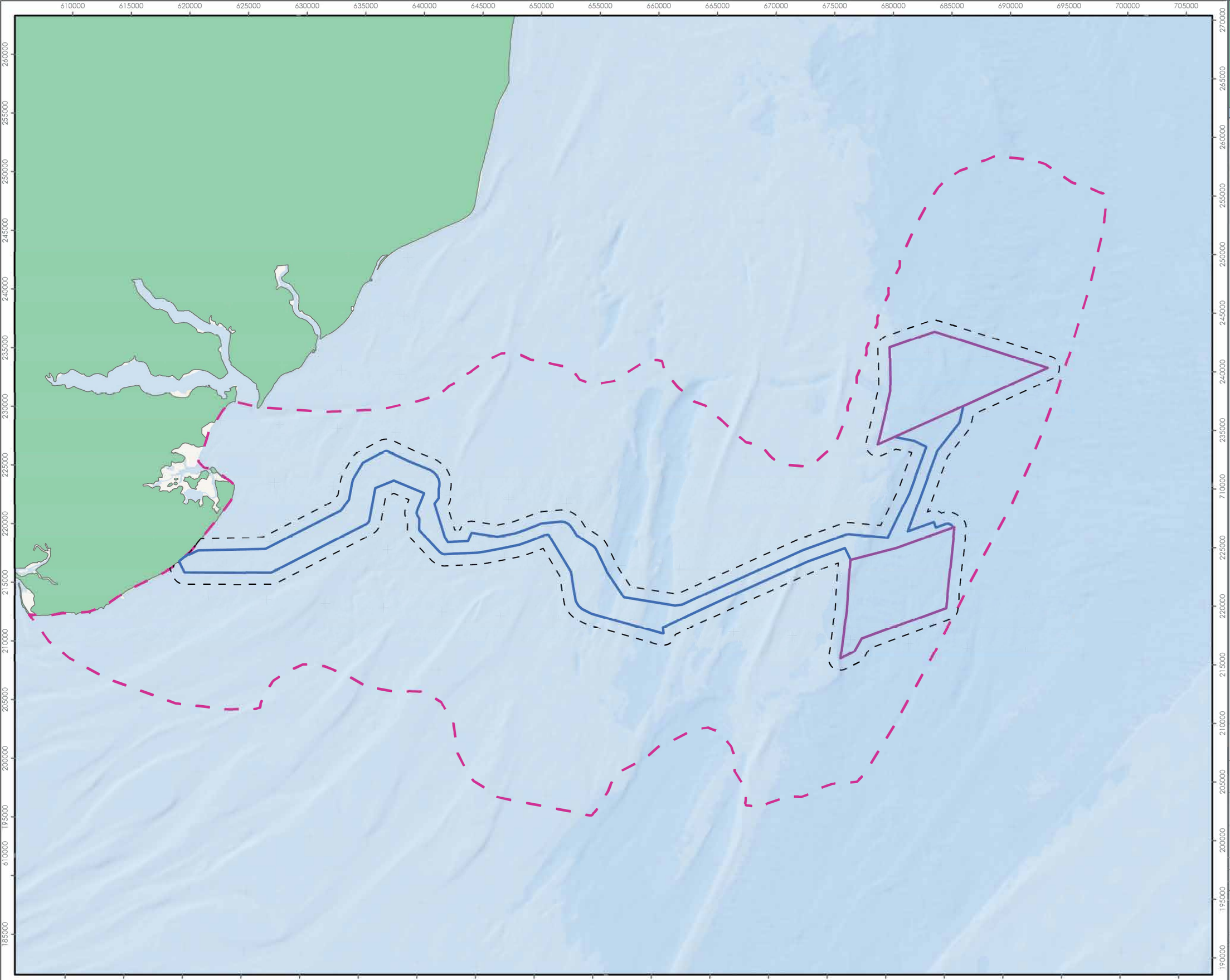
11.4.4 A marine archaeology study area has been established for the purposes of collating and characterising baseline data as part of this ES. The marine archaeology study area encompasses the ES Order Limits plus a 1 km buffer up to MHWS (Figure 11.1). This study area has been slightly refined since PEIR along the Offshore ECC Order Limits (Figure 11.2).

11.4.5 The extended marine archaeology study area is industry standard and is designed to accommodate the potential imprecision of historic marine positioning. The marine archaeological study area is used for geophysical and baseline record assessment; however, the wider context of the region and its historical and archaeological uses are also included in the baseline and Historic Seascape Characterisation (HSC) assessments.

11.4.6 It is important to note, the study area assessed for impacts extends beyond this 1 km buffer and is in keeping with the study area defined within Volume 6, Part 2, Chapter 2: Marine Geology, Oceanography and Physical Processes, allowing for the consideration of direct and indirect effects on marine archaeological and cultural heritage receptors. For example the distance away from VE which suspended sediment plumes may be advected (and meaningfully interact with potentially sensitive receptors) has been defined by a spring tidal excursion ellipse buffer around the Array areas and Offshore ECC (Figure 11.1).

11.4.7 There is an intertidal overlap between the onshore and offshore archaeology study areas up to MHWS to ensure that there is total coverage of the ES Order Limits between the two chapters. Liaison between the two topics has been ongoing to avoid repetition of sites and marine heritage receptors. A detailed account of onshore archaeology can be found in Volume 6, Part 3, Chapter 7: Onshore Archaeology and Cultural Heritage.

11.4.8 Additionally, there is overlap between the Order Limits, and consequently the study areas, of VE and North Falls Offshore Wind Farm. This overlap has been considered through the sharing of information and data assessment between the two projects. The areas where the North Falls assessment of data has been used to supplement the VE assessment are illustrated in Figure 11.3.



LEGEND

- Array Areas
- Offshore Export Cable Corridor
- Marine Archaeology Study Area
- Marine Archaeology Impact Assessment Area

0 3.25 6.5 13

Kilometers

PROJECT TITLE:

FIVE ESTUARIES OFFSHORE WINDFARM

DRAWING TITLE:

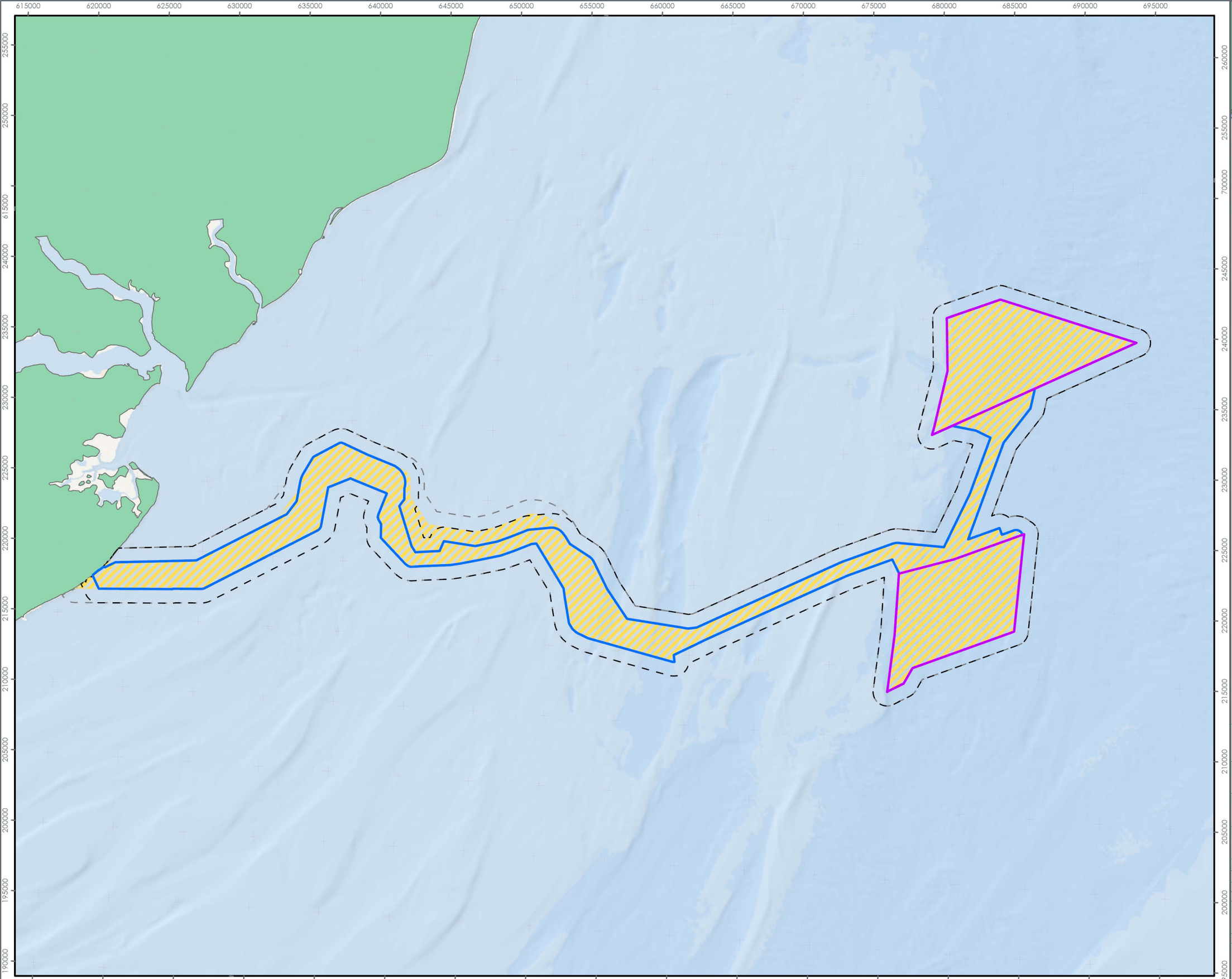
Marine Archaeology Study Area and Impact Assessment Area

VER	DATE	REMARKS	Drawn	Checked
1	29/01/2024	DRAFT	HA	CH

DRAWING NUMBER: 11.1

SCALE:	PLOT SIZE:	DATUM:	PROJECTION:
1:300,000	A3	WGS84	UTMN31

FIVE ESTUARIES OFFSHORE WINDFARM



LEGEND

- Array Areas
- Offshore Export Cable Corridor
- Marine Archaeology Study Area
- PEIR Red Line Boundary
- PEIR Marine Archaeology Study Area

0 2.5 5 10

Kilometers

PROJECT TITLE:

FIVE ESTUARIES OFFSHORE WINDFARM

DRAWING TITLE:

Changes to the VE proposed Order Limits from PEIR to ES

VER	DATE	REMARKS	Drawn	Checked
1	29/01/2024	DRAFT	HA	CH

DRAWING NUMBER: 11.2

SCALE:	PLOT SIZE:	DATUM:	PROJECTION:
1:250,000	A3	WGS84	UTMN31

FIVE ESTUARIES
OFFSHORE WIND FARM

POTENTIAL MARINE HERITAGE RECEPTORS

11.4.9 The scope of the assessment has enabled the identification of marine heritage receptors potentially being affected by the proposed development. The marine heritage receptors are defined as remains or resources of heritage significance and include:

- Physical resources such as shipwrecks, aviation remains, archaeological sites, archaeological finds and material including prehistoric deposits;
- Archival documents and oral accounts recognised as of historical/ archaeological or cultural significance; and
- Historic seascape character and the changes perceived through historic use of this seascape.

DATA SOURCES

11.4.10 The key data sources used to inform the assessment of the existing environment are described below.

Table 11.3: Data sources used for the marine archaeology baseline

Source	Summary	Spatial Coverage of VE
United Kingdom Hydrographic Office (UKHO) wrecks and obstructions	Records of known wrecks and obstructions held by the United Kingdom Hydrographic Office (UKHO) and available via emapsite.com.	Coverage of the marine archaeology study area up to MLWS.
UKHO Admiralty Charts	Admiralty charts and historic mapping relevant to the defined marine archaeology study area.	Full coverage of the marine archaeology 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.
Essex Historic Environment Record (HER)	Point data derived from Historic Environment Record held by Essex HER Office.	Coverage of the marine archaeology study area to MLWS.
Suffolk Historic Environment Record (HER)	The online Historic Environment Record for Suffolk.	No coverage of the marine archaeology study area, though the records provide useful characterisation of the historic use of the region.

Source	Summary	Spatial Coverage of VE
North Sea Palaeolandscape Project (NSPP)	Palaeolithic and Mesolithic landscape mapping of the North Sea.	No 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, as well as a framework and agenda for the management of submerged prehistoric archaeological sites, features, and landscapes.	Full coverage of the marine archaeology study area.
Lost Frontiers Project (LFP)	A continuation of the NSPP. Building on the mapping of Palaeolithic and Mesolithic landscapes of the North Sea, using paleoenvironmental data and ancient DNA. Potential submerged Neolithic landscapes will also be explored.	Data is not yet published for this project but will be considered when this data becomes available.
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.	No data within the marine archaeology study area although peats have been located along the Essex coast.
British Geological Survey (BGS)	Database of a range of marine geoscience data held within the National Geoscience Data Centre	Full coverage of the marine archaeology study area. No peat recorded within the marine archaeology study area, with the

Source	Summary	Spatial Coverage of VE
	(NGDC). Primarily shallow geology and geophysics data collected as either part of regional or local mapping work or provided by third parties.	closest core containing peat located approximately 100 km north of the marine archaeology study area.
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.
Galloper Wind Farm Project-Environmental Statement – Chapter 19: Archaeology and Cultural Heritage (Wessex Archaeology, 2011)	Review of archaeological potential of the subzone.	Some overlap with the marine archaeology study area. The detailed study also provides useful characterisation of the directly adjacent subzone.
England's Historic Seascapes Marine HSC Pilot Study: Southwold to Clacton (Oxford Archaeology, 2007)	Description of palaeolandscape and marine archaeological potential in the offshore zone from Southwold to Clacton.	Broadscale data with regional coverage.
Greater Gabbard Windfarm – Phase One: Offshore Turbine Area – Archaeological Desk Based Assessment (Maritime Archaeology Ltd, 2005a)	Review of archaeological potential of the subzone.	No coverage of the marine archaeology study area although the detailed study provides useful characterisation of the directly adjacent subzone.
Greater Gabbard Windfarm – Phase Two: Export Cable Route and Onshore Works – Archaeological Desk Based Assessment (Maritime Archaeology Ltd, 2005b)	Review of archaeological potential of the subzone.	Minor overlap with the marine archaeology study area. The detailed study also provides useful characterisation of the directly adjacent subzone.
Geophysical surveys conducted by Fugro on behalf of RWE Renewables UK Ltd (August and October 2021)	Side Scan Sonar (SSS), Multi-beam Bathymetry (MBES), Magnetometer (MAG), Ultra-High Resolution Seismic (UHRS) and Sub-Bottom Profiler (SBP) surveys of	Full coverage of the Array areas and the preferred ECC. Where full data coverage is not included in the assessment, other available data has been relied on. (see Section 11.6 and).

Source	Summary	Spatial Coverage of VE
	the proposed development area.	
North Falls Offshore Wind Farm Preliminary Environmental Information Report – Chapter 16 Offshore and Intertidal Archaeology and Cultural Heritage (North Falls Offshore Wind Farm, 2022)	Review of archaeological potential of the North Falls Offshore Wind Farm proposed development area.	Some overlap within the Offshore ECC Order Limits (Figure 11.3).

ASSESSMENT METHODOLOGY

11.4.11 The assessment methodology for marine archaeology takes into consideration the following guidance documents for marine archaeological developments:

- Standard and Guidance for Historic Environment Desk-Based Assessment, Chartered Institute for Archaeologists (CIfA) (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);
- Historic Seascape Characterisation: England's Historic Seascape: HSC Method Consolidation, Cornwall Council (2008);
- 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, Historic England (2013);
- Archaeological Written Schemes of Investigation for Offshore Wind Farm Projects, The Crown Estate (2021); and
- Protocol for Archaeological Discoveries: Offshore Renewables Projects, The Crown Estate (2014).

11.5 ASSESSMENT CRITERIA AND ASSIGNMENT OF SIGNIFICANCE

11.5.1 This section outlines the method used to assess the significance of effect on marine heritage receptors up to MHWS.

11.5.2 The criterion for determining this significance is based on both the impact of magnitude (Table 11.4) and the sensitivity (value) of those receptors 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 11.13 to 11.19 outlines the significance of effect on marine heritage receptors of each identified potential impact.

11.5.3 Sensitivity (value) of the marine environment and marine heritage receptors is defined in Table 11.5.

Table 11.4: Impact magnitude definitions.

Magnitude	Description/ reason
High	Adverse, major, and substantial or irreversible change to archaeological sites, materials or the context of archaeological materials or features. High magnitude impact would result in long term, permanent and significant alteration of the archaeological site, feature, or materials, inhibiting interpretation of 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 changes to archaeological sites, materials or the context of archaeological materials or features. May result in long term, permanent and clear alteration, inhibiting interpretation of several 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.

Magnitude	Description/ reason
	Beneficial impacts of Medium magnitude include the addition of, key characteristics, features, or elements, deriving from site-specific survey and investigations such as diver/ ROV or ground-truthing of anomalies leading to an enhancement of disseminated knowledge.
Low	Adverse, minor level of change to archaeological sites, material or the context of archaeological materials or features 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 marine heritage receptors not disseminated or made publicly available.
Negligible	Negligible level of change and indistinguishable from natural variation, do not change archaeological sites or materials, and do not affect key characteristics, sub-features, or components or their environment or context.
	Beneficial impacts of Negligible magnitude, does not contribute with enhanced knowledge

Table 11.5: Sensitivity (value) of the marine environment.

Receptor sensitivity (value)	Definition
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. 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.

11.5.4 The significance of the effect on marine heritage receptors is determined by comparing the impact of magnitude and the receptor sensitivity (value) as detailed in the Matrix below, Table 11.6.

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Table 11.6: Matrix to determine effect significance.

Magnitude		Sensitivity: High	Sensitivity: Medium	Sensitivity: Low	Sensitivity: Negligible
Adverse	High	Major	Major	Moderate	Minor
Adverse	Medium	Major	Moderate	Minor	Negligible
Adverse	Low	Moderate	Minor	Minor	Negligible
Neutral	Negligible	Minor	Minor	Negligible	Negligible
Beneficial	Low	Moderate	Minor	Minor	Negligible
Beneficial	Medium	Major	Moderate	Minor	Negligible
Beneficial	High	Major	Major	Moderate	Minor

Note: shaded cells are defined as significant with regards to the EIA Regulations 2017[1].

11.6 UNCERTAINTY AND TECHNICAL DIFFICULTIES ENCOUNTERED

11.6.1 The data received to date has been of good quality and suitable for archaeological interpretation (further defined in Section 2.4 of Volume 6, Part 5, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report).

11.6.2 Geophysical data acquisition has been undertaken for the Project within the area described as the preferred offshore cable route corridor within the Scoping Report, and therefore extends beyond the Proposed Order Limits as well as covering the entirety of and beyond the Array areas, see Figure 11.3.

11.6.3 For this ES Chapter the Offshore ECC assessment of geophysical data has been supplemented with the archaeological results from the North Falls Offshore Wind Farm assessment where there are overlaps in the Order Limits (North Falls Preliminary Environmental Information Report, 2023). However there are some small remaining geophysical data gaps where archaeological assessment has not been undertaken as illustrated on Figure 11.3.

11.6.4 Figure 11.4, Figure 11.6 and Figure 11.8 show the VE marine heritage receptors as detailed in Section 11.7 as well as 56 AEZs recommended by North Falls but does not include the 1,771 anomalies classified as A2_h and A_I (North Falls Preliminary Environmental Information Report, 2023).

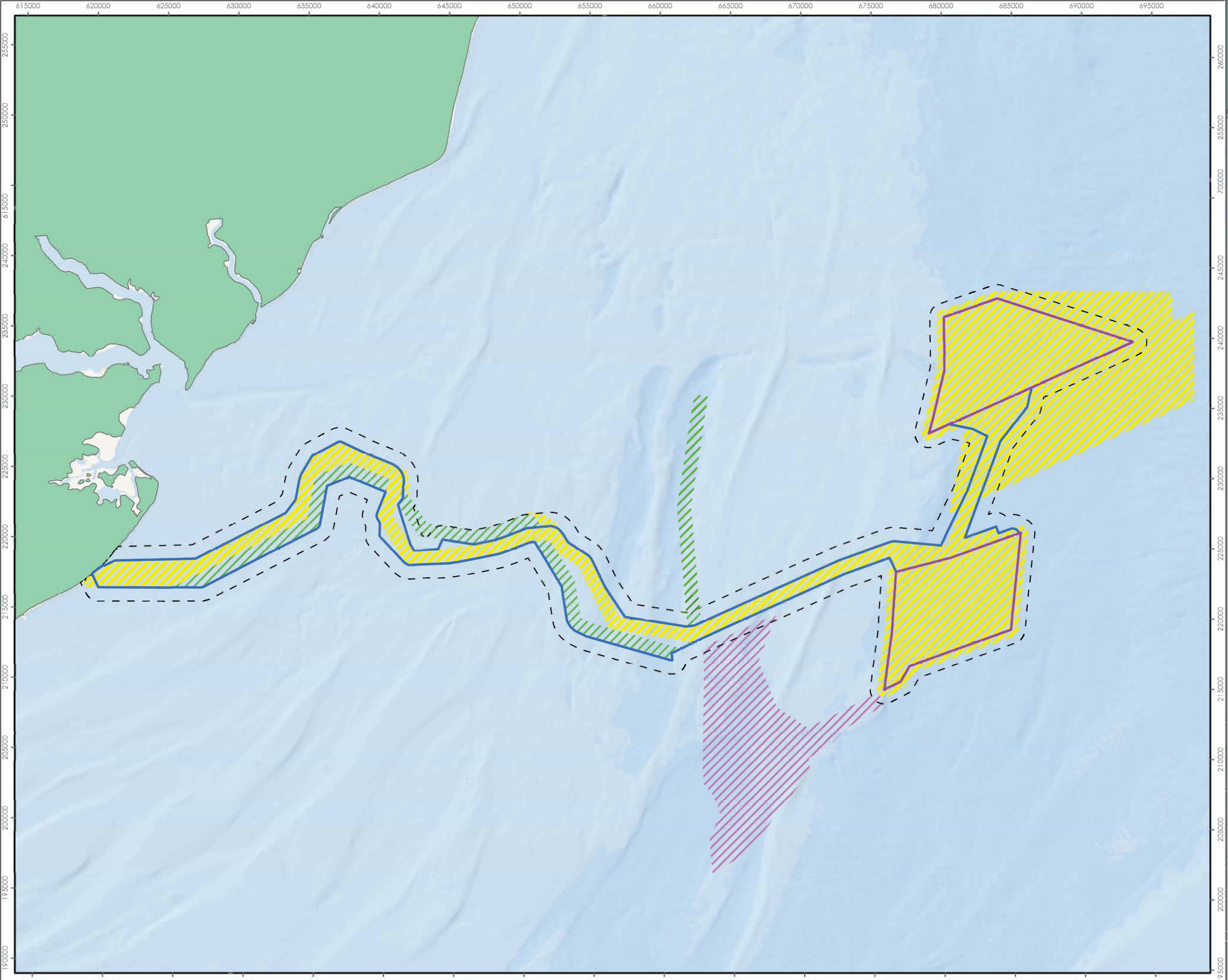
11.6.5 Further details on data coverage as well as remaining data gaps are covered in Section 2.4 and Section 6 of Volume 6, Part 5, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report.

[1] The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017

11.6.6 In consideration of the high number of baseline records within the Offshore ECC route and the marine archaeology study area around it, precautionary AEZs of 50 m will be applied around any records not seen in the VE geophysical data already assessed.

11.6.7 There is a likelihood that previously unidentified sites or features of archaeological interest or significance may be present in the areas where the data has not yet been obtained.

11.6.8 At this time there have been no offshore geotechnical surveys undertaken for the project, however, these are planned post consent. Archaeology specific sampling will be included and informed by the results of the sub bottom data analysis (see Section 11.11).



LEGEND

- Array Areas
- Offshore Export Cable Corridor
- Marine Archaeology Study Area
- VE Geophysical Survey Extent
- North Falls Offshore Array Boundary
- North Falls Export Cable Route Boundary

0 2.5 5 10

Kilometers

PROJECT TITLE:

FIVE ESTUARIES OFFSHORE WINDFARM

DRAWING TITLE:

Geophysical data coverage

VER	DATE	REMARKS	Drawn	Checked
1	29/01/2024	DRAFT	HA	CH

DRAWING NUMBER: 11.3

SCALE: 1:250,000	PLOT SIZE: A3	DATUM: WGS84	PROJECTION: UTMN31

FIVE ESTUARIES OFFSHORE WIND FARM

11.7 EXISTING ENVIRONMENT

OVERVIEW

11.7.1 The marine archaeological resource can be characterised within the following five main categories of sites and features:

- Landscape: submerged prehistoric landscapes related to fluctuations in past sea-level. Such landscapes may contain significant evidence of prehistoric human occupation and/ or environmental change.
- Vessels: Archaeological remains of vessels deposited after a wrecking event at sea or abandoned in an intertidal context, including structural remains of the vessel and cargo or apparatus jettisoned during the wrecking.
- Aircraft: Remains of aircraft crash sites, either coherent assemblages or scattered material, typically the result of Second World War military conflict or passenger casualties. This category includes aircraft, airships and other dirigibles dating to the First World War.
- Structures: Structural remains including defensive structures, lighthouses, jetties, harbours, fish traps or sites lost to the sea as a result of coastal erosion may be found within the intertidal zone (between Mean Low Water Springs (MLWS) and MHWS).
- Historic Seascape Character: The historic cultural influences which shape present perception of seascape, its use, and its ability to accommodate change.

11.7.2 The marine archaeology study area has been assessed and described as a whole, however a summary of records, features, and anomalies within the array areas and ECC can be seen below.

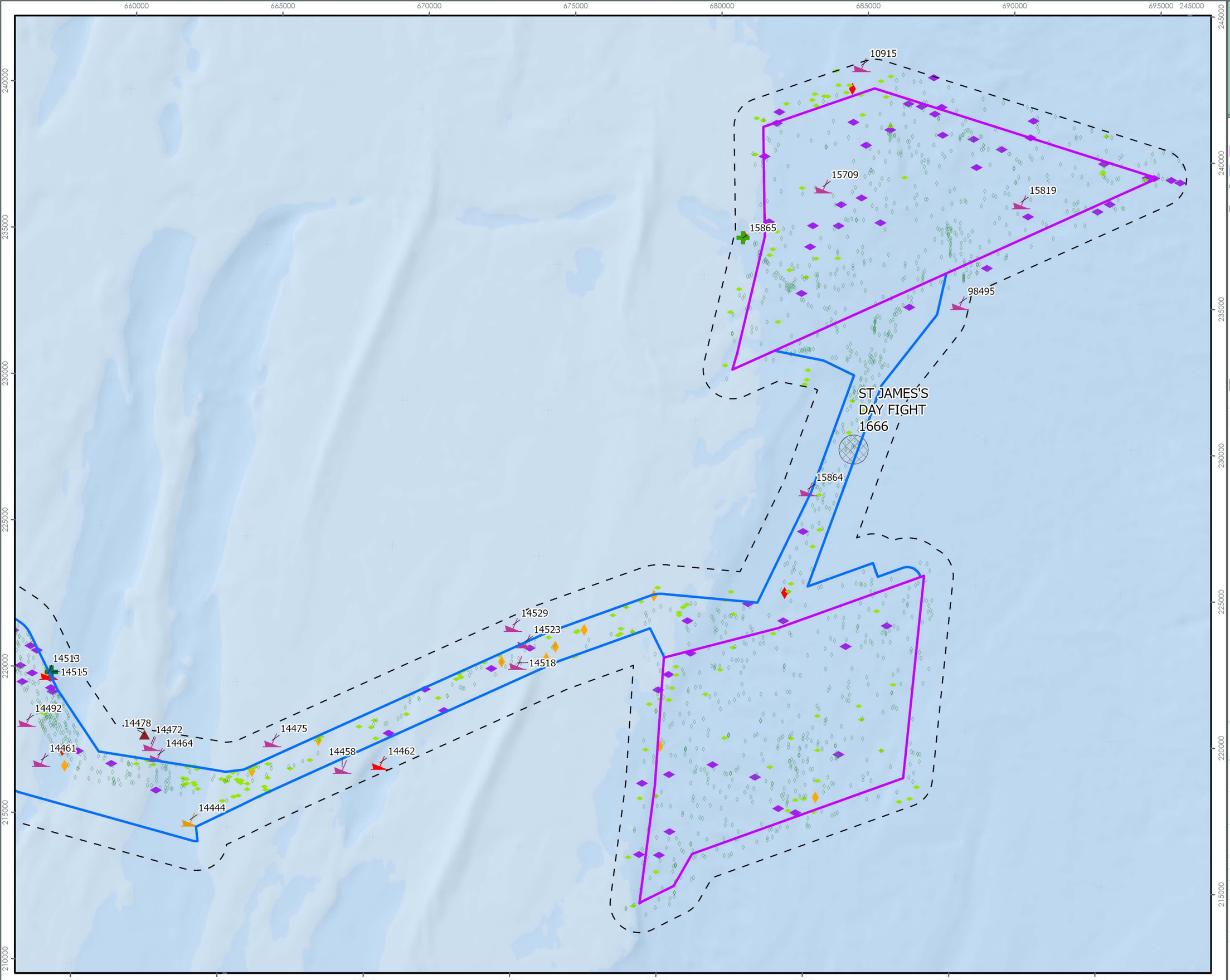
11.7.3 In addition to this ES chapter, a technical report and an Outline Marine WSI (Volume 6, Part 5, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report and Volume 9, Report 19: Outline Marine Written Schemes of Investigation) were produced. A review of the key findings from that study has been incorporated into the description of the existing environment below.

THE ARRAY AREAS

11.7.4 Within the maritime archaeology study area, covering the Array Areas and inter-array cable corridor, there are six records for wrecks and obstructions (Figure 11.4). Of these, one (UKHO15865, MA0001) was seen in the geophysical data. Interpreted channel systems recorded by EMU *et al*. (2009) and valleys and channels of geoarchaeological potential identified in the SBP data can be seen across both array areas (Figure 11.5).

THE OFFSHORE EXPORT CABLE CORRIDOR

11.7.5 Within the maritime archaeology study area covering the Offshore ECC there are 99 records for wrecks, aircraft, obstructions, foul ground, sites and two areas. Of these, 24 were seen in the geophysical data, including one aircraft and 16 wrecks (Figure 11.6 and Figure 11.8). Interpreted channel systems recorded by Emu *et al.* (2009) and valleys and channels of geoarchaeological potential identified in the SBP data can be seen across the Offshore ECC, predominantly at the western extent of the cable route (Figure 11.7 and Figure 11.9).



LEGEND

- Array Areas
- Offshore Export Cable Corridor
- Marine Archaeology Study Area

UKHO and NRHE records

- foul ground
- obstruction
- obstruction (seen in geophysical data)
- wreck
- wreck (seen in geophysical data)
- wreck (covered by North Falls data)
- UKHO and NRHE area records

Anomalies of archaeological potential

- High
- High (mag only)
- Medium
- Low
- Low (mag only)

0 1.25 2.5 5

Kilometers

PROJECT TITLE:

FIVE ESTUARIES OFFSHORE WINDFARM

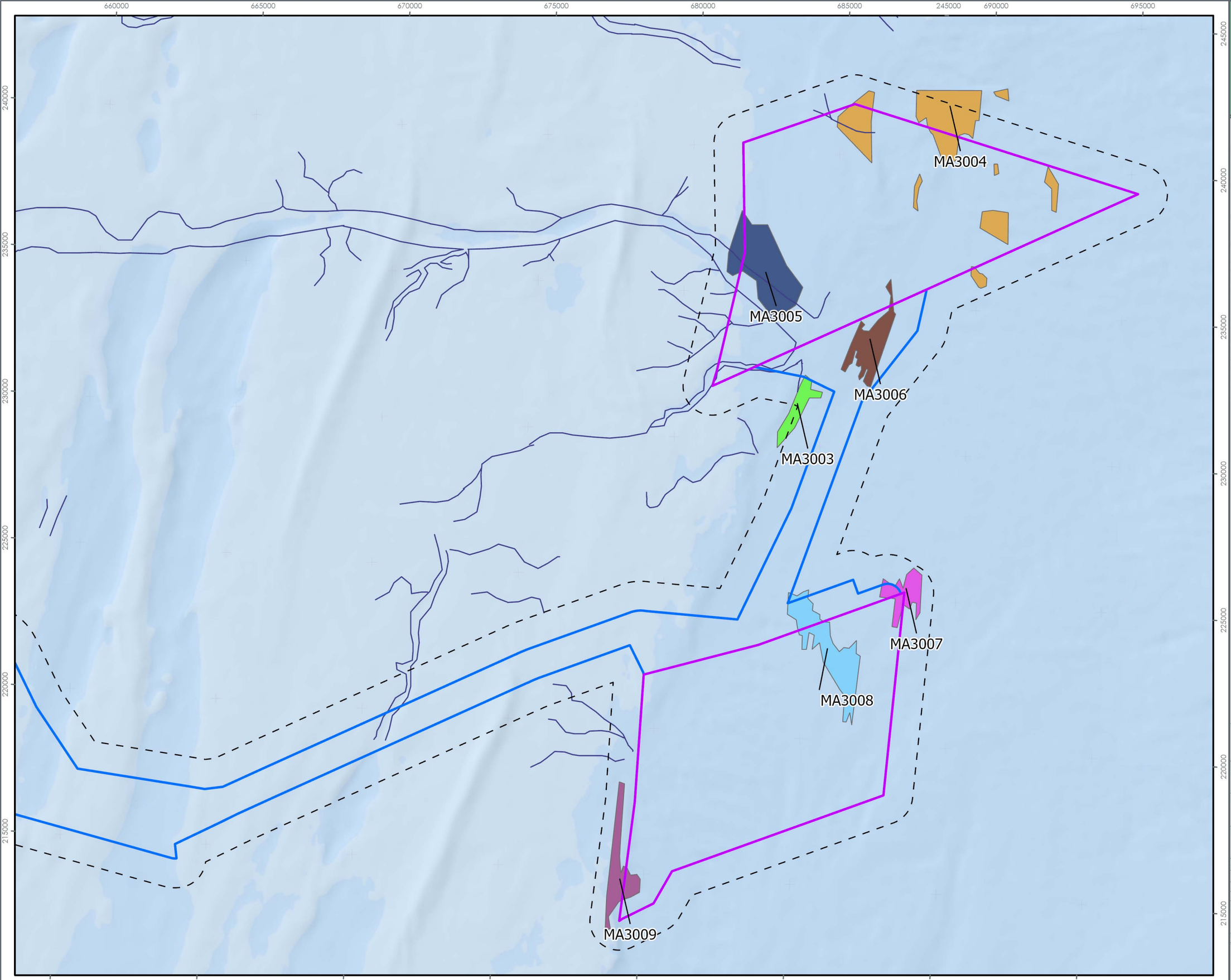
DRAWING TITLE: **Recorded losses and geophysical anomalies within the Array Areas and offshore section of the Offshore ECC**

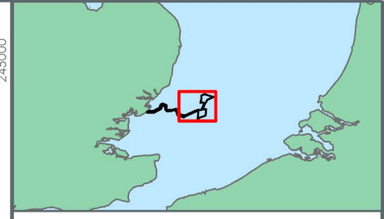
VER	DATE	REMARKS	Drawn	Checked
1	30/01/2024	DRAFT	HA	CH

DRAWING NUMBER: 11.4

SCALE:	PLOT SIZE:	DATUM:	PROJECTION:
1:120,000	A3	WGS84	UTMN31

FIVE ESTUARIES
OFFSHORE WIND FARM





LEGEND

- Array Areas
- Offshore Export Cable Corridor
- Marine Archaeology Study Area
- Interpreted channel systems (EMU, 2009)

Channels with geoarchaeological potential

- MA3003
- MA3004
- MA3005
- MA3006
- MA3007
- MA3008
- MA3009

0 1,250 2,500 5,000

Meters

PROJECT TITLE:

FIVE ESTUARIES OFFSHORE WINDFARM

DRAWING TITLE:

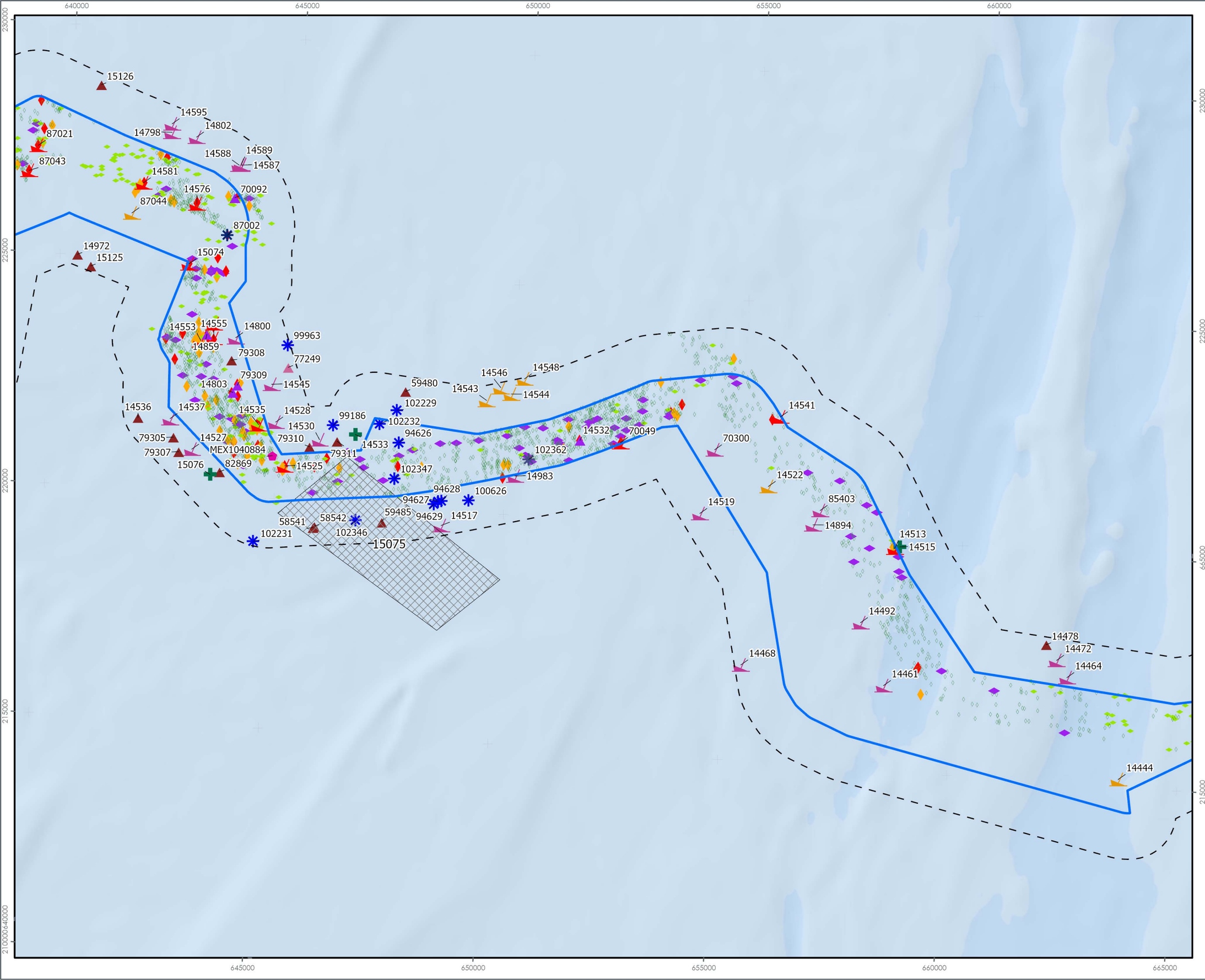
Features of geoarchaeological potential within the Array Areas and offshore section of the Offshore ECC

VER	DATE	REMARKS	Drawn	Checked
1	11/12/2023	DRAFT	HA	CH

DRAWING NUMBER: 11.5

SCALE:	PLOT SIZE:	DATUM:	PROJECTION:
1:120,000	A3	WGS84	UTMN31

FIVE ESTUARIES OFFSHORE WIND FARM



LEGEND

- Offshore Export Cable Corridor
- Marine Archaeology Study Area

UKHO and NRHE records

- foul ground
- foul ground (seen in geophysical data)
- foul ground (covered by North Falls data)
- obstruction
- unknown
- unknown (seen in geophysical data)
- unknown (covered by North Falls)
- wreck
- wreck (seen in geophysical data)
- wreck (covered by North Falls data)
- HER records
- UKHO and NRHE area records

Anomalies of archaeological potential

- High
- High (mag only)
- Medium
- Low
- Low (mag only)

PROJECT TITLE:

FIVE ESTUARIES OFFSHORE WINDFARM

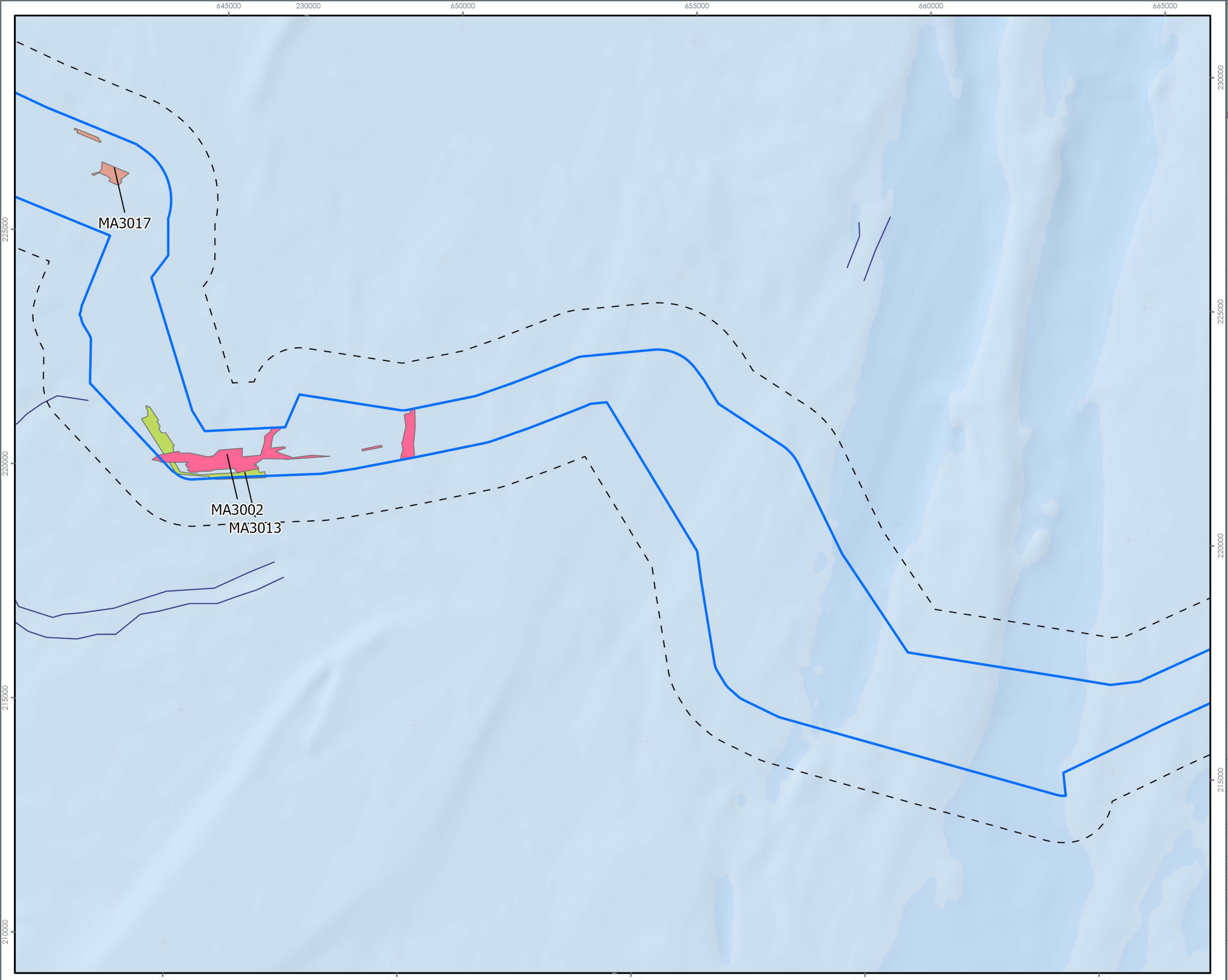
DRAWING TITLE: **Recorded losses and geophysical anomalies within the mid-section of the Offshore ECC**

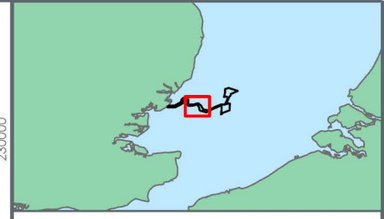
VER	DATE	REMARKS	Drawn	Checked
1	30/01/2024	DRAFT	HA	CH

DRAWING NUMBER: 11.6

SCALE:	PLOT SIZE:	DATUM:	PROJECTION:
1:75,000	A3	WGS84	UTMN31

FIVE ESTUARIES OFFSHORE WIND FARM





LEGEND

- Offshore Export Cable Corridor
- Marine Archaeology Study Area
- Interpreted channel systems (EMU, 2009)

Channels with geoarchaeological potential

- MA3002
- MA3013
- MA3017

0 500 1,000 2,000

Meters

PROJECT TITLE:

FIVE ESTUARIES OFFSHORE WINDFARM

DRAWING TITLE: **Features of geoarchaeological potential within the mid-section of the Offshore ECC**

VER	DATE	REMARKS	Drawn	Checked
1	11/12/2023	DRAFT	HA	CH

DRAWING NUMBER: 11.7

SCALE:	PLOT SIZE:	DATUM:	PROJECTION:
1:75,000	A3	WGS84	UTMN31

FIVE ESTUARIES OFFSHORE WIND FARM

620000 625000 630000 635000 640000 645000

230000 225000 220000 215000

15126 14971 14595 14802 14798 87021 14588 14589 14587 87043 14581 87019 14576 70092 87044 87002 14972 15125 15074 14553 14555 14800 99963 14859 79308 77249 14996 79309 14803 14545 14540 14534 14536 14537 14535 MEX104088 14530 14970 79305 14527 79307 15076 82869 79310 14525 15075 58542 102231 58541 MEX31513 MEX10276 MEX31512 MEX10124 MEX1033273 MEX31510 MEX12258 MEX1039272 MEX1040009 MEX10282 MEX31498 14520 MEX31492 MEX31497 MEX1033272 MEX31495 MEX1034362 MEX1042145 MEX31496 MEX10111 MEX1039273 14995 14514 MEX1034361 MEX31493 MEX1039274 82140 70010

LEGEND

- Offshore Export Cable Corridor
- Marine Archaeology Study Area

UKHO and NRHE records

- aircraft
- aircraft (seen in geophysical data)
- foul ground
- foul ground (seen in geophysical data)
- foul ground (covered by North Falls data)
- obstruction
- unknown
- unknown (seen in geophysical data)
- wreck
- wreck (seen in geophysical data)
- wreck (covered by North Falls data)
- HER records
- UKHO and NRHE area records

Anomalies of archaeological potential

- High
- High (mag only)
- Medium
- Low
- Low (mag only)

0 0.75 1.5 3

Kilometers

PROJECT TITLE:

FIVE ESTUARIES OFFSHORE WINDFARM

DRAWING TITLE: **Recorded losses and geophysical anomalies within the nearshore Offshore ECC**

VER	DATE	REMARKS	Drawn	Checked
1	01/03/2024	DRAFT	HA	CH

DRAWING NUMBER: 11.1.4

SCALE:	PLOT SIZE:	DATUM:	PROJECTION:
1:75,000	A3	WGS84	UTMN31

FIVE ESTUARIES
OFFSHORE WIND FARM

625000
630000
635000
640000
645000
230000
225000
220000
215000

MA3000
MA3016
MA3012
MA3015
MA3017
MA3014
MA3011
MA3001
MA3003
MA3010
MA3013
MA3002

LEGEND

- Offshore Export Cable Corridor
- Marine Archaeology Study Area
- Potential geotechnical sample locations
- Interpreted channel systems (EMU, 2009)

Channels with geoarchaeological potential

- MA3000
- MA3001
- MA3002
- MA3003
- MA3010
- MA3011
- MA3012
- MA3013
- MA3014
- MA3015
- MA3016
- MA3017

0 0.75 1.5 3
Kilometers

PROJECT TITLE:
FIVE ESTUARIES OFFSHORE WINDFARM

DRAWING TITLE:
Features of geoarchaeological potential within the nearshore Offshore ECC

VER	DATE	REMARKS	Drawn	Checked
1	30/01/2024	DRAFT	HA	CH

DRAWING NUMBER: 11.9

SCALE:	PLOT SIZE:	DATUM:	PROJECTION:
1:75,000	A3	WGS84	UTMN31

FIVE ESTUARIES
OFFSHORE WIND FARM

11.7.6 The area of seabed that the marine archaeology study area covers was previously a large swathe of dryland 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)colonization 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.

11.7.7 These periods of (re)colonisation are associated with the retreat of icesheets following the last three glacial maximums:

- Devensian: Upper Palaeolithic c. 100 – 22,000 BP (glacial maximum);
- Wolstonian: Lower Palaeolithic c. 250 – 150,000 BP (glacial maximum); and
- Anglian: Lower Palaeolithic c. 350 – 280,000 BP (glacial maximum).

11.7.8 The potential for submerged landscapes within the marine archaeology study area is high. To the north of the marine archaeology study area, at Happisburgh and Pakefield, the earliest evidence of hominin occupation of northern Europe (c. 900 ka to 800 ka) comes from sites, features, and finds within the coastal and marine zone (Parfitt *et al*., 2005, 2010; Bynoe, 2018). While to the south lie significant Lower Palaeolithic sites at Clacton (Emu *et al*., 2009).

11.7.9 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 been eroded or reworked by younger landscapes (Cohen *et al.*, 2017).

11.7.10 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 Essex and Suffolk coasts. Changing routes of river systems during these periods of glaciation is exemplified in the terraces of the Thames-Medway rivers which originally occupied a more northerly course in Norfolk, but were pushed south to their current location approximately 450,000 BP.

11.7.11 The Naze, now a headland on the Essex coast, once formed the northern side of the major river valley which contained the Thames, Medway, Crouch, Colne and Blackwater and their minor tributaries. This coastal setting with major estuaries, high in marine resources, suggests the Naze would have been a prime location for early human settlement but the area is likely to have been inundated by rising sea-levels around 10,000 BP.

11.7.12 The significant assemblage of microliths discovered at Stone Point, approximately 5.5 km to the north of the VE landfall, suggests Mesolithic activity in the area was taking place at a time when the coast had reached its present outline following a rise in sea-levels. The discovery of Neolithic pottery and axe heads in this same area suggests settlement here was continuous over a long period (Oxford Archaeology, 2007).

11.7.13 The archaeological and palaeoenvironmental potential of the offshore deposits from the southern end of the North Sea basin 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.

11.7.14 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 developments such as aggregate dredging Area 240 approximately 60 km north 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.

11.7.15 Eight prehistoric and Palaeolithic finds have also been recorded in the marine archaeology area within the Historic Environment Record (HER) and National Record of the Historic Environment (NRHE) databases including three mammoth tooth find spots recorded in the NHRE data, an additional mammoth tooth find spot and tools found from the Palaeolithic, Mesolithic and Neolithic recorded in the HER data. A Palaeolithic hand axe was found along the beach in Frinton-on-Sea and was also recorded by CITiZAN. There are currently no protected areas or statutory designations in relation to submerged landscapes within the marine archaeology study area.

11.7.16 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 UK and continental Europe was permanently inundated.

11.7.17 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).

11.7.18 The potential for substantial submerged landscape deposits offshore is further reduced in the Bronze Age due to the increased stability in sea levels. However, with increasingly sedentary populations, both on the coast and inland, this inevitably gave rise to increased communications along the coast and waterways of the region.

11.7.19 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.

11.7.20 By the Iron Age, sea-level change no longer has a significant effect on the geomorphology of the coastline and is replaced by coastal erosion as the key factor in these changes. Maritime trade networks were further developed, with evidence of cross-channel, as well as coastal and inland, trade. From the Late Iron Age there is more clear 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 and France/ Belgium, and a range of other traded and imported Roman material.

11.7.21 During the Romano-British period, there is clear evidence for seaborne and coastal activity along the Suffolk and Essex coastlines. Several important sites were established in Suffolk following the Roman invasion in AD 43, including Ipswich, as well as evidence of enclosures, trackways, and fields. A range of maritime vessel types would have been in use during the Romano-British period to facilitate activity along the east coast. Watercraft used for less archaeologically visible pursuits such as fishing would have also been present.

11.7.22 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 into 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.

11.7.23 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 archaeology study area.

11.7.24 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 innovations 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 liners in favour of cruise ships and newly developed passenger aircraft in the mid-1900s, and planes becoming the primary method of intercontinental travel. All recorded wrecks within the marine archaeology study area where the date of loss is known are considered modern. These are detailed in Section 3.3 of Volume 6, Part 5, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report.

KNOWN WRECKS AND OBSTRUCTIONS

11.7.25 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.

11.7.26 Records from the 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.

11.7.27 The archaeological assessment of geophysical data combined with the baseline conditions has identified 34 LIVE wrecks (including two aircrafts), 20 DEAD wrecks, six UNKNOWN or unconfirmed, no LIFTED wrecks, and one wreck listed as 'Not Fully Surveyed' within the marine archaeology study area (Figure 11.10). Of the wrecks recorded in the UKHO and NRHE baseline data assessment, 16 were identified within the geophysical data. Additionally, the recorded locations of five foul ground, one obstruction, two unclassified and one aircraft site were seen to correspond with anomalies identified in the geophysical data (Section 11.8).

AVIATION REMAINS

11.7.28 Remains of aircraft crash sites, either coherent assemblages or scattered material are usually the result of Second World War military conflict. The numerous passenger casualties, particularly during the peak of seaplane activity during the inter-war period are the other most likely potential source. Aviation remains include aircraft, airships and other dirigibles dating to the First World War, although these rarely survive in the archaeological record.

11.7.29 There are two reported losses of aircrafts within the study area: UKHO15199, a FW 190 from which the engine has been recovered recorded approximately 400 m from the coast, 700 m north of the Order Limits and outside of the geophysical survey area (Figure 11.8 and Figure 11.10).

11.7.30 The second aircraft is a charted wreck, recorded as UKHO14995 and described as an unidentified aircraft believed to be a Vickers Wellington. The Vickers Wellingtons were British twin-engine, long-range medium bombers, designed during the mid-1930s. The remains of UKHO14995 are recorded approximated 6.4 km from the coast within the ECC (Figure 11.8 and Figure 11.10) and was first located by a naval vessel in 1988 when it was measured to be 35 m long. The following year, a small piece of aircraft structure was reported as recovered by divers and confirmed as a distinctive 'geodetic' structure used in the Vickers Wellington aircrafts, a manufacturer's number confirmed this as the case. SSS, MBES and magnetometer data indicates that there some structural elements might still be present on the sea floor (MA0029), however, further investigation is needed to confirm whether MA0029 relates to the record for UKHO14995.

11.7.31 Where *in situ* remains associated with any military aviation losses are found and confirmed, they will be archaeologically significant and protected under the Protection of Military Remains Act 1986. These losses are further detailed in Section 3.3 of Volume 6, Part 5, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report.

FISHERMEN'S FASTENERS

11.7.32 Records classed as fishermen's fasteners, or which otherwise remain unidentified and are not associated with vessel or structural remains (including records classified as DEAD by the UKHO). They are unidentified obstructions reported by fishermen, possibly indicative of a wreck or submerged feature. No other baseline information is available for any of these obstructions, and while they may well represent archaeological remains, this is not possible to ascertain from the existing sources.

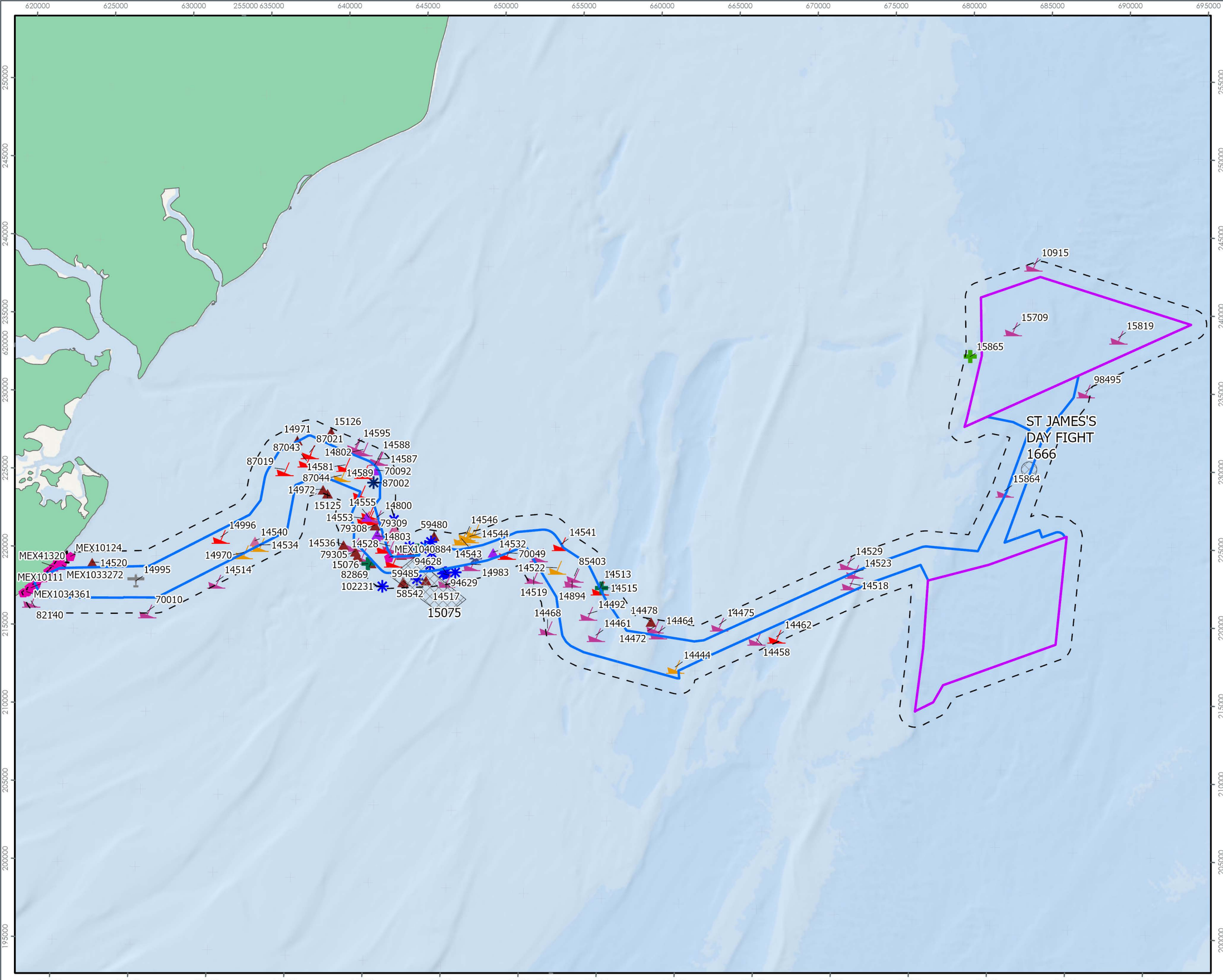
11.7.33 Within the marine archaeology study area, there are currently no records classed as fishermen's fasteners recorded by the NRHE.

DESIGNATED SITES

11.7.34 There are currently no known or identified features or sites within the marine archaeology study area that are designated under the Protection of Wrecks Act 1973, or any other site designation or statutory protection. The site of UKHO 14995, the Vickers Wellington aircraft (corresponding with geophysical anomaly MA0029) is likely to be automatically protected under the Protection of Military Remains Act, 1986, following investigation should it be found to relate to the recorded loss.

UNLOCATED MARINE HERITAGE RECEPTORS

11.7.35 There is always a possibility that not yet identified marine heritage receptors are located within the marine archaeology study area and/ or ES Order Limits. Unlocated marine heritage 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 the last years located several previously unknown and unlocated sites of high archaeological significance within site boundaries, often as part of or after completing pre-construction surveys. Mitigation for unlocated marine heritage receptors is further discussed in Section 11.11 and Volume 9, Report 19: Outline Marine Written Schemes of Investigation.



LEGEND

- Array Areas
- Offshore Export Cable Corridor
- Marine Archaeology Study Area

UKHO and NRHE records

- aircraft
- aircraft (seen in geophysical data)
- foul ground
- foul ground (seen in geophysical data)
- foul ground (covered by North Falls data)
- obstruction
- obstruction (seen in geophysical data)
- unknown
- unknown (seen in geophysical data)
- unknown (covered by North Falls)
- wreck
- wreck (seen in geophysical data)
- wreck (covered by North Falls data)
- HER records
- UKHO and NRHE area records

0 2.25 4.5 9

Kilometers

PROJECT TITLE:

FIVE ESTUARIES OFFSHORE WINDFARM

DRAWING TITLE: **Recorded losses, obstructions and foul grounds within the marine archaeology study area**

VER	DATE	REMARKS	Drawn	Checked
1	30/01/2024	DRAFT	HA	CH

DRAWING NUMBER: 11.10

SCALE:	PLOT SIZE:	DATUM:	PROJECTION:
1:225,000	A3	WGS84	UTMN31

FIVE ESTUARIES OFFSHORE WIND FARM

HISTORIC SEASCAPE CHARACTERISATION

11.7.36 The Historic Seascape Characterisation (HSC) assessment covering the VE Order Limits and broader environmental context was completed in line with the National Heritage Protection Plan (NHPP). This characterisation extended the principles applied in the Historic Landscape Characterisation (HLC) (as covered in Volume 3 Chapter 7) to the coastal and marine environment, including the sub-sea floor, sea floor, water column, sea surface and coastal areas.

11.7.37 The HSC assessment draws on the consolidated National Historic Seascape 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). These references have been used to assess and define areas within HSC character types that are illustrated in the narrative of historic trends and processes of an area to inform a sustainable management of change over time and the capacity of this area to accommodate changes influenced by the development of the VE OWF.

11.7.38 The VE development area lies within the Southwold to Clacton study area (Oxford Archaeology, 2007). Key characteristics of this area include mudflats sand waves, which may obscure archaeology from detection in geophysical survey, and palaeochannels which have potential to be further mapped through geophysical and geotechnical investigation, with the results to be incorporated into the deposit model.

11.7.39 The multi-level character of the sea and the character types within in it which relate to the seascape within the Southwold to Clacton study area are outlined below. The dominant character type is determined as the predominant character type as seen by geospatial coverage in the HSC GIS data.

Table 11.7: Sub-sea floor level characterisation

Sub-Sea Floor Broad Character Types	Character Types	Character Sub-Types
Navigation	Navigation hazard	Shoals and flats
	Navigation activity	Anchorage
	Navigation feature	Navigation channel (active) Navigation channel (disused) Dredged channel/ area
Industry	Processing industry	Spoil and waste dumping,
	Extractive industry	Aggregate dredging
	Energy industry	Hydrocarbon pipeline Renewable energy installation (wind) Submarine power cable
Communications	Telecommunications	Submarine telecommunications cable

Sub-Sea Floor Broad Character Types	Character Types	Character Sub-Types
Military	Military facility	Ordnance dumping
Cultural Topography	Cultural topography (marine)	Cultural topography (marine) (unspecified) Mixed sediment plains, Coarse sediment plains Fine sediment plains Sand banks with sand waves Mud plains
	Palaeolandscape component	Palaeochannel Palaeolandscape component

11.7.40 The dominant character type for the sub-sea floor is Cultural Topography (Figure 11.11).

Table 11.8: Sea floor level characterisation

Sea Floor Broad Character Types	Character Types	Character Sub-Types
Navigation	Navigation hazard	Wreck hazard Submerged rocks Shoals and flats Maritime debris Rock outcrops
	Maritime safety	Safety area
	Navigation activity	Anchorage
	Navigation feature	Navigation channel (active) Navigation channel (disused) Dredged channel/ area
Industry	Processing industry	Spoil and waste dumping,
	Extractive industry	Aggregate dredging
	Energy industry	Hydrocarbon installation Hydrocarbon pipeline Renewable energy installation (wind) Submarine power cable

Sea Floor Broad Character Types	Character Types	Character Sub-Types
Fishing	Fishing	Bottom trawling Potting Drift netting Shellfish dredging Fixed netting
Ports and Docks	Ports and docks	Harbour Working pier
Coastal Infrastructure	Flood and erosion defences	Sea defence
Communications	Telecommunications	Submarine telecommunications cable
Military	Military facility	Military practice area Ordnance dumping
Recreation	Recreation	Pleasure pier
Cultural Topography	Cultural topography (marine)	Mixed sediment plains Coarse sediment plains Fine sediment plains Sand banks with sand waves Mud plains
	Cultural topography (intertidal)	Sandy foreshore Mudflats Saltmarsh,
	Palaeolandscape component	Palaeochannel

11.7.41 The dominant character type for the sea floor level is Fishing (Figure 11.12).

Table 11.9: Water column level characterisation

Water Column Broad Character Types	Character Types	Character Sub-Types
Navigation	Navigation hazard	Hazardous water Submerged rocks
	Maritime safety	Buoyage Safety area Safety services

Water Column Broad Character Types	Character Types	Character Sub-Types
	Navigation activity	Anchorage Ferry crossing Harbour pool Navigation route
	Navigation feature	Navigation channel (active) Navigation channel (disused)
Industry	Extractive industry	Aggregate dredging
	Energy industry	Hydrocarbon installation Renewable energy installation (wind)
	Shipping industry	Boat yard
Fishing	Fishing	Pelagic trawling Fishing ground Longlining Bottom trawling Potting Drift netting Shellfish dredging
	Aquaculture	Shellfish farming
Ports and Docks	Ports and docks	Harbour Working pier
Coastal Infrastructure	Flood and erosion defences	Flood defence Sea defence
Military	Military facility	Military practice area
Recreation	Recreation	Leisure fishing Leisure sailing Leisure beach Marina Sports facility Pleasure pier
Cultural Topography	Cultural topography (intertidal)	Saltmarsh Mudflats

11.7.42 The dominant character type for the water column level is Fishing (Figure 11.13).

Table 11.10: Sea surface level characterisation

Sea Surface Broad Character Types	Character Types	Character Sub-Types
Navigation	Navigation hazard	Hazardous water
	Maritime safety	Buoyage Safety area Safety services
	Navigation activity	Anchorage Ferry crossing Navigation route
	Navigation feature	Navigation channel (active),
Industry	Extractive industry	Aggregate dredging
	Energy industry	Hydrocarbon installation Renewable energy installation (wind)
	Shipping industry	Boat yard
Fishing	Fishing	Bottom trawling Longlining Drift netting Pelagic trawling Fishing ground Shellfish dredging
Ports and Docks	Ports and docks	Harbour Working pier
Coastal Infrastructure	Flood and erosion defences	Flood defence Sea defence
Military	Military facility	Military practice area
Recreation	Recreation	Leisure sailing Wildlife watching Marina Bathing/ swimming Sports facility

Sea Surface Broad Character Types	Character Types	Character Sub-Types
		Pleasure pier
Cultural Topography	Cultural topography (intertidal)	Saltmarsh

11.7.43 The dominant character type for the sea surface level is Fishing (Figure 11.14).

Table 11.11: Coastal level characterisation

Coastal Broad Character Types	Character Types	Character Sub-Types
Navigation	Navigation hazard	Hazardous water Water turbulence Wreck hazard Shoals and flats Submerged rocks Rocky foreshore
	Maritime safety	Daymark Lighthouse Buoyage Safety area Safety services
	Navigation activity	Anchorage Ferry crossing Harbour pool Navigation route
	Navigation feature	Navigation channel (active)
Industry	Extractive industry	Aggregate dredging Quarrying
	Energy industry	Hydrocarbon installation Renewable energy installation (wind) Submarine power cable, Power station (nuclear) Mining (unspecified)

Coastal Broad Character Types	Character Types	Character Sub-Types
	Processing industry	Industrial production (unspecified) Sewage works Spoil and waste dumping Chemical works Salt production
	Shipping industry	Boat yard
Fishing	Aquaculture	Shellfish farming,
	Fishing	Bottom trawling Longlining Drift netting Pelagic trawling Fishing ground Potting Fish processing facility Shellfish dredging
Ports and Docks	Ports and docks	Harbour Quay Dockyard (civilian) Port Warehousing Working pier
Coastal Infrastructure	Flood and erosion defences	Flood defence Sea defence
Communications	Transport	Railway Civilian airfield Canal Road
	Telecommunications	Submarine telecommunications cable
Military	Military facility	Naval dockyard Firing range (land)

Coastal Broad Character Types	Character Types	Character Sub-Types
		Barracks,
	Military defence and fortification	Roman fortification Post-medieval fortification Early modern fortification
Settlements	Settlement	Urban settlement Village
Recreation	Recreation	Bathing/ swimming Golf course Holiday park Leisure sailing Marina Parks and gardens Seaside entertainment Sports facility Wildlife watching Promenade Pleasure pier Leisure beach Recreational open ground Landing point,
Cultural Topography	Palaeolandscape component	Palaeochannel Palaeolandscape component
	Cultural topography (intertidal)	Saltmarsh Sandy foreshore Mudflats Shingle foreshore
	Cultural topography (landward)	Cliff Lake, pond Reservoir Watercourse Wetland Lagoon

Coastal Broad Character Types	Character Types	Character Sub-Types
	Cultural topography (marine)	Mixed sediment plains Coarse sediment plains Fine sediment plains
Woodland	Woodland	Plantation Ancient woodland
Enclosed Land	Reclaimed land	Reclamation from tidal marsh Reclamation from wetland
Unimproved Land	Coastal rough ground	Heathland, rough grassland
HLC	HLC	HLC

11.7.44 The dominant character type for the coastal level is Navigation (Figure 11.5).

11.7.45 The sub-sea floor, sea floor and water column have been assessed for archaeological potential and significance in detail in this Chapter, using a wide suite of geophysical datasets and historical resources (see Sections 11.7, 11.8 and 11.9).

11.7.46 The Historic Seascape Character of the study area, and the predominant character type of industry seen throughout all levels of the marine and coastal zone, is reflected in its prolonged, and continued, maritime history.

CAPACITY TO ACCOMMODATE CHANGE

11.7.47 VE will contribute to an existing arrangement of offshore wind farms along the east coast. Because of the previous installation of active wind farms in the seascape character, the impact to this character has already occurred, and the installation of turbines for VE will contribute to, rather than alter this feature (see Volume 6, Part 2, Chapter 10: Seascape, Landscape and Visual Impact Assessment).

11.7.48 It is therefore predicted that the capacity of the region to accommodate change means that the perception of VE OWF would mainly occur as a positive or neutral change equalling a negligible magnitude.

LEGEND

- Array Areas
- Offshore Export Cable Corridor
- Marine Archaeology Study Area

Type

- Cultural Topography
- Navigation
- Industry
- Communications
- Military

0 4.25 8.5 17

Kilometers

PROJECT TITLE:

FIVE ESTUARIES OFFSHORE WINDFARM

DRAWING TITLE:

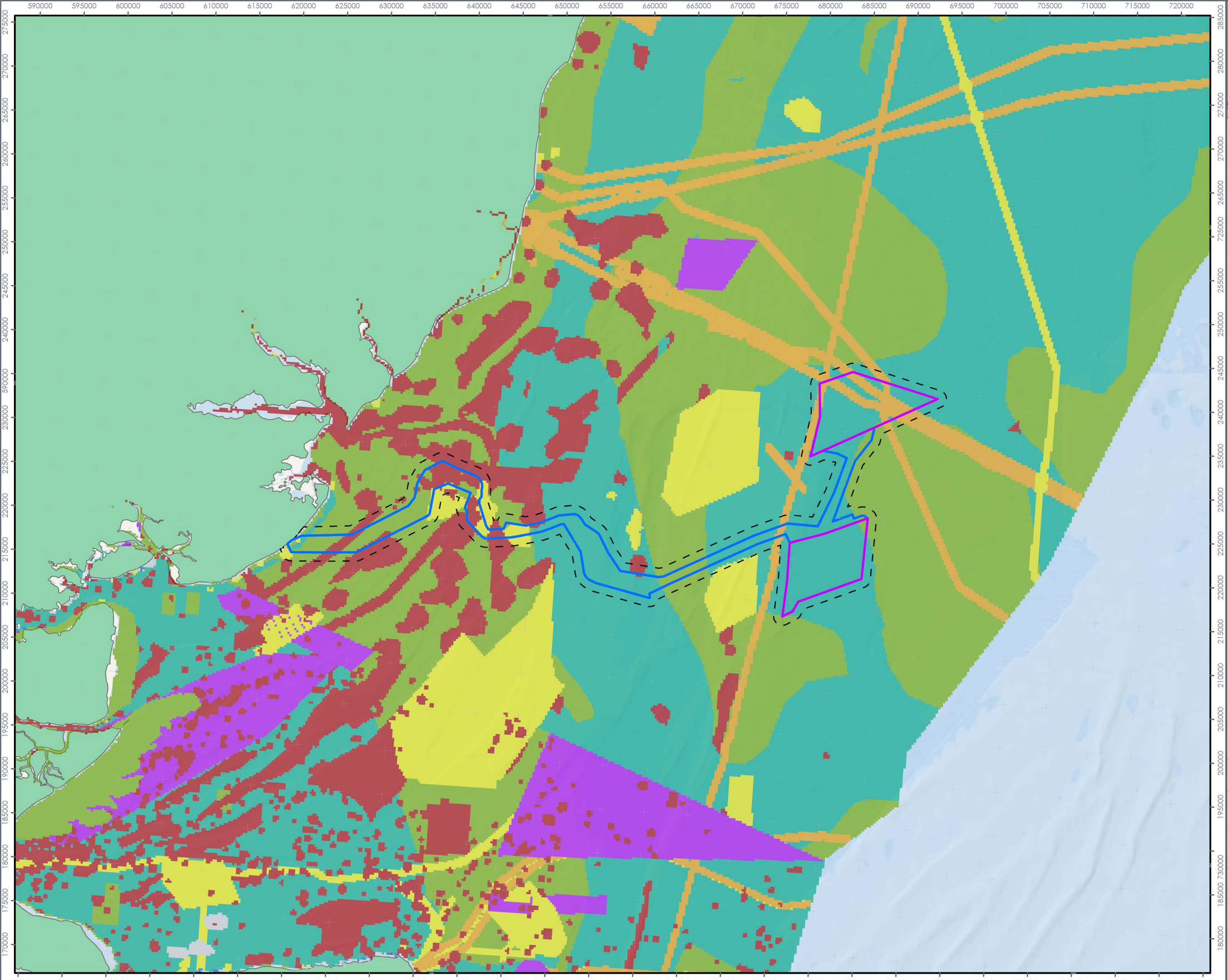
Historic Seascape Characterisation of the sub-sea floor level

VER	DATE	REMARKS	Drawn	Checked
1	29/01/2024	DRAFT	HA	CH

DRAWING NUMBER: 11.11

SCALE:	PLOT SIZE:	DATUM:	PROJECTION:
1:400,000	A3	WGS84	UTMN31

FIVE ESTUARIES OFFSHORE WIND FARM



LEGEND

- Array Areas
- Offshore Export Cable Corridor
- Marine Archaeology Study Area

Type

- Fishing
- Cultural Topography
- Ports and Docks
- Navigation
- Industry
- Communications
- Coastal Infrastructure
- Military

0 4.25 8.5 17

Kilometers

PROJECT TITLE:

FIVE ESTUARIES OFFSHORE WINDFARM

DRAWING TITLE:

Historic Seascape Characterisation of the sea floor level

VER	DATE	REMARKS	Drawn	Checked
1	29/01/2024	DRAFT	HA	CH

DRAWING NUMBER: 11.12

SCALE:	PLOT SIZE:	DATUM:	PROJECTION:
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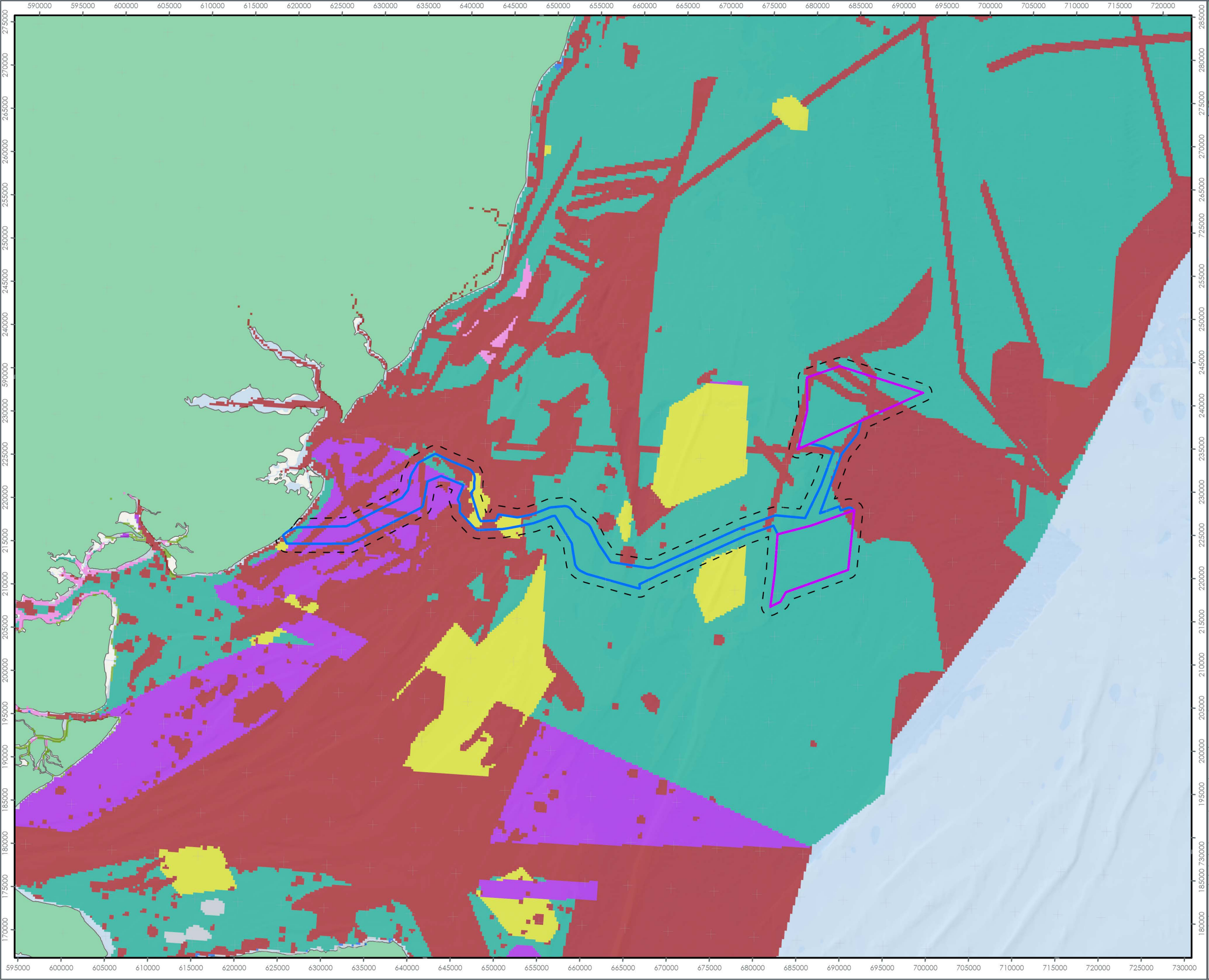
FIVE ESTUARIES OFFSHORE WIND FARM



LEGEND

- Array Areas
- Offshore Export Cable Corridor
- Marine Archaeology Study Area

Type

- Fishing
- Cultural Topography
- Ports and Docks
- Navigation
- Industry
- Coastal Infrastructure
- Military
- Recreation

0 4.25 8.5 17

Kilometers

PROJECT TITLE:

FIVE ESTUARIES OFFSHORE WINDFARM

DRAWING TITLE:

Historic Seascape Characterisation of the water column level

VER	DATE	REMARKS	Drawn	Checked
1	29/01/2024	DRAFT	HA	CH

DRAWING NUMBER: 11.13

SCALE:	PLOT SIZE:	DATUM:	PROJECTION:
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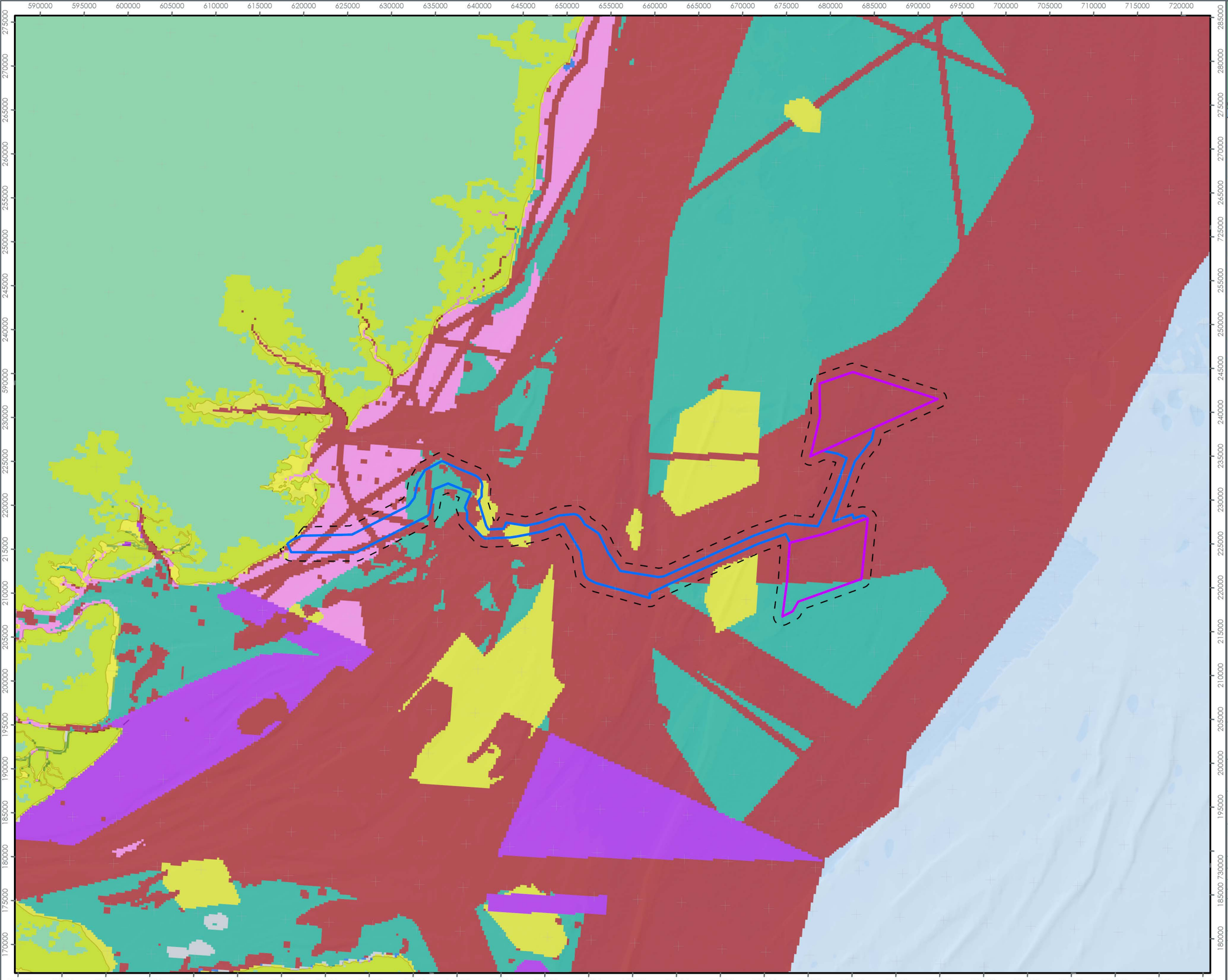
FIVE ESTUARIES
OFFSHORE WIND FARM



LEGEND

- Array Areas
- Offshore Export Cable Corridor
- Marine Archaeology Study Area

Type

- Fishing
- Cultural Topography
- Ports and Docks
- Navigation
- Industry
- Coastal Infrastructure
- Military
- Recreation

0 4.25 8.5 17

Kilometers

PROJECT TITLE:

FIVE ESTUARIES OFFSHORE WINDFARM

DRAWING TITLE:

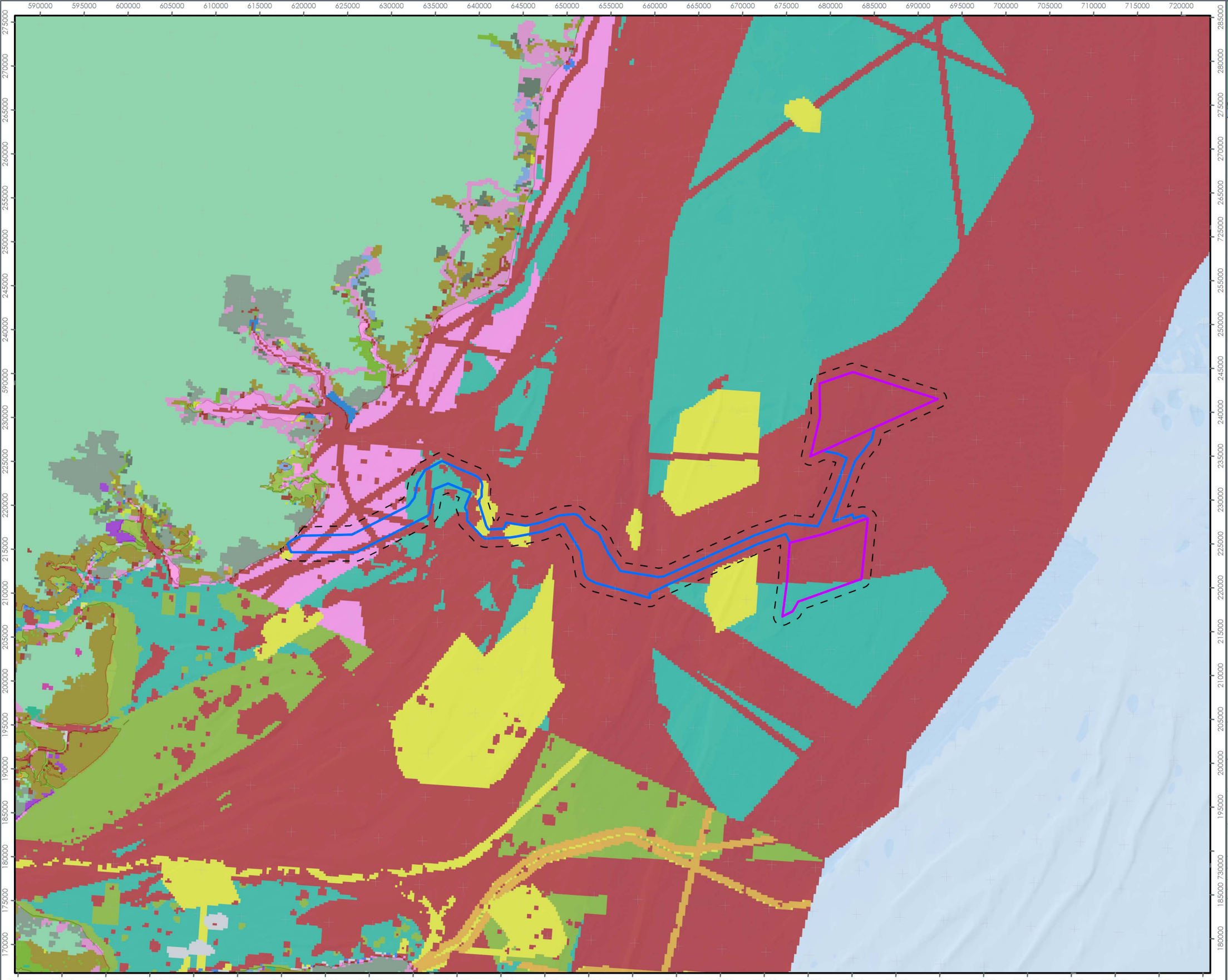
Historic Seascape Characterisation of the sea surface level

VER	DATE	REMARKS	Drawn	Checked
1	29/01/2024	DRAFT	HA	CH

DRAWING NUMBER: 11.14

SCALE:	PLOT SIZE:	DATUM:	PROJECTION:
1:400,000	A3	WGS84	UTMN31

FIVE ESTUARIES OFFSHORE WIND FARM



LEGEND

- Array Areas
- Offshore Export Cable Corridor
- Marine Archaeology Study Area

Coastal Activity Type

- Fishing
- Cultural Topography
- Ports and Docks
- Navigation
- Industry
- Settlements
- Communications
- Woodland
- Enclosed Land
- Coastal Infrastructure
- Military
- His toric Landscape Characterisation
- Unimproved Land
- Recreation

0 4.25 8.5 17

Kilometers

PROJECT TITLE:

FIVE ESTUARIES OFFSHORE WINDFARM

DRAWING TITLE:

Historic Seascape Characterisation of the coastal level

VER	DATE	REMARKS	Drawn	Checked
1	29/01/2024	DRAFT	HA	CH

DRAWING NUMBER: 11.15

SCALE: 1:400,000	PLOT SIZE: A3	DATUM: WGS84	PROJECTION: UTMN31

FIVE ESTUARIES
OFFSHORE WIND FARM

EVOLUTION OF THE BASELINE

11.7.49 An outline of the likely evolution of the baseline presented above without implementation of the development of VE due to natural changes to the environment is presented below, in accordance with the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017.

11.7.50 The environmental baseline 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 11.22) that have the potential to cause adverse, direct impact on marine archaeological receptors or contribute with beneficial impacts such as large-scale enhanced understanding of the archaeological resource through large area geophysical/ geotechnical survey data released to public domain or the enhanced knowledge of, key characteristics, features or elements, deriving from site-specific survey and investigations.

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

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

11.8 ARCHAEOLOGICAL ASSESSMENT OF GEOPHYSICAL DATA

11.8.1 The archaeological assessment of geophysical data is presented below, and the results are summarised in Table 11.12. All geophysical anomalies have been cross-referenced with records of marine heritage receptors identified during the baseline assessment (see above).

11.8.2 Fugro was contracted by RWE Renewables UK Ltd to acquire shallow geophysical and Ultra-High Resolution Seismic (UHRS) data across areas being considered for development at the VE array and associated export cable route corridor ().

11.8.3 The data quality was assessed as good, meaning suitable, clear data in which anomalies can be clearly identified and interpreted and which provides the highest probability for marine heritage receptors to be identified. The definition of survey data quality for archaeological interpretation is further detailed in Section 2.4 of Volume 6, Part 5, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report.

Table 11.12: Summary of archaeological anomalies within the marine archaeology study area seen in the geophysical data

Number of anomalies	Archaeological potential
58	High
172	Magnetic anomalies of high potential (>100 nT not seen in SSS or MBES data)
4	Magnetic anomalies of high potential (>100 nT not seen in SSS or MBES data, but correlate with UKHO records)

Number of anomalies	Archaeological potential
98	Medium
471	Low (excluding magnetic anomalies)
4,114	Magnetic anomalies of low potential with no correlating data (<100nT)

11.8.4 Two hundred and thirty-four (234) anomalies have been assessed as high archaeological potential, as seen in SSS and MBES data, showing a magnetic return of >100 nT or correlating with UKHO records. Of these, 172 have only been seen in the magnetic data and do not correlate with any records. There are four UKHO records that correlate with magnetic data which were not otherwise seen in SSS or MBES data.

HIGH POTENTIAL ANOMALIES

11.8.5 The 58 anomalies of high archaeological potential seen in SSS and/ or MBES data and the four magnetic anomalies which correlate with UKHO records are summarised below and detailed in Table 11.13. Of the 62 anomalies summarised below, 28 correlate with UKHO/ NRHE records (Figure 11.4, Figure 11.6, Figure 11.8 and Figure 11.16).

Table 11.13: High potential anomalies seen in geophysical data

MA ID	Geophysical ID	Description
MA0001	> SSS MA2003	A pair of isolated, slightly curved hard reflectors with extended shadow and some scour; probable anthropogenic or wreck debris associated with UKHO15865, an obstruction recorded 65 m north.
MA0002	> SSS MA2119 > MBES MA4034 > MAG MA6002	An isolated, cylindrical hard reflector with extended shadow which corelates with the recorded location for the wreck of SS *Nico* (UKHO14513); magnetic return of 4,844 nT.
MA0003	> SSS MA2123 > MBES MA4036 > MAG MA6005	An area of scattered linear hard reflectors with shadow and scour; possibly the wreck of MV *Janny* (UKHO14461), recorded 832 m southwest, potentially wreck debris; magnetic return of 3,106 nT.
MA0004	> SSS MA2129 > MAG MA6055	A hard reflector with shadow and scour located 50 m from MA0003; potential wreck debris; magnetic return of 241 nT.
MA0005	> SSS MA2160 > MBES MA4058 > MAG MA6150	An angular hard reflector with scour; potential anthropogenic or wreck debris; magnetic return of 124 nT.

MA ID	Geophysical ID	Description
MA0006	> SSS MA2197 > MBES MA4084 > MAG MA6154	A semi-circular hard reflector with shadow; potential wheel; corelates with record for an unidentified wreck (UKHO14576); magnetic return of 120 nT.
MA0007	> SSS MA2198 > MBES MA4085 > MAG MA6154	A circular hard reflector in a patch of scour with extended shadow; probable wreck debris associated with UKHO14576, wheel or anthropogenic debris; magnetic return of 120 nT.
MA0008	> SSS MA2199 > MBES MA4086 > MAG MA6003	An ovate hard reflector with shadow and scour with smaller linear hard reflectors; partially buried wreck with potential wreck debris, hull appears intact; corelates with record for unidentified wreck (UKHO14581); magnetic return of 4,705 nT.
MA0009	> SSS MA2240 > MBES MA4289 > MAG MA6015	An isolated linear soft reflector with shadow; possible partially buried anthropogenic debris; seen in MBES as a cross-shaped feature; magnetic return of 579 nT.
MA0010	> SSS MA2241 > MBES MA4290 > MAG MA6012	An isolated linear soft reflector with shadow; possible partially buried anthropogenic debris associated with MA0009; magnetic return of 737 nT.
MA0011	> SSS MA2244 > MAG MA10481	Three isolated linear hard reflectors with shadow arranged in a line; potential anthropogenic debris; magnetic return of 143.1 nT.
MA0012	> SSS MA2260 > MBES MA4305 > MAG MA6000	A dispersed area of hard reflectors with shadow; corelates with position for unidentified wreck (UKHO14553); magnetic return of 20,411 nT.
MA0013	> SSS MA2263 > MBES MA4309	A hard reflector with shadow and scour with points of raised features across its length; potential wreck with rope; corelates with record for foul ground (UKHO14859); potentially associated with MA0264 located 27 m south.
MA0014	> SSS MA2270 > MBES MA4315 > MAG MA6786	An isolated angular hard reflector with shadow and scour; potential wreck or anthropogenic debris; corelates with record for unidentified wreck (UKHO15035); magnetic return of 27.7 nT.
MA0015	> SSS MA2279 > MBES MA4321 > MAG MA6089	An isolated linear hard reflector with shadow and scour; potential anthropogenic debris; magnetic return of 177 nT.

MA ID	Geophysical ID	Description
MA0016	> SSS MA2284 > MBES MA4325 > MAG MA6007	An isolated extended curvilinear hard reflector with notched shadow; probable chain; magnetic return of 1,151 nT.
MA0017	> SSS MA2286 > MBES MA4327 > MAG MA6140	A linear hard reflector with shadow and scour; possible anthropogenic or wreck debris associated with MA0016 which is found 65 m northeast; magnetic return of 129.9 nT.
MA0018	> SSS MA2289 > MAG MA6014	A pair of linear hard reflectors with shadow and scour; potential anthropogenic or wreck debris; magnetic return of 677 nT.
MA0019	> SSS MA2310 > MBES MA4345 > MAG MA6160	An isolated semi-circular hard reflector with shadow and scour; potential anthropogenic debris; magnetic return of 117.4 nT.
MA0020	> SSS MA2314 > MBES MA4349 > MAG MA6001	An area of linear hard reflectors with scour and spikes of elongated shadows; corelates with record for the wreck of SS *Norhauk* (UKHO14535); magnetic return of 19,031.6 nT.
MA0021	> SSS MA2327 > MBES MA4360 > MAG MA6587	An angular hard reflector with linear hard reflector, both with shadow and scour; potential anchor associated with MA0285; corelates with record for foul ground (UKHO79309); magnetic return of 36.4 nT.
MA0022	> SSS MA2335 > MBES MA4365 > MAG MA6004	An area of scattered linear hard reflectors covering approximately 100 x 50 m; likely the broken up remains of a wreck; corelates with the record for the wreck of SS *Morar* (UKHO14525); magnetic return of 3,936 nT.
MA0023	> SSS MA2342 > MBES MA4371 > MAG MA6011	An isolated hard reflector with shadow; potential anthropogenic or wreck debris; magnetic return of 755 nT.
MA0024	> SSS MA2358 > MBES MA4383 > MAG MA6053	An isolated linear hard reflector with shadow; potential anthropogenic or wreck debris; magnetic return of 244.8 nT.
MA0025	> SSS MA2359 > MBES MA4384 > MAG MA6076	An isolated soft reflector with scour; potential partially buried anthropogenic debris; magnetic return of 196.5 nT.

MA ID	Geophysical ID	Description
MA0026	> SSS MA2372 > MBES MA4393 > MAG MA6066	An isolated linear hard reflector with notched shadows; possible anthropogenic debris; magnetic return of 218 nT.
MA0027	> SSS MA2372 > MBES MA4394 > MAG MA6074	An isolated soft reflector with shadow and scour; potential anthropogenic debris; magnetic return of 199 nT. Corresponds with unclassified record (UKHO102362).
MA0028	> SSS MA2384 > MAG MA6013	An isolated elongated curvilinear reflector with shadow; probable rope or chain; magnetic return of 726.5 nT.
MA0029	> SSS MA2397 > MBES MA4228 > MAG MA9137	A cluster of hard reflectors with shadow; potential anthropogenic debris; corelates with recorded location for unidentified aircraft (UKHO14995); magnetic return of 6.9 nT.
MA0030	> SSS MA2456 > MAG MA6191	An isolated linear hard reflector with shadow; potential anthropogenic debris; magnetic return of 102.7 nT.
MA0031	> SSS MA2459 > MBES MA4274	An isolated hard reflector with linear hatching across the extent of the feature and circular debris; probable wreck or anthropogenic debris.
MA0032	> SSS MA2472 > MAG MA6094	A pair of isolated hard reflectors with shadow; potential anthropogenic debris; magnetic return of 172.1 nT.
MA0033	> MBES MA4114 > MAG MA9346	An area of scattered raised features covering approximately 38 x 11 m; corelates with record for foul ground (UKHO70092); magnetic return of 6 nT.
MA0034	> MBES MA4146 > MAG MA6134	A small, raised feature in a patch of scour; corelates with record for unidentified wreck (UKHO15074); magnetic return of 131 nT.
MA0035	> MBES MA4159 > MAG MA6075	A small area of scour; magnetic return of 198 nT.
MA0036	> MBES MA4196 > MAG MA6091	A raised feature measuring approximately 6 x 4 m; magnetic return of 174 nT.
MA0037	> MBES MA4198 > MAG MA10465	A linear hard reflector; probable anthropogenic debris, potential pipe debris; magnetic return of 490.7 nT.
MA0038	> SSS MA2521 > MBES MA4201	A rectangular raised feature measuring approximately 10 x 3.6 m with linear features

MA ID	Geophysical ID	Description
	> MAG MA10469	across the middle; probable wreck; magnetic return of 246.7 nT. Area not covered by SSS but is covered by North Falls magnetic data overlap.
MA0039	> MBES MA4209 > MAG MA6071	A small, raised feature in patch of scour; magnetic return of 200.7 nT.
MA0040	> SSS MA2647 > MBES MA4428 > MAG MA10470	An angular feature in patch of scour; magnetic return of 227.1 nT.
MA0041	> MBES MA4429 > MAG MA10482	A pair of raised features; magnetic return of 142.5 nT.
MA0042	> MBES MA4430 > MAG MA10484	A pair of raised features; magnetic return of 129.5 nT.
MA0043	> MBES MA4431 > MAG10486	A small, raised feature; magnetic return of 375 nT.
MA0062	> SSS MA2544 > MAG MA10467	Isolated small hard reflector with shadow; magnetic return of 375.9 nT, potential anthropogenic debris.
MA0063	> MBES MA4423 > MAG MA6025	A small, raised feature; magnetic return of 375 nT.
MA0065	> MBES MA4424 > MAG MA6027	A raised feature measuring approximately 7.5 x 2.7 m; magnetic return of 370 nT.
MA0068	> MBES MA4437 > MAG MA6030	A small, raised feature in area of sand waves; corelates with record for unidentified wreck (UKHO87019); magnetic return of 355 nT.
MA0088	> SSS MA2521 > MAG MA10469	An isolated curvilinear hard reflector with shadow and scour; potential cable, chain or anthropogenic or fishing debris with a magnetic return of 259.4 nT.
MA0094	> MBES MA4425 > MAG MA6057	A curvilinear feature; potential rope or chain with anchor; magnetic return of 237 nT.
MA0124	> MBES MA4426 > MAG MA6090	A linear area of scour measuring approximately 116 x 3.5 m; magnetic return of 175 nT.
MA0223	> SSS MA2542 > MAG MA10491	Isolated hard reflector with shadow with a magnetic return of 103.7 nT, potential anthropogenic or fishing debris.

MA ID	Geophysical ID	Description
MA0232	> SSS MA2378 > MBES MA4398	An isolated elongated curvilinear hard reflector; probable cable, rope, or chain; corelates with record for HMS *Hastfen* (UKHO70049).
MA0283	> SSS MA2323 > MBES MA4356	An area of linear hard reflectors with extended shadows; probable wreck debris associated with MA0020 (SS *Norhauk*, UKHO14535).
MA0578	> SSS MA2334	An isolated curvilinear hard reflector with shadow and scour; potential partially buried anthropogenic or wreck debris; corelates with record for wreck of SS *Vancouver* (UKHO14555).
MA0602	> SSS MA2380	An isolated hard reflector with shadow and scour; potential anthropogenic or wreck debris; located 273 m east from recorded location of submarine HMSM *E6* (UKHO14983); area not covered by MBES or Mag data.
MA0703	> MBES MA4144	A cluster of raised features surrounded by scattered smaller raised features over area measuring approximately 37 x 19 m; corelates with record for distributed remains of unidentified wreck (UKHO87021).
MA0704	> MBES MA4145	A small, raised feature in patch of scour; corelates with record for unidentified potential wreck (UKHO87043).
MA0754	> SSS MA2536 > MBES MA4207 > MAG MA10505	A patch of scour; corelates with record for unidentified patch of scour (UKHO87002); magnetic return of 12 nT.
MA6243	> MAG MA6243	Magnetic anomaly with return of 83.3 nT; corelates with record for unidentified wreck (UKHO14541).
MA6377	> MAG MA6377	Magnetic anomaly with return of 53.3 nT; corelates with record for foul ground (UKHO14532).
MA6650	> MAG MA6650	Magnetic anomaly with return of 33.1 nT; corelates with record for unidentified wreck (UKHO14996).
MA6677	> MAG MA6677	Magnetic anomaly with return of 31.8 nT; corelates with record for foul ground (UKHO14803).

MEDIUM POTENTIAL ANOMALIES

11.8.6 Ninety-eight anomalies of medium archaeological potential were identified, they are summarised below and detailed in Table 11.14 (see Figure 11.4, Figure 11.5, Figure 11.8 and Figure 11.16). These did not corelate with any known UKHO/ NRHE records but may represent debris associated with the recorded wrecks listed above.

Table 11.14: Medium potential anomalies seen in geophysical data

MA ID	Geophysical ID	Description
MA0233	> SSS MA2050 > MBES MA4048 > MAG MA6347	An isolated hard reflector with shadow and scour; potential anthropogenic debris; MA6347 (magnetic return of 57 nT) is located 38 m west.
MA0234	> SSS MA2072 > MBES MA4013 > MAG MA7093	An isolated curvilinear hard reflector with shadow; possible anthropogenic debris; MA7093 (magnetic return of 20 nT) is located 29 m northwest.
MA0235	> SSS MA2090 > MAG MA6539	An isolated linear hard reflector in a patch of scour; possible anthropogenic debris; magnetic return of 40 nT.
MA0236	> SSS MA2097 > MBES MA4021	An isolated soft reflector with scattered shadow, seen in MBES as a raised feature in an area of scour; possible anthropogenic debris or anchor; listed as possible anchor in the VE assessment of SSS data (as described in the shapefile for FE4 SSS).
MA0237	> SSS MA2101 > MAG MA6643	An isolated linear hard reflector with shadow and scour; potential anthropogenic debris; magnetic return of 33 nT.
MA0238	> SSS MA2108 > MBES MA4027 > MAG MA6226	An isolated angular hard reflector with shadow and scour lying across a sand wave; potential anthropogenic debris; magnetic return of 87 nT.
MA0239	> SSS MA2111 > MBES MA4030 > MAG MA7468	An isolated hard reflector with shadow in an area of sand waves; possible anthropogenic debris; magnetic return of 15 nT.
MA0240	> SSS MA2117 > MBES MA4032	Parallel linear raised features extending over 110 m; probable anthropogenic debris.
MA0241	> SSS MA2121	A hard reflector with shadows and scour located 41 m north of MA0002; probable wreck debris associated with MA0002 (SS *Nico*, UKHO14513).

MA ID	Geophysical ID	Description
MA0242	> SSS MA2143 > MBES MA4403 > MAG MA7895	An isolated pair of hard reflectors with shadow and scour; possible anthropogenic debris; magnetic return of 11.5 nT.
MA0243	> SSS MA2148 > MBES MA4052	An isolated curvilinear hard reflector with shadow and scour; potential anthropogenic debris.
MA0244	> SSS MA2153	Three isolated linear hard reflectors; potential anthropogenic debris.
MA0245	> SSS MA2154 > MBES MA4055 > MAG MA9569	An isolated hard reflector with scour and extended shadow; possible anthropogenic debris; magnetic return of 6 nT (MA9569) located 20 m northeast.
MA0246	> SSS MA2158 > MBES MA4057 > MAG MA6206	A linear hard reflector with smaller hard reflectors approximately 20 m to the east and west; potential anthropogenic debris; magnetic return of 97 nT.
MA0247	> SSS MA2161 > MBES MA4059	An isolated curvilinear hard reflector with shadow and scour with apparent attached linear hard reflectors; probable cable or rope.
MA0248	> SSS MA2179 > MBES MA4072 > MAG MA6464	An isolated hard reflector with shadow; possible anthropogenic debris; MA6464 (magnetic return of 45 nT) is located 21 m east.
MA0249	> SSS MA2181 > MBES MA4107 > MAG MA7442	An isolated linear soft reflector with shadow; possible anthropogenic debris; MA7442 (magnetic return of 15 nT) is located 22 m southwest.
MA0250	> SSS MA2212 > MBES MA4094	An isolated linear hard reflector with shadow and scour; potential wreck debris associated with MA0008 (unidentified wreck, UKHO14581).
MA0251	> SSS MA2216 > MBES MA4097	A cluster of hard reflectors next to a curvilinear hard reflector; potential anthropogenic debris with cable or rope.
MA0252	> SSS MA2217 > MBES MA4098 > MAG MA10235	A cluster of hard reflectors with shadow and scour over area covering 48 x 25 m; potential scattering of anthropogenic debris; magnetic return of 5 nT.
MA0253	> SSS MA2227	An isolated square hard reflector with linear features; probable anthropogenic debris.

MA ID	Geophysical ID	Description
MA0254	> SSS MA2231 > MBES MA4106	An isolated V-shaped hard reflector with shadow and scour; probable anthropogenic debris.
MA0255	> SSS MA2242 > MBES MA4291 > MAG MA10497	An isolated soft reflector with scour; possible partially buried anthropogenic debris; seen in MBES as two patches of scour located 18 m apart; MA10497 (magnetic return of 92 nT) located 35 m northwest.
MA0256	> SSS MA2253 > MBES MA4299 > MAG MA6220	An isolated hard reflector with shadow and scour; possible anthropogenic debris.
MA0257	> SSS MA2255 > MBES MA4300 > MAG MA6535	An isolated pair of linear hard reflectors with shadow and scour; potential anthropogenic debris; magnetic return of 40.3 nT.
MA0258	> SSS MA2256 > MBES MA4301	A linear hard reflector with scour; potential wreck debris associated with MA0012 (unidentified wreck, UKHO14553) which is located 80 m east.
MA0259	> SSS MA2257 > MBES MA4302	A cluster of hard reflectors with shadow; seen in MBES as a linear feature in a patch of scour; probable wreck debris associated with MA0012 (unidentified wreck, UKHO14553).
MA0260	> SSS MA2258 > MBES MA4303	A hard reflector with shadow and scour; probable wreck debris associated with MA0012 (unidentified wreck, UKHO14553).
MA0261	> SSS MA2259 > MBES MA4304	A curvilinear hard reflector with shadow and scour; seen in MBES as a raised feature in a patch of scour; probable wreck debris associated with MA0012 (unidentified wreck, UKHO14553).
MA0262	> SSS MA2261 > MBES MA4306	A curvilinear hard reflector with shadow; seen as scour in MBES; potential wreck debris associated with MA0012 (unidentified wreck, UKHO14553).
MA0263	> SSS MA2262 > MBES MA4307 > MAG MA6265	An isolated linear hard reflector with shadow and scour; potential anthropogenic debris; magnetic return of 78.2 nT.
MA0264	> SSS MA2265 > MBES MA4310	A semi-circular hard reflector with an extended linear hard reflector, both with

MA ID	Geophysical ID	Description
		shadow and scour; probable anchor and chain or wreck debris associated with MA0013 (currently recorded as foul ground, UKHO14859).
MA0265	> SSS MA2271 > MBES MA4316 > MAG MA6513	An isolated curvilinear hard reflector with shadow and scour; potential chain, rope, or anthropogenic debris; magnetic return of 41.7 nT.
MA0266	> SSS MA2278 > MBES MA4320 > MAG MA9935	An isolated pair of hard reflectors adjacent to another softer reflector, all with shadow; seen in MBES as small, raised feature in a patch of scour; potential anthropogenic debris; magnetic return of 5.6 nT.
MA0267	> SSS MA2280 > MBES MA4322 > MAG MA6895	An isolated hard reflector with shadow; potential anthropogenic debris; magnetic return of 24.3 nT.
MA0268	> SSS MA2281 > MBES MA4323 > MAG MA8493	A curvilinear soft reflector with shadow and a thin linear trail of shadow; possibly partially buried anthropogenic debris; magnetic return of 8.8 nT; potentially associated with and contained completely within the 100 m AEZ for MA0231 (a complex magnetic anomaly not identified in SSS or MBES data).
MA0269	> SSS MA2285 > MBES MA4326 > MAG MA6688	An isolated angular hard reflector with shadow and scour; potential anthropogenic debris; magnetic return of 31.5 nT.
MA0270	> SSS MA2287 > MAG MA6636	An isolated curvilinear hard reflector with shadow; possible anthropogenic debris; magnetic return of 33.8 nT.
MA0271	> SSS MA2291 > MBES MA4328 > MAG MA6207	An isolated curvilinear hard reflector with shadow; potential anthropogenic debris associated with MA0018 an unrecorded potential wreck located 19 m south; magnetic return of 97.1 nT.
MA0272	> SSS MA2293 > MBES MA4330 > MAG MA7755	An isolated hard reflector with shadow and scour; potential anthropogenic debris; magnetic return of 12.4 nT.
MA0273	> SSS MA2294 > MBES MA4331	An isolated linear hard reflector with shadow and scour; possible anthropogenic debris; magnetic return of 26.3 nT.

MA ID	Geophysical ID	Description
	> MAG MA6822	
MA0274	> SSS MA2302 > MBES MA4337 > MAG MA7236	An isolated linear hard reflector with extended shadow and scour; possible anthropogenic debris; magnetic return of 17.9 nT.
MA0275	> SSS MA2303 > MBES MA4338 > MAG MA7097	An isolated hard reflector with shadow and scour; possible anthropogenic debris; magnetic return of 20.1 nT.
MA0276	> SSS MA2306 > MBES MA4341 > MAG MA6545	An isolated triangular hard reflector with shadow in a patch of scour; seen in MBES as a small, raised feature in a patch of scour; potential anthropogenic debris; magnetic return of 39.6 nT.
MA0277	> SSS MA2312 > MBES MA4347 > MAG MA6413	An isolated triangular hard reflector with shadow and scour; potential anthropogenic debris; seen in MBES as a small, linear feature in a patch of scour; magnetic return of 49.5 nT.
MA0278	> SSS MA2313 > MBES MA4348	A triangular hard reflector with shadow and scour; probable wreck debris associated with MA0020 (SS *Norhauk*, UKHO14535) located 93 m east.
MA0279	> SSS MA2315 > MBES MA4350	A curvilinear elongated hard reflector with shadow and scour; probable rope or chain associated with MA0020 (SS *Norhauk*, UKHO14535) located 73 m southeast.
MA0280	> SSS MA2318 > MBES MA4352	A circular hard reflector in scour with shadow; probable wheel or wreck debris associated with MA0020 (SS *Norhauk*, UKHO14535) located 75 m west.
MA0281	> SSS MA2319 > MBES MA4353	A circular hard reflector with shadow and scour; probable wheel or wreck debris associated with MA0020 (SS *Norhauk*, UKHO14535) located 51 m north.
MA0282	> SSS MA2320 > MBES MA4354	An angular hard reflector with shadow and scour; potential wreck debris or anchor found 21 m south from the end of MA0279.
MA0284	> SSS MA2326 > MBES4359	An isolated pair of hard reflectors next to each other; potential wreck or anthropogenic debris.

MA ID	Geophysical ID	Description
MA0285	> SSS2328	An extended linear hard reflector; probable cable, rope, or chain; potentially associated with MA0021 (foul ground, UKHO79309).
MA0286	> SSS MA2336 > MBES MA4366 > MAG MA6267	A linear hard reflector with shadow and scour located approximately 150 m east northeast from MA0022 (SS *Morar,* UKHO14525); magnetic return of 77.9 nT.
MA0287	> SSS MA2339 > MBES MA4368 > MAG MA7045	An isolated angular hard reflector with shadow and scour; possible anthropogenic debris; magnetic return of 21 nT.
MA0288	> SSS MA2344 > MBES MA4373 > MAG MA6588	An isolated linear hard reflector with shadow lying across sand waves; potential anthropogenic debris; magnetic return of 36.3 nT.
MA0289	> SSS MA2348 > MBES MA4376	An isolated curved soft reflector with shadow and scour; potential partially buried anthropogenic debris likely associated with MA0022 (SS *Morar,* UKHO14525).
MA0290	> SSS MA2352	An isolated hard reflector with extended shadow and scour; potential anthropogenic debris likely associated with MA0022 (SS *Morar,* UKHO14525).
MA0291	> SSS MA2354 > MBES MA4379 > MAG MA6945	A linear hard reflector with shadow and scour; possible anthropogenic debris; magnetic return of 23.1 nT.
MA0292	> SSS MA2356 > MBES MA4381 > MAG MA6934	An isolated hard reflector with shadow and scour in area of sand waves; potential anthropogenic debris; magnetic return of 23.5 nT.
MA0293	> SSS MA2360 > MBES MA4171	An isolated pair of arrangements of linear hard reflectors with extended shadow; probable wreck or anthropogenic debris, potentially associated with MA0022 (SS *Morar,* UKHO14525) located 107 m northeast.
MA0294	> SSS MA2370 > MAG MA6964	An isolated hard reflector with shadow and scour; potential anthropogenic debris; magnetic return of 22.6 nT.
MA0295	> SSS MA2371 > MAG MA6357	An isolated linear hard reflector with shadow and scour; potential anthropogenic debris; magnetic return of 56.4 nT.

MA ID	Geophysical ID	Description
MA0296	> SSS MA2374 > MBES MA4395 > MAG MA6853	An isolated cluster of linear hard reflectors with shadow and scour; potential anthropogenic debris; magnetic return of 25.5 nT.
MA0297	> SSS MA2375 > MBES MA4396 > MAG MA6468	An isolated hard reflector with shadow and scour; potential anthropogenic debris, possibly associated with MA0602 (HMSM *E6*, UKHO14983), located 289 m southeast; magnetic return of 44.9 nT.
MA0298	> SSS MA2377 > MAG MA6492	An isolated hard reflector with shadow and scour; potential anthropogenic debris; magnetic return of 43 nT.
MA0299	> SSS MA2382 > MBES MA4212 > MAG MA6485	An isolated elongated curvilinear soft reflector with shadow; probable cable, rope, or chain; magnetic return of 43.5 nT.
MA0300	> SSS MA2396 > MA4220	An isolated linear hard reflector with arm-like features; seen in MBES as raised feature; potential anchor.
MA0301	> SSS MA2398 > MBES MA4229 > MAG MA6883	A cluster of hard reflectors with shadow potentially debris associated with MA0029 (unidentified aircraft, UKHO14995) located 46 m north; magnetic return of 24.7 nT.
MA0302	> SSS MA2408 > MBES MA4237	A circular patch of hard reflectors with shadow; potential anthropogenic debris.
MA0303	> SSS MA2409 > MBES MA4238 > MAG MA8524	An isolated linear hard reflector with shadow and scour; potential anthropogenic debris; magnetic return of 8.6 nT.
MA0304	> SSS MA2426 > MBES MA4247	An isolated linear hard reflector with linear protrusions at the centre and an apparently curvilinear feature at the end; seen in MBES as small, raised feature in patch of scour; potential anchor.
MA0305	> SSS MA2432 > MBES MA4251 > MAG MA6862	An isolated hard reflector with extended shadow; potential anthropogenic debris; magnetic return of 25.2 nT.
MA0306	> SSS MA2435 > MBES MA4254	An isolated linear hard reflector seen in some lines to have a multidirectional shadow; seen in MBES as raised feature with scour to south; potential anchor.

MA ID	Geophysical ID	Description
MA0307	> SSS MA2446 > MBES MA4262 > MAG MA7083	An area of small hard reflectors with shadow; potential anthropogenic debris or ballast; magnetic return of 20.3 nT.
MA0308	> SSS MA2460 > MBES MA4275	A hard linear reflector with a curvilinear feature lying adjacent at one end, with scour; potential anchor, located 50 m east northeast from MA0654 (described as probable cable, rope, or chain).
MA0309	> SSS MA2466 > MBES MA4280	An isolated ovate hard reflector with three smaller reflectors at the eastern side, all with shadow; potential anthropogenic or wreck debris.
MA0310	> SSS MA2467 > MBES MA4281 > MAG MA6739	An isolated curvilinear hard reflector with shadow and scour with potentially associated small hard reflectors in surrounding area; possible anthropogenic debris; magnetic return of 29.5 nT (MA6739) is located 38 m southeast.
MA0311	> SSS MA2470 > MBES MA4283 > MAG MA7770	An isolated ovate hard reflector with shadow and scour; potential anthropogenic debris; MA7770 (magnetic return of 12.3 nT) is located 12 m northwest.
MA0312	> MBES MA4116 > MAG MA6776	A line of three small, raised features; magnetic return of 28 nT.
MA0313	> MBES MA4125 > MAG MA6713	A 19 m linear feature and cross-shaped raised feature; potential anchor; magnetic return of 30 nT.
MA0314	> MBES MA4127 > MAG MA7629	A cluster of raised features with scour over an area measuring 28 x 11 m; MA7629 (magnetic return of 13 nT) is located 22 m north.
MA0315	> MBES MA4128 > MAG MA6250	A curvilinear raised feature measuring 26 m, located 10 m north of MA0720; potential rope or chain with anchor (MA0720); magnetic return of 80 nT.
MA0316	> MBES MA4132 > MAG MA8043	A small, raised feature in a patch of scour measuring 60 x 60 m; magnetic return of 10.8 nT (MA8043) is located 22 m northwest.
MA0317	> MBES MA4140 > MAG MA7724	A raised feature measuring 15 x 11 m; magnetic return of 12 nT.

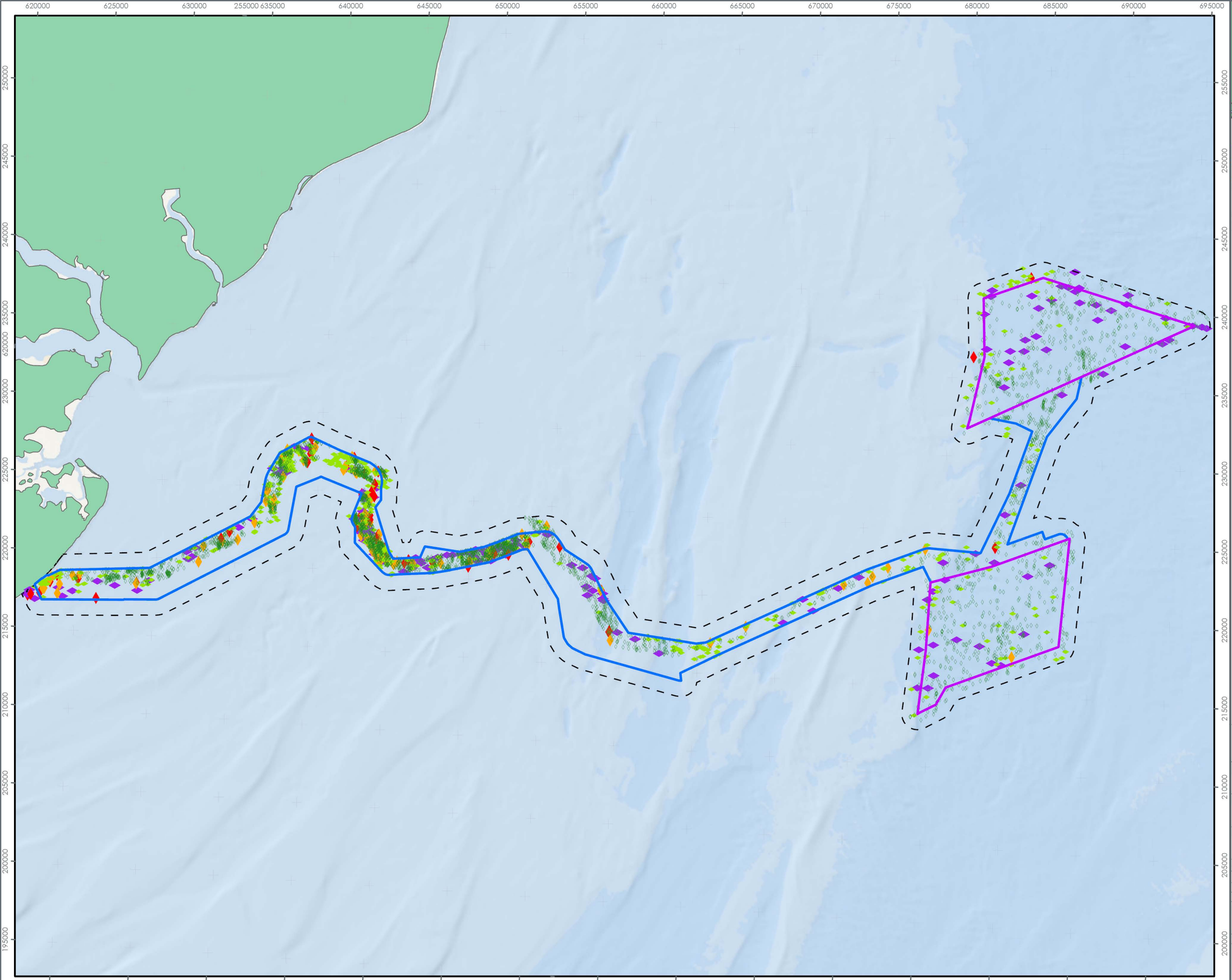
MA ID	Geophysical ID	Description
MA0318	> MBES MA4141 > MAG MA7354	A raised feature measuring 14 x 14 m; located 34 m west northwest of MA0317; magnetic return of 16 nT.
MA0319	> MBES MA4142 > MAG MA7228	A small, raised feature in area of seabed scarring; magnetic return of 18 nT.
MA0320	> MBES MA4173 > MAG MA6328	An angular patch of scour; magnetic return of 60.4 nT.
MA0321	> MBES MA4187 > MAG MA6349	A raised feature next to small patch of scour; magnetic return of 57 nT.
MA0322	> SSS MA2524 > MBES MA4202 > MAG MA10507	A pair of raised features with scour; probable wreck debris associated with MA0038, located 22 m northwest; magnetic return of 28.5 nT.
MA0323	> SSS MA2527 > MBES MA4205 > MAG MA10495	A linear hard reflector in an area of scour; probable anthropogenic debris; magnetic return of 57.1 nT.
MA0324	> MBES MA4206 > MAG MA10496	A raised feature with scour either side; magnetic return of 56.2 nT.
MA0325	> MBES MA4432 > MAG MA10493	A small, angular raised feature; magnetic return of 89.1 nT.
MA0326	> MBES MA4433 > MAG MA10498	A small, raised feature located 20 m northeast from MA0038; potential wreck debris; magnetic return of 31.1 nT.
MA0327	> MAG MA10494	Magnetic anomaly with return of 67.2 nT, potentially associated with MA0538 (described as potential anthropogenic debris with a magnetic return of 9 nT, seen in SSS and MBES as an isolated linear reflector with scour) which is located 20 m northeast.
MA0328	> SSS MA2364 > MBES MA4388 > MAG MA6274	An isolated soft reflector with triangular scour and thin shadows; possible partially buried anthropogenic debris; magnetic return of 76.2 nT.
MA0787	> MA2514	An area of scattered linear hard reflectors with shadow; possible anthropogenic debris.
MA0789	> SSS MA2516	An area of scattered linear hard reflectors with shadow and scour; potential anthropogenic or wreck debris.

MA ID	Geophysical ID	Description
MA0796	> SSS MA2526 > MBES MA4450	A rectangular hard reflector with repeating parallel linear features across extent; probable anthropogenic, wreck or fishing debris.

LOW POTENTIAL ANOMALIES

11.8.7 The low potential 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.

11.8.8 Magnetic anomalies under 100 nT 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 (Figure 11.4, Figure 11.5, Figure 11.8 and Figure 11.16).



LEGEND

- Array Areas
- Offshore Export Cable Corridor
- Marine Archaeology Study Area

Anomalies of archaeological potential

- High
- High (mag only)
- Medium
- Low
- Low (mag only)

0 2.25 4.5 9

Kilometers

PROJECT TITLE:

FIVE ESTUARIES OFFSHORE WINDFARM

DRAWING TITLE:

Anomalies of archaeological potential identified in the geophysical data

VER	DATE	REMARKS	Drawn	Checked
1	29/01/2024	DRAFT	HA	CH

DRAWING NUMBER: 11.16

SCALE:	PLOT SIZE:	DATUM:	PROJECTION:
1:225,000	A3	WGS84	UTMN31

FIVE ESTUARIES
OFFSHORE WIND FARM

11.9 GEOARCHAEOLOGICAL ASSESSMENT OF GEOPHYSICAL DATA

11.9.1 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).

11.9.2 As also seen in seismic data interpreted by Emu *et al.* (2009), this area is characterised by complex cross-cutting channels that can exceed 40 m thickness in places and the presence of shallow gas suggesting fine-grained or organic deposits may be preserved. This interpretation is very similar to the sub-bottom assessment of data for VE as outlined below (described in detail in Section 4.3 of Volume 6, Part 5, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report). Several of the channels indicate crosscutting features. Blanking is seen across large parts of the area, often in association with channel deposits, which indicates that well preserved deposits with high geoarchaeological potential are extant within the study area.

11.9.3 While less evidence for both organic material and clear channel and valley features is seen within the two array areas of VE, the ECC does go through areas where geoarchaeological channels have previously been mapped and an increase of deposits of interest are noted (MA3000, to MA3003 and MA3010 to MA3017).

11.9.4 The channels and riverbeds identified by the Thames REC project (Emu *et al.*, 2009) within the Array Areas correlate with the VE SBP data analysis as illustrated in Figure 11.5, Figure 11.7, Figure 11.9 and Figure 11.17. See; MA3004, MA3005, MA3006 and MA3009.

11.9.5 Further channels and deposits of geoarchaeological potential were recently mapped by the North Falls Offshore Wind Farm Project (North Falls Offshore Wind Farm Project, 2022). There is minor spatial overlap between channels identified within the VE Array areas and the North Falls array areas and the North Falls inter connector cable where only one of the features identified from the VE sub-bottom dataset (MA3009) and the North Falls Channel, have a clear geographical association.

11.9.6 MA3009 has been interpreted as a wide shallow channel or valley with slightly sloping edges and generally flat base. Overlain by seabed sediment, possibly cut into older sediments indicating a Pleistocene cut and fill. Continuing over 5 km and generally 200 m wide but up to 1 km wide in places. The feature is located at the south-western end of the southern array. The associated North Falls feature 7030 is described as possible palaeochannel feature of high archaeological potential and indicates an extension of the same feature stretching south outside the VE data (North Falls Offshore Wind Farm, 2022).

11.9.7 The channels along the ECC are also possibly associated or extensions of the features identified in the Thames REC project (Emu *et al.*, 2009), see MA3000, MA3013 and MA3016.

11.9.8 Further channels and deposits of geoarchaeological potential were recently mapped by the North Falls Offshore Wind Farm Project (North Falls Offshore Wind Farm Project, 2022) along the two projects parallel running Offshore ECCs.

11.9.9 Channel feature MA3002 (Holocene channels cutting through London Clay with infill represented by high amplitude reflectors indicating silt, clay, or organics) is possibly associated with North Falls 7046, a broad and shallow channel feature characterised by a well-defined basal reflector and layered fill, possible buried fluvial feature.

11.9.10 MA3013 (an area of folding and possible shallow channels or dipping through London Clay, with rounded base and gentle sides infilled by high-amplitude reflectors indicating silt, clay, or organics) is associated with North Falls 7051, described as a possible channel feature cut into the underlying London Clay Formation.

11.9.11 Around the middle of the Offshore ECC MA3017 (areas of channels with a round base and steep sides, infilled by high-amplitude reflectors indicating silt, clay, or organics) is associated with North Falls 7052 and 7053, described as areas of complex channel deposits.

11.9.12 MA3000 (areas of acoustic blanking within or cut through London Clay) and MA3016 (clearly visible channels with a round base and steep sides) are potentially associated with North Falls 7054 (a possible channel feature identified cutting into the underlying London Clay formation) or with North Falls features 7055, 7056 and 7057, all described as shallow cut and fill features cutting into the underlying London Clay formation.

11.9.13 MA3012 (area of channels with mostly round base and steep edges, infilled by low-amplitude reflectors indicating a high sand content) is possibly associated with North Falls feature 7058 while MA3015 (area of thick Holocene clays) maybe be associated with North Falls cut and fill feature 7059.

11.9.14 Further towards the shore the deposits identified from the sub-bottom assessment are more complex, as outlined below.

11.9.15 MA3003 (areas of acoustic blanking within or cut through London Clay) lines up with North Falls 7066, described as a cut and fill feature with a number of areas of acoustic blanking (7067, 7068, 7069, 7070).

11.9.16 MA3011 (narrow channel feature), is possibly associated with North Falls 7064, described as a distinct channel feature.

11.9.17 MA3014 (Area of multiple complex channels) is associated with North Falls 7062, described as an area of channel complex deposits.

11.9.18 As noted, this area demonstrated complex cross-cutting channels. The features are not easily identified across survey lines, or survey directions. As an example, this complexity is visible at feature MA3006 and explains why some of the channels along the ECC are not as easily associated with features identified in the Thames REC project (Emu *et al*., 2009).

11.9.19 The blanking which may be associated with possible organic material (MA3003) is frequently seen across the whole study area and is likely to be associated with deposits previously identified and analysed, (Wessex Archaeology, 2016; Brown and Russell, 2019).

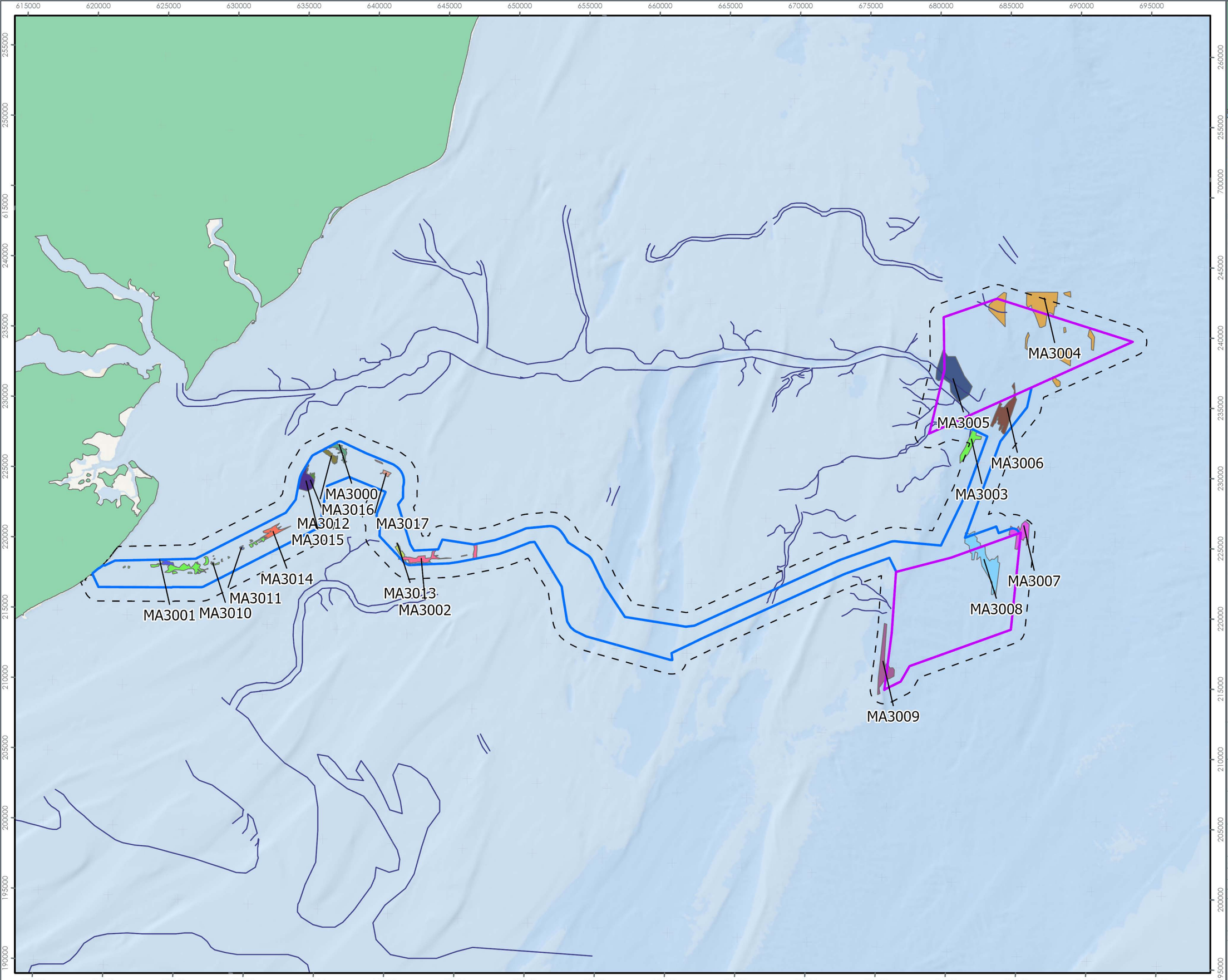
11.9.20 As outlined in Table 11.15, the seabed in the marine archaeology study area is dominated by shallow mobile sands (Unit 5) overlaying London Clay (Unit 3) which in areas protrudes from the seabed and is visible or is just under the seabed sediments. A number of cut and fill features as well as channel sand valleys have been identified within the SBP data and are described below (Unit 4). Earlier sediments such as the Harwich Formation (Unit 2) and Reading or Woolwich Formation (Unit 1) are also found across the area**.**

11.9.21 The outline deposit model will be further refined following a phased geoarchaeological assessment as detailed in Volume 9, Report 19: Outline Marine Written Schemes of Investigation.

Table 11.15 Outline deposit model

Unit	Sediment	Description	Epoch	Geoarchaeological potential
5	Mobile seabed sediments	Sand and gravel.	Holocene	No
4	Channel/ Valley infill	Soft possibly peaty silt, clay, or sand.	Late Pleistocene to Early Holocene	Yes
3	London Clay	Firm to hard silty clay.	Tertiary	Low
2	Harwich Formation	Silty clays and sandy clayey silts.	Ypresian (MIS 3)	Low
1	Reading or Woolwich Formation	Dark grey shelly clay, laminated clay, and silt or fine- to coarse-grained sand.	Thanetian to Ypresian (MIS 4-3)	Low

11.9.22 The geoarchaeological assessment undertaken on behalf of the North Falls Offshore Wind Farm (North Falls Offshore Wind Farm, 2022) has been referenced in the geoarchaeological assessment above to contribute to a greater understanding of the geoarchaeological potential of the region.



LEGEND

- Array Areas
- Offshore Export Cable Corridor
- Marine Archaeology Study Area
- Interpreted channel systems (EMU, 2009)

Channels with geoarchaeological potential

- MA3000
- MA3001
- MA3002
- MA3003
- MA3004
- MA3005
- MA3006
- MA3007
- MA3008
- MA3009
- MA3010
- MA3011
- MA3012
- MA3013
- MA3014
- MA3015
- MA3016
- MA3017

0 2.5 5 10

Kilometers

PROJECT TITLE:

FIVE ESTUARIES OFFSHORE WINDFARM

DRAWING TITLE:

Valleys and channels of geoarchaeological potential

VER	DATE	REMARKS	Drawn	Checked
1	29/01/2024	DRAFT	HA	CH

DRAWING NUMBER: 11.17

SCALE:	PLOT SIZE:	DATUM:	PROJECTION:
1:250,000	A3	WGS84	UTMN31

FIVE ESTUARIES
OFFSHORE WIND FARM

11.10 KEY PARAMETERS FOR ASSESSMENT

11.10.1 The Maximum Design Scenario (MDS) in environmental terms, defined by the project design envelope can be seen in Table 11.16. This establishes the maximum potential impact associated with VE on marine heritage receptors. The engineering parameters of the project design envelope are defined in Volume 6, Part 2, Chapter 1: Offshore Project Description.

11.10.2 Although the proposed VE development will be confined within the ES Order Limits, the exact layout of the turbines, other structures and cable route is yet to be confirmed. The maximum design parameters, and therefore maximum possible effect, have been used to inform the below assessment. Variations in the final layout may determine the extent of effects on different marine heritage receptors, however a worst-case scenario approach ensures that any difference in layout has been fully captured. Where potential impacts would be due to a result in sedimentary and hydrodynamic processes the assessment should be read in conjunction with Volume 6, Part 2, Chapter 2: Marine Geology, Oceanography and Physical Processes.

Table 11.16: Maximum design scenario 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 marine heritage receptors	> Total maximum impact of seabed preparation > 79 gravity base jacket foundations, per foundation 3,600 m^2 total, 284,400 m^2 > for 2 Gravity Base Monopile OSP foundations 14,000 m^2 > depth of seabed preparation required 4 m > Total volume of seabed preparation spoil volume > 79 WTG foundations 1,137,600 m^3 > 2 OSP foundations 56,000 m^3 > Total volume of gravel bed per foundation, > WTG 284,400 m^3, > OSP 14,000 m^3 > Total volume of sediment disturbed by sand wave clearance; > inter-array cable laying 22,795,580 m^3 > Maximum area of seabed disturbed by wet storage area 15,000 m^2 (with an indicative shape of 75 m x 200 m). > Total volume of sediment disturbed by sand wave clearance; > export cable installations 6,968,922 m^3	The maximum assessment assumptions represent the maximum seabed disturbance by sediment removal that could potentially affect marine heritage receptors located within the proposed development. The maximum assessment assumptions represent the maximum seabed disturbance by sediment removal that could potentially affect marine heritage receptors located within the proposed development

Potential effect	Maximum Design Scenario assessed	Justification
Impact 2: Direct impact by penetration, compression, and disturbance of piling foundations leading to the total or partial loss of marine heritage receptors	> Total maximum impact of seabed preparation > 79 gravity base jacket foundations, per foundation 3,600 m^2 total, 284,400 m^2 > for 2 Gravity Base Monopile OSP foundations 14,000 m^2 > depth of seabed preparation required 4 m > Maximum scour protection volume; > 79 WTG Gravity Based Monopile Structures: 2,109,300 m^3 > 2 OSP Gravity Based Monopile Structures: 148,100 m^3	The maximum assessment assumptions represent the maximum seabed disturbance by piling operations that could potentially affect marine heritage receptors located within the proposed development
Impact 3: Direct impact by penetration, compression, and disturbance of stratigraphic contexts containing archaeological material from the combined weight of the WTG and associated foundations leading to total or partial loss of marine heritage receptors	> Largest rotor turbines combined weight 1,150 tonnes	The maximum assessment assumptions represent the maximum seabed disturbance by WTGs potentially affecting marine heritage receptors located within the proposed development

Impact 4: Direct impact by penetration, compression, and disturbance of cable laying operations leading to total or partial loss of marine heritage receptors	> Total volume of sediment disturbed by cable installation;
	  > inter-array cables 3,150,000 m^3
	> Total volume of sediment disturbed by sand wave clearance;
	  > inter-array cable laying 22,795,580 m^3
	> Total area of seabed disturbed by Pre-Lay Grapnel Run;
	  > inter-array cables 6,000,000 m^2
	> Maximum area of seabed covered by cable protection;
	  > inter-array cable protection 321,600 m^2
	> Total volume of sediment disturbed by trial trenching;
	  > inter-array cables 78,750 m^3
	> Total area of seabed disturbed by boulder plough/ clearance;
	  > inter-array cables 900,000 m^2
	> Total area of seabed covered by cable crossings;
	  > inter-array cables 103,400 m^2
	> Up to three HDD exit pits, maximum seabed disturbance (10 m x 75 m x 2 m) 1,875 m^3 per HDD total 5,625 m^3
	> Maximum area of seabed disturbed by wet storage area 15,000 m^2 (with an indicative shape of 75 m x 200 m).
	> Total volume of sediment disturbed by cable installation;
	  > export cables 3,079,125 m^3
	> Total volume of sediment disturbed by sand wave clearance;
	  > export cable installations 6,968,922 m^3
		The maximum assessment assumptions represent the maximum seabed disturbance of cable laying operations that could potentially affect marine heritage receptors located within the proposed development

	> Total area of seabed disturbed by Pre-Lay Grapnel Run;
	  > export cables 5,865,000 m^2
	> Maximum area of seabed covered by cable protection;
	  > export cable protection 178,304 m^2
	> Total volume of sediment disturbed by trail trenching;
	  > export cables 78,750 m^3
	> Total area of seabed disturbed by boulder plough/ clearance;
	  > export cable protection 3,520,000 m^2
	> Total area of seabed covered by cable crossings;
	  > export cable protection 119,300 m^2
	> Up to 3 HDD exit pits, maximum seabed disturbance (10 m x 75 m x 2 m) 1,875 m^3 per HDD total 5,625 m^3
	> Maximum area of seabed disturbed by wet storage area 15,000 m^2 (with an indicative shape of 75 m x 200 m).	

Potential effect	Maximum Design Scenario assessed	Justification
Impact 5: Direct impact by penetration, compression, and disturbance effects of jack-up barges and anchoring of construction vessels during construction activities leading to total or partial loss of marine heritage receptors	> Maximum volume of sediment disturbed for all jack-up operations during construction; 8,316,000 m^2 > Typical penetration depth; > anchor 1.5 m > jack-up barge 15 m > Total impact of anchor footprints during construction; > WTG and OPS installation in the array 1,516,320 m^2, > inter-array installation 374,693 m^3 > total seabed volume disturbed by up to 6 vessel mooring buoys during construction 120,960 m^3 > Wet storage area for anchors and other items to be temporarily placed on the seabed. Maximum area of disturbance: 15,000 m^2 with an indicative shape of 75 m X 200 m > Total impact of anchor footprints during construction; > export cable installation 363,906 m^3 > up to 6 permanent vessel moorings > total seabed volume disturbed during construction 120,960 m^3 > Wet storage area for anchors and other items to be temporarily placed on the seabed. > Maximum area of disturbance: 15,000 m^2 with an indicative shape of 75 m x 200 m	The maximum assessment assumptions represent the maximum seabed disturbance by vessel activities that could potentially affect marine heritage receptors located within the proposed development

Impact 6: Indirect impact causing disturbance of sediment containing potential marine heritage receptors (material and contexts) leading to the exposure of those marine heritage receptors to natural, chemical, or biological processes and indirectly causing or accelerating their loss	> Total maximum impact of seabed preparation
	  > 79 gravity base jacket foundations, per foundation 3,600 m^2 total, 284,400 m^2
	  > for 2 Gravity Base Monopile OSP foundations 14,000 m^2
	  > depth of seabed preparation required 4 m
	> Typical anchor penetration depth;
	  > WTG foundation 4 m
	  > OSP foundation 4 m
	> Total volume of seabed preparation spoil volume
	  > 79 foundations 1,137,600m^3
	  > 2 OPS foundations 56,000m^3
	> Total volume of gravel bed per foundation,
	  > WTG 284,400 m^3,
	  > OSP 7,000 m^3
	> Total volume of sediment disturbed by sand wave clearance;
	  > inter-array cable laying 22,795,580 m^3
	> Maximum area of seabed disturbed by wet storage area 15,000 m^2 (with an indicative shape of 75 m x 200 m).
	> Total maximum impact of seabed preparation
	  > 79 gravity base jacket foundations, per foundation 3,600 m^2 total, 284,400 m^2
	  > for 2 Gravity Base Monopile OSP foundations 14,000 m^2
	> Maximum scour protection volume;
	  > 79 WTG Gravity Based Monopile Structures: 2,109,235 m^3
		The maximum assessment assumptions represent the maximum seabed disturbance by sediment disturbance that could potentially affect marine heritage receptors located within the proposed development

	> 2 OSP Gravity Based Monopile Structures: 148,100 m^3 > Maximum volume of sediment disturbed for all jack-up operations during construction; 8,316,000m^2 > Total impact of anchor footprints during construction; > WTG, & OPS installation in the arrays 1,516,320 m^3, > inter-array installation 374,693 m^3 > Total volume of sediment disturbed by sand wave clearance; > export cable installations 6,968,922 m^3 > Total impact of anchor footprints during construction; > export cable installation 363,906 m^3 > total seabed volume disturbed during construction 120,960 m^3	

Potential effect	Maximum Design Scenario assessed	Justification
Impact 7: Indirect impacts causing changes to the Historic Seascape Character as a result of construction and survey vessel activities and the addition of cables, foundations and turbines indirectly leading to changes to the perceived historic use of the seascape during construction activities	> Total project area 128 km^2 > Up to 41 large or 79 smaller WTG > WTG maximum rotor diameter > large 360 m > smaller 259 m > Maximum upper blade tip height above MHWS > large 395 m > smaller 320 m > Up to 2 OSPs > Topside height above LAT (including stowed crane, helideck, and mast) 195 m > Minimum spacing for structures in the arrays > WTGs 830 m > OSP to nearest WTG 500 m > 200 km maximum length of inter-array cables > Maximum export cable length 196 km > Maximum peak number of construction vessels; > foundations (WTG and OSP) 38 > WTG installation 10 > OSP installation 4 > export cable installation 12 > inter-array cable installation 12 > commissioning vessels 5 > other vessels 15 > Maximum number of vessels > peak 96 > round trips 4,311	The maximum assessment assumptions represent construction activities that could potentially affect perception of the HSC

Potential effect	Maximum Design Scenario assessed	Justification

	> Indicative peak vessels on-site simultaneously
	  > peak 35
	  > round trips 35
	> Maximum 530 return trips by 2 helicopters
	> Up to 6 permanent mooring anchors	

Operation		

Impact 8: Direct impact by penetration, compression, and disturbance effects of maintenance activities at WTG substation foundations and along inter-array cables leading to total or partial loss of marine heritage receptors	> Up to 8 inter-array cable repairs/ replacements over the project lifetime (approximately 40 years)
	  > seabed disturbance per inter-array cable repair/ replacement event (including vessel anchors) 34,582 m^2
	  > total seabed disturbance for inter-array cables over project lifetime 276,656 m^2
	> Up to 10,000 m of inter-array cables requiring remedial burial over project lifetime via jetting or rock placement
	  > seabed disturbance volume per inter-array cable burial event (including vessel anchors) 53,762 m^3
	  > total seabed disturbance volume for inter-array cables over project lifetime 430,096 m^3
	> Up to 9 numbers of export cable repairs over project lifetime (Approximately 40 years)
	  > seabed disturbance per export cable repair event (including vessel anchors) 16,205 m^2
	  > total seabed disturbance for export cables over project lifetime 145,842 m^2
		The maximum assessment assumptions represent the maximum seabed disturbance during maintenance activities that could potentially affect marine heritage receptors located within the proposed development

Potential effect	Maximum Design Scenario assessed	Justification
	> Up to 5,000 m of export cables requiring remedial burial over project lifetime via jetting or rock placement seabed disturbance volume per export cable burial event (including vessel anchors) 25,057 m^3	
Impact 9: Indirect impacts during the operation phase causing disturbance of sediment containing potential marine heritage receptors during maintenance activities leading to the exposure of those marine heritage receptors to natural, chemical, or biological process, accelerating loss of the same	> Up to 8 number of inter-array cable repairs/ replacements over the project lifetime (approximately 40 years) > seabed disturbance per inter-array cable repair/ replacement event (including vessel anchors) 34,582 m^2 > Up to 10,000 m of inter-array cables requiring remedial burial over project lifetime via jetting or rock placement > seabed disturbance volume per inter-array cable burial event (including vessel anchors) 53,762 m^3 > Total seabed disturbance volume for inter-array cables over project lifetime 430,096 m^3 > Up to 9 numbers of export cable repairs over project lifetime (Approximately 40 years) > seabed disturbance per export cable repair event (including vessel anchors) 16,205 m^2 > total seabed disturbance for export cables over project lifetime 145,842 m^2 > Up to 5,000 m of export cables requiring remedial burial over project lifetime via jetting or rock placement > seabed disturbance volume per export cable burial event (including vessel anchors) 25,057 m^3	The maximum assessment assumptions represent the maximum seabed disturbance during the operational phase that could potentially affect marine heritage receptors located within the proposed development

Potential effect	Maximum Design Scenario assessed	Justification
Impact 10: Direct impact by penetration, compression, and disturbance effects of jack-up barges and anchoring of operation and maintenance vessels during the operation and maintenance phase leading to total or partial loss of marine heritage receptors	> Maximum Jack-up vessel operations during construction; 504 > Individual leg footprint; 275 m^2 > Maximum area of seabed impacted per Jack-up vessel operation; 1,100 m^2 > Typical seabed penetration 15 m > Maximum volume of sediment disturbed for all Jack-up vessel operations; 8,316,000 > Maximum impact footprint of all 6 permanent navigation buoy chains on sea floor during operation 698,520 m^2	The maximum assessment assumptions represent the maximum seabed disturbance by vessels activities that could potentially affect marine heritage receptors located within the proposed development

Potential effect	Maximum Design Scenario assessed	Justification
Impact 11: Indirect impacts causing scour effects as a result of the presence of WTG substation foundations and the exposure of inter-array and export cables or the use of cable protection measures leading to the exposure of those marine heritage receptors to natural, chemical, or biological processes and indirectly causing or accelerating their loss	> Maximum scour protection volume for all foundations 2,257,400 m^3 > Maximum impact footprint of all 6 permanent navigation buoy chains on sea floor during operation 698,520 m^2 > 200 km maximum length of inter-array cables > Maximum area of seabed covered by cable protection; > inter-array cable protection 321,600 m^2 > Volume 6, Part 2, Chapter 2: Marine Geology, Oceanography and Physical Processes outlines that for all foundations, the footprint area of scour protection is larger than the predicted footprint of local scour. The overall level of effect of scour has therefore been assessed as being of minor adverse significance which is not significant in EIA terms. > Maximum export cable length 196 km > Maximum area of seabed covered by cable protection; > export cable protection 178,304 m^2	The maximum assessment assumptions represent the maximum seabed disturbance and scour that could potentially affect marine heritage receptors located within the proposed development

Potential effect	Maximum Design Scenario assessed	Justification
Impact 12: Indirect impacts causing changes to the Historic Seascape Character as a result of operation and maintenance vessel activities and the presence of the completed wind farm indirectly leading to changes to the perceived historic use of the seascape during the operation phase	> Total project area 128 km^2 > Up to 41 large or 79 smaller WTG > WTG maximum rotor diameter > large 360 m > smaller 260 m > Maximum upper blade tip height above MHWS > large 395 m > smaller 320 m > Up to 2 of OSPs > Topside height above LAT (including stowed crane, helideck, and mast) 195 m > Minimum spacing for structures in the arrays > WTGs 830 m > OSPs 500 m > 200 km maximum length of inter-array cables > Maximum export cable length 196 km > Maximum peak number of operation vessels; > peak 27 > round trips 1,776 > Indicative peak vessels on-site simultaneously > peak 27 > Maximum 125 return trips by helicopters > Up to 6 permanent mooring anchors	The maximum assessment assumptions represent construction activities that could potentially affect perception of the HSC
Decommissioning		

Potential effect	Maximum Design Scenario assessed	Justification
Impact 13: Direct impact by penetration, compression and disturbance effects of jack-up barges and anchoring of decommissioning vessels leading to total or partial loss of marine heritage receptors	> For the purposes of the MDS for EIA, at the end of the operational lifetime of VE, it is assumed that all infrastructure above the seabed will be completely removed. The decommissioning sequence will generally be in the reverse of construction (reverse lay) and is expected to involve similar types and numbers of vessels and equipment and take place over a three-year period. > An initial Decommissioning Plan, including programme, waste management and proposed end state of the environment is expected to be required to be submitted pre-construction > For the purposes of the MDS for EIA, at the end of the operational lifetime of VE, it is assumed that all infrastructure above the seabed will be completely removed. The decommissioning sequence will generally be in the reverse of construction (reverse lay) and is expected to involve similar types and numbers of vessels and equipment and take place over a three-year period > An initial Decommissioning Plan, including programme, waste management and proposed end state of the environment is expected to be required to be submitted pre-construction	The maximum assessment assumptions represent the maximum seabed disturbance by vessels activities that could potentially affect marine heritage receptors during decommissioning

Potential effect	Maximum Design Scenario assessed	Justification
Impact 14: Indirect impacts creating draw-down of sediment into voids left by removed WTG foundations leading to loss of sediment or destabilisation of archaeological sites and contexts indirectly leading to exposing marine heritage receptors within the Array Areas to natural, chemical, or biological processes and causing or accelerating loss of the same	> Total maximum impact on seabed when using monopile, Suction Bucket Jacket WTG foundations 397,097 m^3 > Total maximum impact on seabed when using Suction Bucket Jacket OSP foundations 33,929 m^3	The maximum assessment assumptions represent the maximum seabed disturbance by voids that could potentially affect marine heritage receptors during decommissioning
Impact 15: Indirect impacts causing changes to the Historic Seascape Character as a result of decommissioning activities and the removal of wind farm components indirectly leading to changes to the perceived historic use of the seascape during the decommissioning phase	> Total project area 128 km^2 > Maximum 79 small or 41 large WTG > Maximum rotor diameter 260 (small) 360 (large) > Max upper blade tip height above MHWS 395 m > Absolute minimum turbine spacing (centre to centre) 830 m > 200 km maximum length of inter-array cable with 26 estimated crossings; > Maximum export cable length 196 km	The maximum assessment assumptions represent decommissioning activities that could potentially affect perception of the HSC

11.11 MITIGATION

11.11.1 The mitigation contained in Table 11.17 are mitigation measures or commitments that have been identified and adopted as part of the evolution of the project design of relevance to the topic, these include project design measures, compliance with elements of good practice and use of standard protocols. Where the assessment determined significant effects accounting for mitigation, further measures may be required, which will be presented as additional mitigation.

11.11.2 The exact mitigation design may evolve through the pre-construction development process and will be updated to reflect any further study and in consultation with the Archaeological Curators. These mitigation measures are secured through the dML conditions.

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

Table 11.17: Mitigation relating to Offshore Archaeology and Cultural Heritage

Project phase	Mitigation measures
General	
Written Schemes of Investigation (WSI)	An Outline Marine WSI document has been produced to accompany the ES to outline the AEZs and establish the basis for mitigation measures and further archaeological campaigns for the project. This will be developed to form the Draft Marine WSI followed by the Agreed Marine WSI.
Archaeological Exclusion Zones (AEZ)	All intrusive activities undertaken during the life of the project will be routed and microsited to avoid any identified marine heritage receptors pre-construction, with AEZs as detailed in the Outline Marine WSI unless other mitigation is agreed with Historic England and MMO.
Protocol for Archaeological Discoveries (PAD)	Additional unknown or unexpected cultural heritage and marine heritage receptors identified during the project stages will be reported utilising the project specific PAD.
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.

Project phase	Mitigation measures
Post-construction monitoring plan	A post-construction monitoring plan as per the Outline Marine WSI (Volume 9, Report 19) will be produced. The post-construction monitoring plan will identify any areas or sites of high archaeological significance recommended for further investigation and outline how post-construction monitoring campaigns will collect, asses and report on changes to marine heritage receptors that may have occurred during the construction phase.

WSI

11.11.4 The Outline Marine WSI (Volume 9, Report 19) Outline Marine Written Schemes of Investigation) 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 WSI also sets out procedures 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 maximized.

11.11.5 Throughout the lifetime of VE, the Marine WSI will evolve from the current Outline Marine WSI (Volume 9, Report 19): Outline Marine Written Schemes of Investigation) to the Draft Marine WSI through to the final Agreed Marine WSI. These documents will be produced in line with The Crown Estate guidance (2021). The mitigation set out in the WSI will be discussed and agreed in consultation with the Archaeological Curators. Note that the implementation of this Marine WSI is mitigation, rather than the document itself.

AEZS AND MICROSITING

11.11.6 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. The avoidance of marine heritage assets remaining *in situ* follows best archaeological practice, and impact by the proposed development will be avoided through the implementation of buffers around the known extents of sites. All development and related activities that could impact the seabed are microsited around the boundaries of an AEZ.

11.11.7 The final development layout of VE will take into account the locations of all AEZs. Where it is deemed that impacts cannot be avoided, measures to reduce, remedy or offset disturbances will be agreed.

11.11.8 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.

11.11.9 AEZs of 50 m are recommended around anomalies of medium archaeological potential (Table 11.14) and records for wrecks and obstructions which did not correlate with geophysical anomalies. For anomalies of high archaeological potential identified in the geophysical data AEZs of 100 m are recommended. The extent of the AEZs are based around the visible extent of the anomaly, where it can be identified, or in the case of recorded anomalies not also identified in the geophysical data and anomalies identified only in the magnetometer data the buffer is based around the recorded location (Figure 11.18, Figure 11.19 and Figure 11.20).

11.11.10 For anomalies assessed as low archaeological potential no AEZ have been recommended at this time. However, avoidance of these features by micrositing is recommended if there is potential for them to be impacted by the development.

11.11.11 It is possible these 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 ROV or UXO surveys.

11.11.12 The methodology for assessing anomalies is set out in Section 8 of Volume 9, Report 19: Outline Marine Written Schemes of Investigation.

PAD

11.11.13 There is potential for previously unknown sites or material of archaeological potential to be encountered during development works. As per the WSI, a project specific PAD will be required to ensure impacts to these unexpected discoveries can be reduced.

11.11.14 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.

11.11.15 Temporary exclusion zones (TEZ) may be established around areas of possible archaeological potential until further investigation and assessment can be conducted.

ARCHAEOLOGICAL ASSESSMENT OF AVAILABLE DATA

11.11.16 Where relevant, offshore geophysical surveys (including UXO surveys) undertaken during the life of VE will be subject to full archaeological review, as per best practice. Any archaeological reviews will be undertaken in consultation with Historic England.

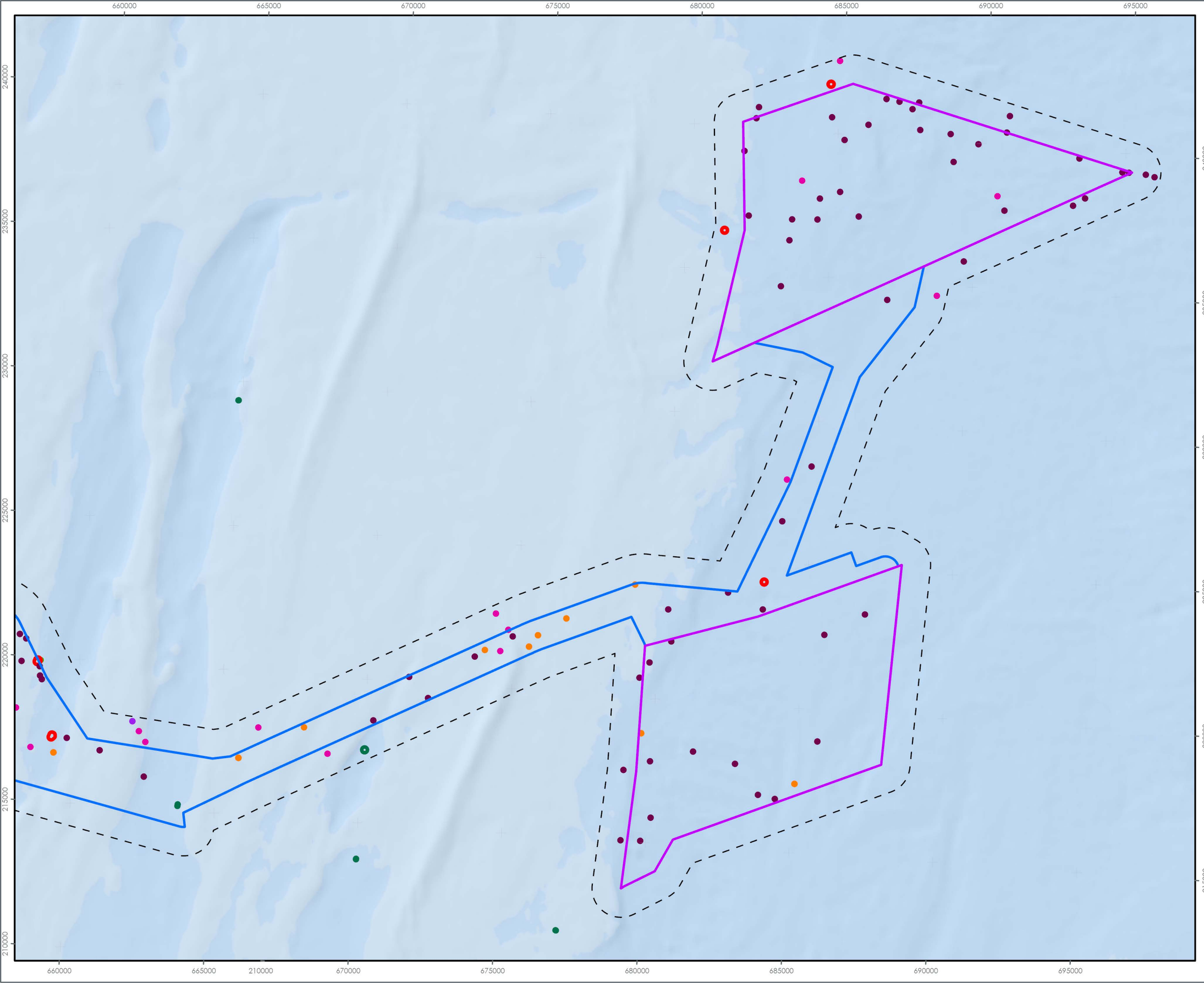
11.11.17 Offshore geotechnical surveys prior to construction will be undertaken following early discussions with Historic England. Areas with geoarchaeological potential will be targeted during geotechnical sampling campaigns and the results of the geoarchaeological assessment will be presented in phased geoarchaeological reports inclusive of publication. The published results will aim to enhance the palaeogeographic knowledge and understanding of the area.

11.11.18 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.

11.11.19 The area is of known importance for historic military and merchant activity as well as of for geoarchaeology. Any features of potential archaeological interest or significance will be avoided where possible or, where impacts cannot be avoided, will be further investigated and risk of impacts managed. Any locations of potential geoarchaeological interest or significance 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.

POST-CONSTRUCTION MONITORING PLAN

11.11.20 A post-construction monitoring plan will be produced within the Agreed Marine WSI (the iteration of the Outline Marine WSI (Volume 9, Report 19: Outline Marine Written Schemes of Investigation) which will be developed post-consent and pre-construction). The post-construction monitoring plan will set out areas or sites of high archaeological interest and/ or significance and outline proposed measures to avoid or monitor such sites. It will also outline how any post-construction monitoring campaigns will collect, assess, and report on changes to marine heritage receptors that may have occurred during the construction phase.



LEGEND

- Array Areas
- Offshore Export Cable Corridor
- Marine Archaeology Study Area

Geophysical AEZ

- High
- High (mag only)
- Medium

Recorded losses AEZ

- aircraft
- foul ground
- obstruction
- unknown
- wreck
- North Falls AEZ

0 1.25 2.5 5

Kilometers

PROJECT TITLE:

FIVE ESTUARIES OFFSHORE WINDFARM

DRAWING TITLE: **Archaeological Exclusion Zones within the Array Areas the offshore section of the Offshore ECC**

VER	DATE	REMARKS	Drawn	Checked
1	30/01/2024	DRAFT	HA	CH

DRAWING NUMBER: 11.18

SCALE:	PLOT SIZE:	DATUM:	PROJECTION:
1:120,000	A3	WGS84	UTMN31

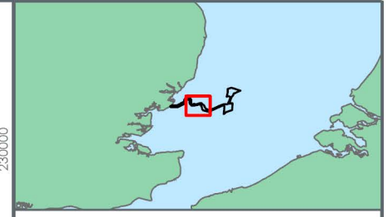
FIVE ESTUARIES OFFSHORE WIND FARM

640000 230000 645000 650000 655000 660000

225000 220000 215000 210000

230000 225000 220000 215000 665000

640000 645000 650000 655000 660000 665000



LEGEND

- Offshore Export Cable Corridor
- Marine Archaeology Study Area

Geophysical AEZ

- High
- High (mag only)
- Medium

Recorded losses AEZ

- aircraft
- foul ground
- obstruction
- unknown
- wreck

North Falls AEZ

0 0.75 1.5 3

Kilometers

PROJECT TITLE:

FIVE ESTUARIES OFFSHORE WINDFARM

DRAWING TITLE:

Archaeological Exclusion Zones within the mid-section of the Offshore ECC

VER	DATE	REMARKS	Drawn	Checked
1	30/01/2024	DRAFT	HA	CH

DRAWING NUMBER: 11.19

SCALE:	PLOT SIZE:	DATUM:	PROJECTION:
1:75,000	A3	WGS84	UTMN31

FIVE ESTUARIES
OFFSHORE WIND FARM

625000
630000
635000
640000
645000
230000
225000
220000
215000

LEGEND

- Offshore Export Cable Corridor
- Marine Archaeology Study Area

Geophysical AEZ

- High
- High (mag only)
- Medium

Recorded losses AEZ

- aircraft
- foul ground
- obstruction
- unknown
- wreck
- North Falls AEZ

0 0.75 1.5 3

Kilometers

PROJECT TITLE:

FIVE ESTUARIES OFFSHORE WINDFARM

DRAWING TITLE:

Archaeological Exclusion Zones within the nearshore Offshore ECC

VER	DATE	REMARKS	Drawn	Checked
1	30/01/2024	DRAFT	HA	CH

DRAWING NUMBER: 11.20

SCALE:	PLOT SIZE:	DATUM:	PROJECTION:
1:75,000	A3	WGS84	UTMN31

FIVE ESTUARIES OFFSHORE WIND FARM

11.12 ENVIRONMENTAL ASSESSMENT: CONSTRUCTION PHASE

11.12.1 Activities associated with the construction phase that have the potential to directly or indirectly impact marine archaeology receptors are considered here. The magnitude of all outlined impacts on marine heritage receptors has been assessed according to the criteria outlined in Table 11.4 and taking into account the mitigations as outlined in Table 11.17. The assumed maximum design scenario (Table 11.16), demonstrates that potential direct and indirect impact during the construction phase is possible within the Order Limits and outlines relevant parameters.

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

11.12.3 The sensitivity (value) of the marine heritage receptors identified within the marine archaeology study area takes into account both the impact of magnitude (Table 11.4) and the sensitivity (value) 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. The sensitivity (value) of the known marine heritage receptors potentially impacted during the construction phase are detailed in Table 11.18. The scope of the area assessed for impact is in line with that in Volume 6, Part 2, Chapter 2: Marine Geology, Oceanography and Physical Processes assessment.

11.12.4 The current project design includes an offshore ECC to shore to facilitate power export from the array areas to the national electricity grid. Under the Offshore Transmissions Network Review (OTNR) options, work to consider the potential for an offshore connection has been commenced but is not well advanced. An offshore connection is not a viable or deliverable alternative at this time. However, in order to allow the identification of impacts that be relevant were this to become an option, the assessment for each potential impact has been split into “Array Area Impacts” and “Offshore Export Cable Corridor Impacts.” Further details on the OTNR process are outlined in Volume 9, Report 29: Offshore Connection Scenario.

Table 11.18: Receptor sensitivity (value): Construction phase

No.	Marine archaeological receptor	Receptor sensitivity (value)
4	High potential anomalies	High
98	Medium potential anomalies	Medium
471	Low potential anomalies	High to Low
4114	Low potential magnetic anomalies	High to Low
6	Very High to High significance (archaeological term) known wrecks	High
22	Medium significance (archaeological term) known wrecks	High/ Medium
9	Low significance (archaeological term) known wrecks	High/ Medium
1	Unknown significance (archaeological term) known wrecks	Unknown
60	Reported losses/ fishermen's fasteners/ obstructions/ dead wrecks (not identified in geophysical data)	High to Low
Channels, valleys, and deposits of geoarchaeological potential		High to Low

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 THE MARINE HERITAGE RECEPTORS

ARRAY AREAS IMPACTS

MAGNITUDE OF IMPACT

11.12.5 Impacts of sediment removal on marine heritage receptors 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** magnitude of impact as detailed in Table 11.4.

SENSITIVITY (VALUE) OF THE RECEPTOR

11.12.6 The sensitivity (value) of the marine heritage receptors 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 11.5**.**

11.12.7 which takes into account both the impact of magnitude (Table 11.4) and the sensitivity (value) of those receptors as a result of potential impacts. The sensitivity (value) of the known marine heritage receptors potentially impacted by sediment removal is detailed in Table 11.18.

SIGNIFICANCE OF EFFECT

11.12.8 As per mitigation outlined in Table 11.17 locations on the seabed of potential and confirmed marine heritage receptors are informed by the archaeological assessment of geophysical and geotechnical data and AEZs have been recommended as outlined in Volume 9, Report 19: Outline Marine Written Schemes of Investigation.

11.12.9 Mitigation by avoidance aims to ensure that there is no direct, indirect, or permanent impact on marine heritage receptors of the proposed VE development meaning a **negligible** magnitude of impact as defined in Table 11.4.

11.12.10 Where avoidance is not possible or in the case of not yet located marine heritage receptors further mitigation and archaeological works will be a requirement under Volume 9, Report 19: Outline Marine Written Schemes of Investigation, and associated documents to ensure **negligible** magnitude of impact as defined in Table 11.4.

11.12.11 It is predicted that the sensitivity (value) of known heritage receptors impacted by sediment removal is **negligible** to **very high** (Table 11.18).

11.12.12 Considering the magnitude of impact and receptor sensitivity (value) within the significance of effect matrix (on marine heritage receptors potentially affected by sediment removal, the magnitude of impact is assessed as **negligible** (**neutral**) and the sensitivity (value) of the receptor as **negligible** to **high**. The significance of effect has therefore been assessed as **minor** to **negligible** and the effect is consequently considered **not significant** in EIA terms.

OFFSHORE EXPORT CABLE CORRIDOR IMPACTS

MAGNITUDE OF IMPACT

11.12.13 Impacts of sediment removal on marine heritage receptors 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** magnitude of impact as detailed in Table 11.4).

SENSITIVITY (VALUE) OF THE RECEPTOR

11.12.14 The sensitivity (value) of the marine heritage receptors 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 11.5 which takes into account both the impact of magnitude (Table 11.4) and the sensitivity (value) of those receptors as a result of potential impacts. The sensitivity (value) of the known marine heritage receptors potentially impacted by sediment removal is detailed in Table 11.18.

SIGNIFICANCE OF EFFECT

11.12.15 As per mitigation outlined in Table 11.17 locations on the seabed of potential and confirmed marine heritage receptors are informed by the archaeological assessment of geophysical and geotechnical data and AEZs have been recommended as outlined in Volume 9, Report 19: Outline Marine Written Schemes of Investigation.

11.12.16 Mitigation by avoidance aims to ensure that there is no direct, indirect, or permanent impact on marine heritage receptors of the proposed VE development meaning a **negligible** magnitude of impact as defined in Table 11.4.

11.12.17 Where avoidance is not possible or in case of not yet located marine heritage receptors further mitigation and archaeological works will be a requirement under Volume 9, Report 19: Outline Marine Written Schemes of Investigation, and associated documents to ensure **negligible** magnitude of impact as defined in Table 11.4.

11.12.18 It is predicted that the sensitivity (value) of known heritage receptors impacted by sediment removal is **negligible** to **very high** (Table 11.18).

11.12.19 Considering the magnitude of impact and receptor sensitivity (value) within the significance of effect matrix on marine heritage receptors potentially effected by sediment removal, the magnitude of impact is assessed as **negligible** (**neutral**) and the sensitivity (value) of the receptor as **negligible** to **high**. The significance of effect has therefore been assessed as **minor** to **negligible** and the effect is consequently considered **not significant** in EIA terms.

OVERLAP BETWEEN ARRAY AREAS IMPACTS AND OFFSHORE ECC IMPACTS

11.12.20 Impacts will occur within the Array Areas and Offshore ECC and may bridge the two areas. The impacts will be localised with no significant additive spatial overlap.

IMPACT 2: DIRECT IMPACT BY PENETRATION, COMPRESSION, AND DISTURBANCE OF PILING FOUNDATIONS LEADING TO THE TOTAL OR PARTIAL LOSS OF MARINE HERITAGE RECEPTORS

ARRAY AREAS IMPACTS

MAGNITUDE OF IMPACT

11.12.21 Impacts of piling activities on marine heritage receptors 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 11.4).

SENSITIVITY (VALUE) OF THE RECEPTOR

11.12.22 The sensitivity (value) of the marine heritage receptors potentially impacted by piling activities and identified within the marine archaeology study area is considered to be negligible to high as defined in Table 11.5 which takes into account both the impact of magnitude (Table 11.4) and the sensitivity (value) of those receptors as a result of potential impacts. The sensitivity (value) of the known marine heritage receptors potentially impacted by piling activities is detailed in Table 11.18.

SIGNIFICANCE OF EFFECT

11.12.23 As per mitigation outlined in Table 11.17 locations on the seabed of potential and confirmed marine heritage receptors are informed by the archaeological assessment of geophysical and geotechnical data and AEZs have been recommended as outlined in Volume 9, Report 19: Outline Marine Written Schemes of Investigation.

11.12.24 Mitigation by avoidance aims to ensure that there is no direct, indirect, or permanent impact on marine heritage receptors of the proposed VE development meaning a **negligible** magnitude of impact as defined in Table 11.4.

11.12.25 Where avoidance is not possible or in cases of not yet located marine heritage receptors further mitigation and archaeological works will be a requirement under Volume 9, Report 19: Outline Marine Written Schemes of Investigation and associated documents, to ensure **negligible** magnitude of impact as defined in Table 11.4.

11.12.26 It is predicted that the sensitivity (value) of known heritage receptors impacted by piling activities is **negligible** to **very high** (Table 11.18).

11.12.27 Considering the magnitude of impact and receptor sensitivity (value) within the significance of effect matrix on marine heritage receptors potentially affected by piling activities, the magnitude of impact is assessed as **negligible** (**neutral**) and the sensitivity (value) of the receptor as **negligible** to **high**. The significance of effect has therefore been assessed as **minor** to **negligible** and the effect is consequently considered **not significant** in EIA terms.

OFFSHORE EXPORT CABLE CORRIDOR IMPACTS

MAGNITUDE OF IMPACT

11.12.28 Impacts of piling activities, such as sheet piling at landfall, on marine heritage receptors 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 11.4).

SENSITIVITY (VALUE) OF THE RECEPTOR

11.12.29 The sensitivity (value) of the marine heritage receptors potentially impacted by piling activities and identified within the marine archaeology study area is considered to be negligible to high as defined in Table 11.5 which takes into account both the impact of magnitude (Table 11.4) and the sensitivity (value) of those receptors as a result of potential impacts. The sensitivity (value) of the known marine heritage receptors potentially impacted by piling activities is detailed in Table 11.18.

SIGNIFICANCE OF EFFECT

11.12.30 As per mitigation outlined in Table 11.17 locations on the seabed of potential and confirmed marine heritage receptors are informed by the archaeological assessment of geophysical and geotechnical data and AEZs have been recommended as outlined in Volume 9, Report 19: Outline Marine Written Schemes of Investigation.

11.12.31 Mitigation by avoidance aims to ensure that there is no direct, indirect, or permanent impact on marine heritage receptors of the proposed VE development meaning a **negligible** magnitude of impact as defined in Table 11.4.

11.12.32 Where avoidance is not possible or in cases of not yet located marine heritage receptors further mitigation and archaeological works will be a requirement under Volume 9, Report 19: Outline Marine Written Schemes of Investigation and associated documents, to ensure **negligible** magnitude of impact as defined in Table 11.4.

11.12.33 It is predicted that the sensitivity (value) of known heritage receptors impacted by piling activities is **negligible** to **very high** (Table 11.18).

11.12.34 Considering the magnitude of impact and receptor sensitivity (value) within the significance of effect matrix on marine heritage receptors potentially effected by piling activities, the magnitude of impact is assessed as **negligible** (**neutral**) and the sensitivity (value) of the receptor as **negligible** to **high**. The significance of effect has therefore been assessed as **minor** to **negligible** and the effect is consequently considered **not significant** in EIA terms.

IMPACT 3: DIRECT IMPACT BY PENETRATION, COMPRESSION, AND DISTURBANCE OF STRATIGRAPHIC CONTEXTS CONTAINING ARCHAEOLOGICAL MATERIAL FROM THE COMBINED WEIGHT OF THE WIND TURBINE GENERATORS (WTG) AND ASSOCIATED FOUNDATIONS LEADING TO TOTAL OR PARTIAL LOSS OF MARINE HERITAGE RECEPTORS

ARRAY AREAS IMPACTS

MAGNITUDE OF IMPACT

11.12.35 Impacts resulting from combined weight on marine heritage receptors 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 11.4).

SENSITIVITY (VALUE) OF THE RECEPTOR

11.12.36 The sensitivity (value) of the marine heritage receptors potentially impacted by piling activities and identified within the marine archaeology study area is considered to be negligible to high as defined in Table 11.5 which takes into account both the impact of magnitude (Table 11.4) and the sensitivity (value) of those receptors as a result of potential impacts. The sensitivity (value) of the known marine heritage receptors potentially resulting from combined weight is detailed in Table 11.18.

SIGNIFICANCE OF EFFECT

11.12.37 As per mitigation outlined in Table 11.17 locations on the seabed of potential and confirmed marine heritage receptors are informed by the archaeological assessment of geophysical and geotechnical data and AEZs have been recommended as outlined in Volume 9, Report 19: Outline Marine Written Schemes of Investigation.

11.12.38 Mitigation by avoidance aims to ensure that there is no direct, indirect, or permanent impact on marine heritage receptors from the proposed VE development meaning a **negligible** magnitude of impact as defined in Table 11.4.

11.12.39 Where avoidance is not possible or in case of not yet located marine heritage receptors further mitigation and archaeological works will be a requirement under Volume 9, Report 19: Outline Marine Written Schemes of Investigation and associated documents, to ensure **negligible** magnitude of impact as defined in Table 11.4.

11.12.40 It is predicted that the sensitivity (value) of known heritage receptors impacted by the combined weight is **negligible** to **very high** (Table 11.18).

11.12.41 Considering the magnitude of impact and receptor sensitivity (value) within the significance of effect matrix on marine heritage receptors potentially affected by the combined weight, the magnitude of impact is assessed as **negligible** (**neutral**) and the sensitivity (value) of the receptor as **negligible** to **high**. The significance of effect has therefore been assessed as **minor** to **negligible** and the effect is consequently considered **not significant** in EIA terms.

OVERLAP BETWEEN ARRAY AREAS IMPACTS AND OFFSHORE ECC IMPACTS

11.12.42 Impacts will occur within the Array Areas only. The impacts will be localised with no significant additive spatial overlap.

IMPACT 4: DIRECT IMPACT BY PENETRATION, COMPRESSION, AND DISTURBANCE OF CABLE LAYING OPERATIONS LEADING TO TOTAL OR PARTIAL LOSS OF MARINE HERITAGE RECEPTORS

ARRAY AREAS IMPACTS

MAGNITUDE OF IMPACT

11.12.43 Impacts as a result of inter-array and interconnector cable laying operations on marine heritage receptors 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 11.4).

SENSITIVITY (VALUE) OF THE RECEPTOR

11.12.44 The sensitivity (value) of the marine heritage receptors 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 11.5 which takes into account both the impact of magnitude (Table 11.4) and the sensitivity (value) of those receptors as a result of potential impacts. The sensitivity (value) of the known marine heritage receptors potentially impacted by cable laying operations is detailed in Table 11.18.

SIGNIFICANCE OF EFFECT

11.12.45 As per mitigation outlined in Table 11.17 locations on the seabed of potential and confirmed marine heritage receptors are informed by the archaeological assessment of geophysical and geotechnical data and AEZs have been recommended as outlined in Volume 9, Report 19: Outline Marine Written Schemes of Investigation.

11.12.46 Mitigation by avoidance aims to ensure that there is no direct, indirect, or permanent impact on marine heritage receptors of the proposed VE development meaning a **negligible** magnitude of impact as defined in Table 11.4.

11.12.47 Where avoidance is not possible or in case of not yet located marine heritage receptors further mitigation and archaeological works will be a requirement under Volume 9, Report 19: Outline Marine Written Schemes of Investigation and associated documents, to ensure **negligible** magnitude of impact as defined in Table 11.4.

11.12.48 It is predicted that the sensitivity (value) of known heritage receptors impacted by cable laying activities is **negligible** to **very high** (Table 11.18).

11.12.49 Considering the magnitude of impact and receptor sensitivity (value) within the significance of effect matrix on marine heritage receptors potentially effected by cable laying activities, the magnitude of impact is assessed as **negligible** (**neutral**) and the sensitivity (value) of the receptor as **negligible** to **high**. The significance of effect has therefore been assessed as **minor** to **negligible** and the effect is consequently considered **not significant** in EIA terms.

OFFSHORE EXPORT CABLE CORRIDOR IMPACTS

MAGNITUDE OF IMPACT

11.12.50 Impacts as a result of cable laying operations on marine heritage receptors 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 11.4).

SENSITIVITY (VALUE) OF THE RECEPTOR

11.12.51 The sensitivity (value) of the marine heritage receptors 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 11.5 which takes into account both the impact of magnitude (Table 11.4) and the sensitivity (value) of those receptors as a result of potential impacts. The sensitivity (value) of the known marine heritage receptors potentially impacted by cable laying operations is detailed in Table 11.18.

SIGNIFICANCE OF EFFECT

11.12.52 As per mitigation outlined in Table 11.17 locations on the seabed of potential and confirmed marine heritage receptors are informed by the archaeological assessment of geophysical and geotechnical data and AEZs have been recommended as outlined in Volume 9, Report 19: Outline Marine Written Schemes of Investigation.

11.12.53 Mitigation by avoidance aims to ensure that there is no direct, indirect, or permanent impact on marine heritage receptors of the proposed VE development meaning a **negligible** magnitude of impact as defined in Table 11.4.

11.12.54 Where avoidance is not possible or in case of not yet located marine heritage receptors further mitigation and archaeological works will be a requirement under Volume 9, Report 19: Outline Marine Written Schemes of Investigation and associated documents, to ensure **negligible** magnitude of impact as defined in Table 11.4.

11.12.55 It is predicted that the sensitivity (value) of known heritage receptors impacted by cable laying activities is **negligible** to **very high** (Table 11.18).

11.12.56 Considering the magnitude of impact and receptor sensitivity (value) within the significance of effect matrix on marine heritage receptors potentially effected by cable laying activities, the magnitude of impact is assessed as **negligible** (**neutral**) and the sensitivity (value) of the receptor as **negligible** to **high**. The significance of effect has therefore been assessed as **minor** to **negligible** and the effect is consequently considered **not significant** in EIA terms.

OVERLAP BETWEEN ARRAY AREAS IMPACTS AND OFFSHORE ECC IMPACTS

11.12.57 Impacts will occur within the Array Areas and Offshore ECC and may bridge the two areas. The impacts will be localised with no significant additive spatial overlap.

IMPACT 5: DIRECT IMPACT BY PENETRATION, COMPRESSION, AND DISTURBANCE EFFECTS OF JACK-UP BARGES AND ANCHORING OF CONSTRUCTION VESSELS DURING CONSTRUCTION ACTIVITIES LEADING TO TOTAL OR PARTIAL LOSS OF MARINE HERITAGE RECEPTORS

ARRAY AREAS IMPACTS

MAGNITUDE OF IMPACT

11.12.58 Impacts as a result of vessel operations, such as jack-up barges and anchoring of construction vessels, on marine heritage receptors 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 11.4).

SENSITIVITY (VALUE) OF THE RECEPTOR

11.12.59 The sensitivity (value) of the marine heritage receptors 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 11.5 which takes into account both the impact of magnitude (Table 11.4) and the sensitivity (value) of those receptors as a result of potential impacts. The sensitivity (value) of the known marine heritage receptors potentially impacted by vessel operations is detailed in Table 11.18.

SIGNIFICANCE OF EFFECT

11.12.60 As per mitigation outlined in Table 11.17 locations on the seabed of potential and confirmed marine heritage receptors are informed by the archaeological assessment of geophysical and geotechnical data and AEZs have been recommended as outlined in Volume 9, Report 19: Outline Marine Written Schemes of Investigation.

11.12.61 Mitigation by avoidance aims to ensure that there is no direct, indirect, or permanent impact on marine heritage receptors of the proposed VE development meaning a **negligible** magnitude of impact as defined in Table 11.4.

11.12.62 Where avoidance is not possible or in case of not yet located marine heritage receptors further mitigation and archaeological works will be a requirement under Volume 9, Report 19: Outline Marine Written Schemes of Investigation and associated documents, to ensure **negligible** magnitude of impact as defined in Table 11.4.

11.12.63 It is predicted that the sensitivity (value) of known heritage receptors impacted by vessel activities is **negligible** to **very high** (Table 11.18).

11.12.64 Considering the magnitude of impact and receptor sensitivity (value) within the significance of effect matrix on marine heritage receptors potentially effected by vessel activities, the magnitude of impact is assessed as **negligible** (**neutral**) and the sensitivity (value) of the receptor as **negligible** to **high**. The significance of effect has therefore been assessed as **minor** to **negligible** and the effect is consequently considered **not significant** in EIA terms.

OFFSHORE EXPORT CABLE CORRIDOR IMPACTS

MAGNITUDE OF IMPACT

11.12.65 Impacts as a result of vessel operations, such as anchoring of construction vessels, on marine heritage receptors 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 11.4).

SENSITIVITY (VALUE) OF THE RECEPTOR

11.12.66 The sensitivity (value) of the marine heritage receptors 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 11.5 which takes into account both the impact of magnitude (Table 11.4) and the sensitivity (value) of those receptors as a result of potential impacts. The sensitivity (value) of the known marine heritage receptors potentially impacted by vessel operations is detailed in Table 11.18.

SIGNIFICANCE OF EFFECT

11.12.67 As per mitigation outlined in Table 11.17 locations on the seabed of potential and confirmed marine heritage receptors are informed by the archaeological assessment of geophysical and geotechnical data and AEZs have been recommended as outlined in Volume 9, Report 19: Outline Marine Written Schemes of Investigation.

11.12.68 Mitigation by avoidance aims to ensure that there is no direct, indirect, or permanent impact on marine heritage receptors of the proposed VE development meaning a **negligible** magnitude of impact as defined in Table 11.4.

11.12.69 Where avoidance is not possible or in case of not yet located marine heritage receptors further mitigation and archaeological works will be a requirement under Volume 9, Report 19: Outline Marine Written Schemes of Investigation and associated documents, to ensure **negligible** magnitude of impact as defined in Table 11.4.

11.12.70 It is predicted that the sensitivity (value) of known heritage receptors impacted by vessel activities is **negligible** to **very high** (Table 11.20).

11.12.71 Considering the magnitude of impact and receptor sensitivity (value) within the significance of effect matrix on marine heritage receptors potentially effected by vessel activities, the magnitude of impact is assessed as **negligible** (**neutral**) and the sensitivity (value) of the receptor as **negligible** to **high**. The significance of effect has therefore been assessed as **minor** to **negligible** and the effect is consequently considered **not significant** in EIA terms.

OVERLAP BETWEEN ARRAY AREAS IMPACTS AND OFFSHORE ECC IMPACTS

11.12.72 Impacts will occur within the Array Areas and Offshore ECC and may bridge the two areas. The impacts will be localised with no significant additive spatial overlap.

IMPACT 6: INDIRECT IMPACT CAUSING DISTURBANCE OF SEDIMENT CONTAINING POTENTIAL MARINE HERITAGE RECEPTORS (MATERIAL AND CONTEXTS) LEADING TO THE EXPOSURE OF THOSE MARINE HERITAGE RECEPTORS TO NATURAL, CHEMICAL OR BIOLOGICAL PROCESSES AND INDIRECTLY CAUSING OR ACCELERATING THEIR LOSS

ARRAY AREAS IMPACTS

MAGNITUDE OF IMPACT

11.12.73 Magnitude of indirect impact on marine heritage receptors of sediment disturbance may lead to exposure of those marine heritage receptors 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** impact of magnitude as detailed in Table 11.4).

SENSITIVITY (VALUE) OF THE RECEPTOR

11.12.74 The sensitivity (value) of the marine heritage receptors identified within the marine archaeology study area is considered to be negligible to high as defined in Table 11.5 which takes into account both the impact of magnitude (Table 11.4) and the sensitivity (value) of those receptors as a result of potential impacts. The sensitivity (value) of the known marine heritage receptors potentially impacted by sediment disturbance is detailed in Table 11.18.

SIGNIFICANCE OF EFFECT

11.12.75 As per mitigation outlined in Table 11.17 locations on the seabed of potential and confirmed marine heritage receptors are informed by the archaeological assessment of geophysical and geotechnical data and AEZs have been recommended as outlined in Volume 9, Report 19: Outline Marine Written Schemes of Investigation.

11.12.76 Mitigation by avoidance aims to ensure that there is no direct, indirect, or permanent impact on marine heritage receptors of the proposed VE development meaning a **negligible** magnitude of impact as defined in Table 11.4.

11.12.77 Where avoidance is not possible or in case of not yet located marine heritage receptors further mitigation and archaeological works will be a requirement under Volume 9, Report 19: Outline Marine Written Schemes of Investigation, and associated documents to ensure **negligible** magnitude of impact as defined in Table 11.4.

11.12.78 It is predicted that the sensitivity (value) of known heritage receptors impacted by sediment disturbance is **negligible** to **very high** (Table 11.18).

11.12.79 Considering the magnitude of impact and receptor sensitivity (value) within the significance of effect matrix on marine heritage receptors potentially effected by sediment disturbance, the magnitude of impact is assessed as **negligible** (**neutra**l) and the sensitivity (value) of the receptor as **negligible** to **high**. The significance of effect has therefore been assessed as **minor** to **negligible** and the effect is consequently considered **not significant** in EIA terms.

OFFSHORE EXPORT CABLE CORRIDOR IMPACTS

MAGNITUDE OF IMPACT

11.12.80 Magnitude of indirect impact on marine heritage receptors of sediment disturbance may lead to exposure of those marine heritage receptors 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** impact of magnitude as detailed in Table 11.4).

SENSITIVITY (VALUE) OF THE RECEPTOR

11.12.81 The sensitivity (value) of the marine heritage receptors identified within the marine archaeology study area is considered to be negligible to high as defined in Table 11.5 which takes into account both the impact of magnitude (Table 11.4) and the sensitivity (value) of those receptors as a result of potential impacts. The sensitivity (value) of the known marine heritage receptors potentially impacted by sediment disturbance is detailed in Table 11.18.

SIGNIFICANCE OF EFFECT

11.12.82 As per mitigation outlined in Table 11.17 locations on the seabed of potential and confirmed marine heritage receptors are informed by the archaeological assessment of geophysical and geotechnical data and AEZs have been recommended as outlined in Volume 9, Report 19: Outline Marine Written Schemes of Investigation.

11.12.83 Mitigation by avoidance aims to ensure that there is no direct, indirect, or permanent impact on marine heritage receptors of the proposed VE development meaning a **negligible** magnitude of impact as defined in Table 11.4.

11.12.84 Where avoidance is not possible or in case of not yet located marine heritage receptors further mitigation and archaeological works will be a requirement under Volume 9, Report 19: Outline Marine Written Schemes of Investigation, and associated documents to ensure **negligible** magnitude of impact as defined in Table 11.4.

11.12.85 It is predicted that the sensitivity (value) of known heritage receptors impacted by sediment disturbance is **negligible** to **very high** (Table 11.18).

11.12.86 Considering the magnitude of impact and receptor sensitivity (value) within the significance of effect matrix on marine heritage receptors potentially effected by sediment disturbance, the magnitude of impact is assessed as **negligible** (**neutra**l) and the sensitivity (value) of the receptor as **negligible** to **high**. The significance of effect has therefore been assessed as **minor** to **negligible** and the effect is consequently considered **not significant** in EIA terms.

OVERLAP BETWEEN ARRAY AREAS IMPACTS AND OFFSHORE ECC IMPACTS

11.12.87 Impacts will occur within the Array Areas and Offshore ECC and may bridge the two areas. The impacts will be localised with no significant additive spatial overlap.

IMPACT 7: INDIRECT IMPACTS CAUSING CHANGES TO THE HISTORIC SEASCAPE CHARACTER AS A RESULT OF CONSTRUCTION AND SURVEY VESSEL ACTIVITIES AND THE ADDITION OF CABLES, FOUNDATIONS AND TURBINES INDIRECTLY LEADING TO CHANGES TO THE PERCEIVED HISTORIC USE OF THE SEASCAPE DURING CONSTRUCTION ACTIVITIES

ARRAY AREAS IMPACTS AND OFFSHORE ECC IMPACTS

MAGNITUDE OF IMPACT

11.12.88 Magnitude of indirect impact on the HSC during the construction phase has been assessed according to the criteria outlined in Table 11.4 and is taking into account the mitigations as outlined in Table 11.17.

11.12.89 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 historic character and the perception surrounding them.

11.12.90 The historic character of a seascape can be defined by its dynamic nature and ability to accommodate change. Perceptions of the seascape are also dynamic and subject to public awareness, time, and place. The intertidal and marine zones are ever changing due to physical processes such as currents, tidal range, and sediment mobility. Considering this dynamism and the multiple dimensions defined by HSC, people create complex spatial relationships within and across all marine levels, reflected within the sites of cultural activity and their material imprints.

11.12.91 The presence of construction vessels is considered to be comparatively inconsequential considering the current marine activity within the marine archaeology study area. The inshore activities at landfall will be short term and small scale with temporary use of larger construction vessels, as outlined in the assumed maximum impact table (Table 11.16).

11.12.92 The addition of cables on the sub-sea floor and sea floor is unlikely to enter the perception of the public, and therefore are unlikely to change the public perception of seascape. Foundations within the water column and sea surface will likely contribute to a change in people's perception of the HSC. This can be a positive, negative, or neutral change which is dependent on personal experience of the area and will continue to be a subjective perception over time.

11.12.93 The magnitude of impact on marine heritage receptors on HSC, specifically the installation of cables on the sub-sea floor and sea floor, foundations within the water column and sea surface and turbines above the sea surface during the construction phase is therefore assessed as a narrative using the Broad Historic Character Types, as summarised in Section 11.7.

11.12.94 It should be noted that changes to the visible elements of the shore and the sea surface have been assessed further in Volume 6, Part 2, Chapter 10: Seascape, Landscape and Visual Impact Assessment, and therefore this chapter only considers the historic aspects of Seascape Characterisation.

SENSITIVITY (VALUE) OF THE RECEPTOR

11.12.95 The sensitivity (value) of the Broad Historic Character Types identified within proposed development is assessed in terms of their ability to adapt to change, as outlined in Section 11.7.

11.12.96 The existing seascape of VE marine archaeology study area is known for its marine and intertidal historic character utilised mainly for Navigation, Industry, Fishing, Ports and Docks, Coastal Infrastructure, Military, Settlements and Recreation.

11.12.97 HSC relates to the historic dimension of the present-day seascape and considers the added effect of VE within the multiple dimensions of the marine environment (sub-sea floor, sea floor, water column, sea surface, coastal land and previous historic character) in combination with the existing activity within the Broad Historic Character Types, as detailed in Section 11.7 and Volume 6, Part 5, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report, and their capacity to accommodate change.

SIGNIFICANCE OF EFFECT

11.12.98 The commitment to undertake further archaeological works will be a requirement under Volume 9, Report 19: Outline Marine Written Schemes of Investigation and associated documents (Table 11.17). This includes ensuring that HSC assessments where relevant are included throughout the life of the project.

11.12.99 It is therefore predicted that the ability to accommodate change is mainly a positive perceived change equalling a negligible magnitude. The significance of effect is therefore assessed as **negligible**, and the effect is consequently considered not **significant** in EIA terms.

11.13 ENVIRONMENTAL ASSESSMENT: OPERATIONAL PHASE

11.13.1 Activities associated with the operational phase that have the potential to impact marine archaeology receptors directly or indirectly are considered here. The magnitude of all outlined impacts on marine heritage receptors has been assessed according to the criteria outlined in Table 11.4 and is considering the mitigations as outlined in Table 11.17. The assumed maximum impact table (Table 11.16), demonstrates that potential direct and indirect impact during the operational phase is possible within the Order Limits and outlines relevant parameters.

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

11.13.3 The sensitivity (value) of the marine heritage receptors identified within the marine archaeology study area considers both the impact of magnitude (Table 11.4) 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 marine heritage receptors potentially impacted during the operational phase are detailed in Table 11.19. The scope of the area assessed for impact is in line that in the Volume 6, Part 2, Chapter 2: Marine Geology, Oceanography and Physical Processes.

Table 11.19: Receptor sensitivity (value): Operational phase

No.	Marine archaeological receptor	Receptor sensitivity (value)
234	High potential anomalies	High
98	Medium potential anomalies	Medium
471	Low potential anomalies	High to Low
4114	Low potential magnetic anomalies	High to Low
6	Very High to High significance (archaeological term) known wrecks	High
22	Medium significance (archaeological term) known wrecks	High/ Medium
9	Low significance (archaeological term) known wrecks	High/ Medium
1	Unknown significance (archaeological term) known wrecks	Unknown
60	Reported losses/ fishermen's fasteners/ obstructions/ dead wrecks (not identified in geophysical data)	High to Low
Channels, valleys, and deposits of geoarchaeological potential		High to Low

IMPACT 8: DIRECT IMPACT BY PENETRATION, COMPRESSION AND DISTURBANCE EFFECTS OF MAINTENANCE ACTIVITIES AT WTG AND SUBSTATION FOUNDATIONS AND ALONG INTER-ARRAY AND EXPORT CABLES LEADING TO TOTAL OR PARTIAL LOSS OF MARINE HERITAGE RECEPTORS

ARRAY AREA IMPACTS

MAGNITUDE OF IMPACT

11.13.4 Direct impacts as a result of maintenance activities on marine heritage receptors 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 11.4).

SENSITIVITY (VALUE) OF THE RECEPTOR

11.13.5 The sensitivity (value) of the marine heritage receptors identified within the marine archaeology study area is considered to be negligible to high as defined in Table 11.5 which takes into account both the impact of magnitude (Table 11.4) and the sensitivity (value) of those receptors as a result of potential impacts. The sensitivity (value) of the known marine heritage receptors potentially impacted by maintenance activities is detailed in Table 11.19.

SIGNIFICANCE OF EFFECT

11.13.6 As per mitigation outlined in Table 11.17 locations on the seabed of potential and confirmed marine heritage receptors are informed by the archaeological assessment of geophysical and geotechnical data and AEZs have been recommended as outlined in Volume 9, Report 19: Outline Marine Written Schemes of Investigation.

11.13.7 Mitigation by avoidance aims to ensure that there is no direct, indirect, or permanent impact on marine heritage receptors of the proposed VE development meaning a **negligible** magnitude of impact as defined in Table 11.4.

11.13.8 Where avoidance is not possible or in case of not yet located marine heritage receptors further mitigation and archaeological works will be a requirement under Volume 9, Report 19: Outline Marine Written Schemes of Investigation and associated documents, to ensure **negligible** magnitude of impact as defined in Table 11.4.

11.13.9 It is predicted that the sensitivity (value) of known heritage receptors impacted by maintenance activities is **negligible** to **very high** (Table 11.19).

11.13.10 Considering the magnitude of impact and receptor sensitivity (value) within the significance of effect matrix on marine heritage receptors potentially effected by maintenance activities, the magnitude of impact is assessed as **negligible** (**neutral**) and the sensitivity (value) of the receptor as **negligible** to **high**. The significance of effect has therefore been assessed as **minor** to **negligible** and the effect is consequently considered **not significant** in EIA terms.

OFFSHORE EXPORT CABLE CORRIDOR IMPACTS

MAGNITUDE OF IMPACT

11.13.11 Direct impacts as a result of maintenance activities on marine heritage receptors 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 11.4).

SENSITIVITY (VALUE) OF THE RECEPTOR

11.13.12 The sensitivity (value) of the marine heritage receptors identified within the marine archaeology study area is considered to be negligible to high as defined in Table 11.5 which takes into account both the impact of magnitude (Table 11.4) and the sensitivity (value) of those receptors as a result of potential impacts. The sensitivity (value) of the known marine heritage receptors potentially impacted by maintenance activities is detailed in Table 11.19.

SIGNIFICANCE OF EFFECT

11.13.13 As per mitigation outlined in Table 11.17 locations on the seabed of potential and confirmed marine heritage receptors are informed by the archaeological assessment of geophysical and geotechnical data and AEZs have been recommended as outlined in Volume 9, Report 19: Outline Marine Written Schemes of Investigation.

11.13.14 Mitigation by avoidance aims to ensure that there is no direct, indirect, or permanent impact on marine heritage receptors of the proposed VE development meaning a **negligible** magnitude of impact as defined in Table 11.4.

11.13.15 Where avoidance is not possible or in case of not yet located marine heritage receptors further mitigation and archaeological works will be a requirement under Volume 9, Report 19: Outline Marine Written Schemes of Investigation and associated documents, to ensure **negligible** magnitude of impact as defined in Table 11.4.

11.13.16 It is predicted that the sensitivity (value) of known heritage receptors impacted by maintenance activities is **negligible** to **very high** (Table 11.19).

11.13.17 Considering the magnitude of impact and receptor sensitivity (value) within the significance of effect matrix on marine heritage receptors potentially effected by maintenance activities, the magnitude of impact is assessed as **negligible** (**neutral**) and the sensitivity (value) of the receptor as **negligible** to **high**. The significance of effect has therefore been assessed as **minor** to **negligible** and the effect is consequently considered **not significant** in EIA terms.

OVERLAP BETWEEN ARRAY AREAS IMPACTS AND OFFSHORE ECC IMPACTS

11.13.18 Impacts will occur within the Array Areas and Offshore ECC and may bridge the two areas. The impacts will be localised with no significant additive spatial overlap.

IMPACT 9: INDIRECT IMPACTS DURING THE OPERATION PHASE CAUSING DISTURBANCE OF SEDIMENT CONTAINING POTENTIAL MARINE HERITAGE RECEPTORS DURING MAINTENANCE ACTIVITIES LEADING TO THE EXPOSURE OF THOSE MARINE HERITAGE RECEPTORS TO NATURAL, CHEMICAL OR BIOLOGICAL PROCESSES AND INDIRECTLY CAUSING OR ACCELERATING LOSS OF THESE RECEPTORS

ARRAY AREA IMPACTS

MAGNITUDE OF IMPACT

11.13.19 Magnitude of indirect impact on marine heritage receptors of sediment disturbance during maintenance activities may lead to exposure of those marine heritage receptors 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** impact of magnitude as detailed in Table 11.4).

SENSITIVITY (VALUE) OF THE RECEPTOR

11.13.20 The sensitivity (value) of the marine heritage receptors identified within the marine archaeology study area is considered to be negligible to high as defined in Table 11.5 which takes into account both the impact of magnitude (Table 11.4) and the sensitivity (value) of those receptors as a result of potential impacts. The sensitivity (value) of the known marine heritage receptors potentially impacted by sediment disturbance during maintenance activities is detailed in Table 11.19.

SIGNIFICANCE OF EFFECT

11.13.21 As per mitigation outlined in Table 11.17 locations on the seabed of potential and confirmed marine heritage receptors are informed by the archaeological assessment of geophysical and geotechnical data and AEZs have been recommended as outlined in Volume 9, Report 19: Outline Marine Written Schemes of Investigation.

11.13.22 Mitigation by avoidance aims to ensure that there is no direct, indirect, or permanent impact on marine heritage receptors of the proposed VE development meaning a **negligible** magnitude of impact as defined in Table 11.4.

11.13.23 Where avoidance is not possible or in case of not yet located marine heritage receptors further mitigation and archaeological works will be a requirement under Volume 9, Report 19: Outline Marine Written Schemes of Investigation and associated documents, to ensure negligible magnitude of impact as defined in Table 11.4.

11.13.24 It is predicted that the sensitivity (value) of known heritage receptors impacted during the operations phase is **negligible** to **very high** (Table 11.19).

11.13.25 Considering the magnitude of impact and receptor sensitivity (value) within the significance of effect matrix on marine heritage receptors potentially effected during the operations phase, the magnitude of impact is assessed as **negligible** (**neutra**l) and the sensitivity (value) of the receptor as **negligible** to **high**. The significance of effect has therefore been assessed as **minor** to **negligible** and the effect is consequently considered **not significant** in EIA terms.

OFFSHORE EXPORT CABLE CORRIDOR IMPACTS

MAGNITUDE OF IMPACT

11.13.26 Magnitude of indirect impact on marine heritage receptors of sediment disturbance during maintenance activities may lead to exposure of those marine heritage receptors 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** impact of magnitude as detailed in Table 11.4).

SENSITIVITY (VALUE) OF THE RECEPTOR

11.13.27 The sensitivity (value) of the marine heritage receptors identified within the marine archaeology study area is considered to be negligible to high as defined in Table 11.5 which takes into account both the impact of magnitude (Table 11.4) and the sensitivity (value) of those receptors as a result of potential impacts. The sensitivity (value) of the known marine heritage receptors potentially impacted by sediment disturbance during maintenance activities is detailed in Table 11.19.

SIGNIFICANCE OF EFFECT

11.13.28 As per mitigation outlined in Table 11.17 locations on the seabed of potential and confirmed marine heritage receptors are informed by the archaeological assessment of geophysical and geotechnical data and AEZs have been recommended as outlined in Volume 9, Report 19: Outline Marine Written Schemes of Investigation.

11.13.29 Mitigation by avoidance aims to ensure that there is no direct, indirect, or permanent impact on marine heritage receptors of the proposed VE development meaning a **negligible** magnitude of impact as defined in Table 11.4.

11.13.30 Where avoidance is not possible or in case of not yet located marine heritage receptors further mitigation and archaeological works will be a requirement under Volume 9, Report 19: Outline Marine Written Schemes of Investigation and associated documents, to ensure negligible magnitude of impact as defined in Table 11.4.

11.13.31 It is predicted that the sensitivity (value) of known heritage receptors impacted during the operations phase is **negligible** to **very high** (Table 11.19).

11.13.32 Considering the magnitude of impact and receptor sensitivity (value) within the significance of effect matrix on marine heritage receptors potentially effected during the operations phase, the magnitude of impact is assessed as **negligible** (**neutra**l) and the sensitivity (value) of the receptor as **negligible** to **high**. The significance of effect has therefore been assessed as **minor** to **negligible** and the effect is consequently considered **not significant** in EIA terms.

OVERLAP BETWEEN ARRAY AREAS IMPACTS AND OFFSHORE ECC IMPACTS

11.13.33 Impacts will occur within the Array Areas and Offshore ECC and may bridge the two areas. The impacts will be localised with no significant additive spatial overlap.

IMPACT 10: DIRECT IMPACT BY PENETRATION, COMPRESSION, AND DISTURBANCE EFFECTS OF JACK-UP BARGES AND ANCHORING OF OPERATION AND MAINTENANCE VESSELS DURING THE OPERATION AND MAINTENANCE PHASE LEADING TO TOTAL OR PARTIAL LOSS OF MARINE HERITAGE RECEPTORS

ARRAY AREA IMPACTS

MAGNITUDE OF IMPACT

11.13.34 Direct impacts as a result of vessel activities, such as jack-up barges and anchoring of operation vessels, on marine heritage receptors 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 11.4).

SENSITIVITY (VALUE) OF THE RECEPTOR

11.13.35 The sensitivity (value) of the marine heritage receptors identified within the marine archaeology study area is considered to be negligible to high as defined in Table 11.5 which takes into account both the impact of magnitude (Table 11.4) and the sensitivity (value) of those receptors as a result of potential impacts. The sensitivity (value) of the known marine heritage receptors potentially impacted by vessel activities is detailed in Table 11.19.

SIGNIFICANCE OF EFFECT

11.13.36 As per mitigation outlined in Table 11.17 locations on the seabed of potential and confirmed marine heritage receptors are informed by the archaeological assessment of geophysical and geotechnical data and AEZs have been recommended as outlined in Volume 9, Report 19: Outline Marine Written Schemes of Investigation.

11.13.37 Mitigation by avoidance aims to ensure that there is no direct, indirect, or permanent impact on marine heritage receptors of the proposed VE development meaning a **negligible** magnitude of impact as defined in Table 11.19.

11.13.38 Where avoidance is not possible or in case of not yet located marine heritage receptors further mitigation and archaeological works will be a requirement under Volume 9, Report 19: Outline Marine Written Schemes of Investigation and associated documents, to ensure **negligible** magnitude of impact as defined in Table 11.4.

11.13.39 It is predicted that the sensitivity (value) of known heritage receptors impacted by vessel activities is **negligible** to **very high** (Table 11.19).

11.13.40 Considering the magnitude of impact and receptor sensitivity (value) within the significance of effect matrix on marine heritage receptors potentially effected by vessel activities, the magnitude of impact is assessed as **negligible** (**neutral**) and the sensitivity (value) of the receptor as **negligible** to **high.** The significance of effect has therefore been assessed as **minor** to **negligible** and the effect is consequently considered **not significant** in EIA terms.

OFFSHORE EXPORT CABLE CORRIDOR IMPACTS

MAGNITUDE OF IMPACT

11.13.41 Direct impacts as a result of vessel activities, such as anchoring of operation vessels, on marine heritage receptors 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 11.4).

SENSITIVITY (VALUE) OF THE RECEPTOR

11.13.42 The sensitivity (value) of the marine heritage receptors identified within the marine archaeology study area is considered to be negligible to high as defined in Table 11.5 which takes into account both the impact of magnitude (Table 11.4) and the sensitivity (value) of those receptors as a result of potential impacts. The sensitivity (value) of the known marine heritage receptors potentially impacted by vessel activities is detailed in Table 11.19.

SIGNIFICANCE OF EFFECT

11.13.43 As per mitigation outlined in Table 11.17 locations on the seabed of potential and confirmed marine heritage receptors are informed by the archaeological assessment of geophysical and geotechnical data and AEZs have been recommended as outlined in Volume 9, Report 19: Outline Marine Written Schemes of Investigation.

11.13.44 Mitigation by avoidance aims to ensure that there is no direct, indirect, or permanent impact on marine heritage receptors of the proposed VE development meaning a **negligible** magnitude of impact as defined in Table 11.19.

11.13.45 Where avoidance is not possible or in case of not yet located marine heritage receptors further mitigation and archaeological works will be a requirement under Volume 9, Report 19: Outline Marine Written Schemes of Investigation and associated documents, to ensure **negligible** magnitude of impact as defined in Table 11.4.

11.13.46 It is predicted that the sensitivity (value) of known heritage receptors impacted by vessel activities is **negligible** to **very high** (Table 11.19).

11.13.47 Considering the magnitude of impact and receptor sensitivity (value) within the significance of effect matrix on marine heritage receptors potentially effected by vessel activities, the magnitude of impact is assessed as **negligible** (**neutral**) and the sensitivity (value) of the receptor as **negligible** to **high.** The significance of effect has therefore been assessed as **minor** to **negligible** and the effect is consequently considered **not significant** in EIA terms.

OVERLAP BETWEEN ARRAY AREAS IMPACTS AND OFFSHORE ECC IMPACTS

11.13.48 Impacts will occur within the Array Areas and Offshore ECC and may bridge the two areas. The impacts will be localised with no significant additive spatial overlap.

IMPACT 11: INDIRECT IMPACTS CAUSING SCOUR EFFECTS AS A RESULT OF THE PRESENCE OF WTG SUBSTATION FOUNDATIONS AND THE EXPOSURE OF INTER-ARRAY AND EXPORT CABLES OR THE USE OF CABLE PROTECTION MEASURES LEADING TO THE EXPOSURE OF THOSE MARINE HERITAGE RECEPTORS TO NATURAL, CHEMICAL OR BIOLOGICAL PROCESSES AND INDIRECTLY CAUSING OR ACCELERATING THEIR LOSS

ARRAY AREA IMPACTS

MAGNITUDE OF IMPACT

11.13.49 Magnitude of indirect impact on marine heritage receptors of sediment disturbance as a result of scour due to the presence of WTG substation foundations and the exposure of inter-array cables or the use of cable protection measures, may lead to exposure of those marine heritage receptors 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** impact of magnitude as detailed in Table 11.4).

SENSITIVITY (VALUE) OF THE RECEPTOR

11.13.50 The sensitivity (value) of the marine heritage receptors identified within the marine archaeology study area is considered to be negligible to high as defined in Table 11.5 which takes into account both the impact of magnitude (Table 11.4) and the sensitivity (value) of those receptors as a result of potential impacts. The sensitivity (value) of the known marine heritage receptors potentially impacted by sediment disturbance as a result of scour is detailed in Table 11.19.

SIGNIFICANCE OF EFFECT

11.13.51 As per mitigation outlined in Table 11.17 locations on the seabed of potential and confirmed marine heritage receptors are informed by the archaeological assessment of geophysical and geotechnical data and AEZs have been recommended as outlined in Volume 9, Report 19: Outline Marine Written Schemes of Investigation.

11.13.52 Mitigation by avoidance aims to ensure that there is no direct, indirect, or permanent impact on marine heritage receptors of the proposed VE development meaning a **negligible** magnitude of impact as defined in Table 11.4.

11.13.53 Where avoidance is not possible or in case of not yet located marine heritage receptors further mitigation and archaeological works will be a requirement under Volume 9, Report 19: Outline Marine Written Schemes of Investigation and associated documents, to ensure **negligible** magnitude of impact as defined in Table 11.4.

11.13.54 It is predicted that the sensitivity (value) of known heritage receptors impacted by scour effects is **negligible** to very high (Table 11.19).

11.13.55 Considering the magnitude of impact and receptor sensitivity (value) within the significance of effect matrix on marine heritage receptors potentially effected by scour effects, the magnitude of impact is assessed as **negligible** (**neutral**) and the sensitivity (value) of the receptor as **negligible** to **high**. The significance of effect has therefore been assessed as **minor** to **negligible** and the effect is consequently considered **not significant** in EIA terms.

OFFSHORE EXPORT CABLE CORRIDOR IMPACTS

MAGNITUDE OF IMPACT

11.13.56 Magnitude of indirect impact on marine heritage receptors of sediment disturbance as a result of scour due to the exposure of inter-array cables or the use of cable protection measures may lead to exposure of those marine heritage receptors 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** impact of magnitude as detailed in Table 11.4).

SENSITIVITY (VALUE) OF THE RECEPTOR

11.13.57 The sensitivity (value) of the marine heritage receptors identified within the marine archaeology study area is considered to be negligible to high as defined in Table 11.5 which takes into account both the impact of magnitude (Table 11.4) and the sensitivity (value) of those receptors as a result of potential impacts. The sensitivity (value) of the known marine heritage receptors potentially impacted by sediment disturbance as a result of scour is detailed in Table 11.19.

SIGNIFICANCE OF EFFECT

11.13.58 As per mitigation outlined in Table 11.17 locations on the seabed of potential and confirmed marine heritage receptors are informed by the archaeological assessment of geophysical and geotechnical data and AEZs have been recommended as outlined in Volume 9, Report 19: Outline Marine Written Schemes of Investigation.

11.13.59 Mitigation by avoidance aims to ensure that there is no direct, indirect, or permanent impact on marine heritage receptors of the proposed VE development meaning a **negligible** magnitude of impact as defined in Table 11.4.

11.13.60 Where avoidance is not possible or in case of not yet located marine heritage receptors further mitigation and archaeological works will be a requirement under Volume 9, Report 19: Outline Marine Written Schemes of Investigation and associated documents, to ensure **negligible** magnitude of impact as defined in Table 11.4.

11.13.61 It is predicted that the sensitivity (value) of known heritage receptors impacted by scour effects is **negligible** to **very high** (Table 11.19).

11.13.62 Considering the magnitude of impact and receptor sensitivity (value) within the significance of effect matrix on marine heritage receptors potentially effected by scour effects, the magnitude of impact is assessed as **negligible** (**neutral**) and the sensitivity (value) of the receptor as **negligible** to **high**. The significance of effect has therefore been assessed as **minor** to **negligible** and the effect is consequently considered **not significant** in EIA terms.

OVERLAP BETWEEN ARRAY AREAS IMPACTS AND OFFSHORE ECC IMPACTS

11.13.63 Impacts will occur within the Array Areas and Offshore ECC and may bridge the two areas. The impacts will be localised with no significant additive spatial overlap.

IMPACT 12: INDIRECT IMPACTS CAUSING CHANGES TO THE HISTORIC SEASCAPE CHARACTER AS A RESULT OF OPERATION AND MAINTENANCE VESSEL ACTIVITIES AND THE PRESENCE OF THE COMPLETED WIND FARM INDIRECTLY LEADING TO CHANGES TO THE PERCEIVED HISTORIC USE OF THE SEASCAPE DURING THE OPERATION PHASE

ARRAY AREAS IMPACTS AND OFFSHORE ECC IMPACTS

MAGNITUDE OF IMPACT

11.13.64 Magnitude of indirect impact on the HSC during the operations phase has been assessed according to the criteria outlined in Table 11.4 and is taking into account the mitigations as outlined in Table 11.17.

11.13.65 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 the perception surrounding them.

11.13.66 The historic character of a seascape can be defined by its dynamic nature and ability to accommodate change. Perceptions of the seascape are also dynamic and subject to public awareness, time, and place. The intertidal and marine zones are ever changing due to physical processes such as currents, tidal range, and sediment mobility. Considering this dynamism and the multiple dimensions defined by HSC, people create complex spatial relationships within and across all marine levels, reflected within the sites of cultural activity and their material imprints.

11.13.67 The presence of operation and maintenance vessels is considered to be comparatively inconsequential considering the current marine activity within the marine archaeology study area. The inshore activities at landfall will be short term and small scale with temporary use of larger construction vessels, as outlined in the assumed maximum impact table (Table 11.16).

11.13.68 The presence of cables on the sub-sea floor and sea floor is unlikely to enter the perception of the public, and therefore are unlikely to change the public perception of seascape. Foundations within the water column and sea surface will likely contribute to a change in people's perception of the HSC. This can be a positive, negative, or neutral change which is dependent on personal experience of the area and will continue to be a subjective perception over time.

11.13.69 The magnitude of impact on marine heritage receptors on HSC, specifically the presence of cables on the sub -sea floor and sea floor, foundations within the water column and sea surface and turbines above the sea surface during the operational phase is therefore assessed as a narrative using the Broad Historic Character Types, as summarised in Section 11.7.

11.13.70 It should be noted that changes to the visible elements of the shore and the sea surface have been assessed further in Volume 6, Part 2, Chapter 10: Seascape, Landscape and Visual Impact Assessment, and therefore this chapter only considers the historic aspects of Seascape Characterisation.

SENSITIVITY (VALUE) OF THE RECEPTOR

11.13.71 The sensitivity (value) of the Broad Historic Character Types identified within proposed development is assessed in terms of their ability to adapt to change, as outlined in Section 11.7.

11.13.72 The existing seascape of VE marine archaeology study area is known for its marine and intertidal historic character utilised mainly for Navigation, Industry, Fishing, Ports and Docks, Coastal Infrastructure, Military, Settlements and Recreation.

11.13.73 HSC relates to the historic dimension of the present-day seascape and considers the added effect of VE within the multiple dimensions of the marine environment (sub-sea floor, sea floor, water column, sea surface, coastal land and previous historic character) in combination with the existing activity within the Broad Historic Character Types, as detailed in Section 11.7 and Volume 6, Part 5, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report and Table 11.19 their capacity to accommodate change.

11.13.74 As there are existing active wind farms in the area surrounding the proposed development area the impact to this character has already occurred, and the capacity of the seascape to accommodate change has been illustrated. The operation of VE OWF will contribute to, rather than alter the perception of the seascape.

SIGNIFICANCE OF EFFECT

11.13.75 The commitment to undertake further archaeological works throughout the life of the project will be a requirement under the Outline Marine WSI (Volume 9, report 19: Outline Marine Written Schemes of Investigation) and associated documents (Table 11.17). This includes ensuring that HSC assessments where relevant are included throughout the life of the project.

11.13.76 It is therefore predicted that the ability to accommodate change is mainly a positive perceived change equalling a negligible magnitude. The significance of effect is therefore assessed as **negligible**, and the effect is consequently considered **not significant** in EIA terms.

11.14 ENVIRONMENTAL ASSESSMENT: DECOMMISSIONING PHASE

11.14.1 Activities associated with the decommissioning phase that have the potential to directly or indirectly impact marine archaeology receptors are considered here. The magnitude of all outlined impacts on marine heritage receptors has been assessed according to the criteria outlined in Table 11.4 and is taking into account the mitigations as outlined in Table 11.17. The assumed maximum design scenario table (Table 11.16), demonstrates that potential direct and indirect impact during the operational phase is possible within the Order Limits and outlines relevant parameters.

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

11.14.3 The sensitivity (value) of the marine heritage receptors identified within the marine archaeology study area considers both the impact of magnitude (Table 11.4) 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 marine heritage receptors potentially impacted during the decommissioning phase are detailed in Table 11.20. The scope of the area assessed for impact is in line that in the Volume 6, Part 2, Chapter 2: Marine Geology, Oceanography and Physical Processes.

Table 11.20: Receptor sensitivity (value): Decommissioning phase

No.	Marine archaeological receptor	Receptor sensitivity (value)
234	High potential anomalies	High
98	Medium potential anomalies	Medium
471	Low potential anomalies	High to Low
4114	Low potential magnetic anomalies	High to Low
6	Very High to High significance (archaeological term) known wrecks	High
22	Medium significance (archaeological term) known wrecks	High/ Medium
9	Low significance (archaeological term) known wrecks	High/ Medium
1	Unknown significance (archaeological term) known wrecks	Unknown
60	Reported losses/ fishermen's fasteners/ obstructions/ dead wrecks (not identified in geophysical data)	High to Low
Channels, valleys, and deposits of geoarchaeological potential		High to Low

IMPACT 13: DIRECT IMPACT BY PENETRATION, COMPRESSION AND DISTURBANCE EFFECTS OF JACK-UP BARGES AND ANCHORING OF DECOMMISSIONING VESSELS LEADING TO TOTAL OR PARTIAL LOSS OF MARINE HERITAGE RECEPTORS

ARRAY AREA IMPACTS

MAGNITUDE OF IMPACT

11.14.4 The impacts of decommissioning activities on marine heritage receptors 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 11.4).

SENSITIVITY (VALUE) OF THE RECEPTOR

11.14.5 The sensitivity (value) of the marine heritage receptors identified within the marine archaeology study area is considered to be negligible to high as defined in Table 11.5 which takes into account both the impact of magnitude (Table 11.4) and the sensitivity (value) of those receptors as a result of potential impacts. The sensitivity (value) of the known marine heritage receptors potentially impacted by the decommissioning activities is detailed in Table 11.20.

SIGNIFICANCE OF EFFECT

11.14.6 As per mitigation outlined in Table 11.17 locations on the seabed of potential and confirmed marine heritage receptors are informed by the archaeological assessment of geophysical and geotechnical data and AEZs have been recommended as outlined in Volume 9, Report 19: Outline Marine Written Schemes of Investigation.

11.14.7 Mitigation by avoidance aims to ensure that there is no direct, indirect, or permanent impact on marine heritage receptors of the proposed VE development meaning a **negligible** magnitude of impact as defined in Table 11.4.

11.14.8 Where avoidance is not possible or in case of not yet located marine heritage receptors further mitigation and archaeological works will be a requirement under Volume 9, Report 19: Outline Marine Written Schemes of Investigation and associated documents, to ensure **negligible** magnitude of impact as defined in Table 11.4.

11.14.9 It is predicted that the sensitivity (value) of known heritage receptors impacted by decommissioning activities is **negligible** to **very high** (Table 11.20).

11.14.10 Considering the magnitude of impact and receptor sensitivity (value) within the significance of effect matrix on marine heritage receptors potentially effected by decommissioning activities, the magnitude of impact is assessed as **negligible** (**neutral**) and the sensitivity (value) of the receptor as **negligible** to **high**. The significance of effect has therefore been assessed as **minor** to **negligible** and the effect is consequently considered **not significant** in EIA terms.

OFFSHORE EXPORT CABLE CORRIDOR IMPACTS

MAGNITUDE OF IMPACT

11.14.11 The impacts of decommissioning activities on marine heritage receptors 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 11.4).

SENSITIVITY (VALUE) OF THE RECEPTOR

11.14.12 The sensitivity (value) of the marine heritage receptors identified within the marine archaeology study area is considered to be negligible to high as defined in Table 11.5 which takes into account both the impact of magnitude (Table 11.4) and the sensitivity (value) of those receptors as a result of potential impacts. The sensitivity (value) of the known marine heritage receptors potentially impacted by the decommissioning activities is detailed in Table 11.20.

SIGNIFICANCE OF EFFECT

11.14.13 As per mitigation outlined in Table 11.17 locations on the seabed of potential and confirmed marine heritage receptors are informed by the archaeological assessment of geophysical and geotechnical data and AEZs have been recommended as outlined in Volume 9, Report 19: Outline Marine Written Schemes of Investigation.

11.14.14 Mitigation by avoidance aims to ensure that there is no direct, indirect, or permanent impact on marine heritage receptors of the proposed VE development meaning a **negligible** magnitude of impact as defined in Table 11.4.

11.14.15 Where avoidance is not possible or in case of not yet located marine heritage receptors further mitigation and archaeological works will be a requirement under Volume 9, Report 19: Outline Marine Written Schemes of Investigation and associated documents, to ensure **negligible** magnitude of impact as defined in Table 11.4.

11.14.16 It is predicted that the sensitivity (value) of known heritage receptors impacted by decommissioning activities is **negligible** to **very high** (Table 11.20).

11.14.17 Considering the magnitude of impact and receptor sensitivity (value) within the significance of effect matrix on marine heritage receptors potentially effected by decommissioning activities, the magnitude of impact is assessed as **negligible** (**neutral**) and the sensitivity (value) of the receptor as **negligible** to **high**. The significance of effect has therefore been assessed as **minor** to **negligible** and the effect is consequently considered **not significant** in EIA terms.

OVERLAP BETWEEN ARRAY AREAS IMPACTS AND OFFSHORE ECC IMPACTS

11.14.18 Impacts will occur within the Array Areas and Offshore ECC and may bridge the two areas. The impacts will be localised with no significant additive spatial overlap.

IMPACT 14: INDIRECT IMPACTS CREATING DRAW-DOWN OF SEDIMENT INTO VOIDS LEFT BY REMOVED WTG FOUNDATIONS LEADING TO LOSS OF SEDIMENT OR DESTABILIZATION OF ARCHAEOLOGICAL SITES AND CONTEXTS INDIRECTLY LEADING TO EXPOSING MARINE HERITAGE RECEPTORS TO NATURAL, CHEMICAL, OR BIOLOGICAL PROCESSES AND CAUSING OR ACCELERATING LOSS OF THESE RECEPTORS

ARRAY AREAS IMPACTS

MAGNITUDE OF IMPACT

11.14.19 Magnitude of indirect impact on marine heritage receptors of sediment disturbance as a result of draw-down effects may lead to exposure of those marine heritage receptors 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** impact of magnitude as detailed in Table 11.4).

SENSITIVITY (VALUE) OF THE RECEPTOR

11.14.20 The sensitivity (value) of the marine heritage receptors identified within the marine archaeology study area is considered to be negligible to high as defined in Table 11.5 which takes into account both the impact of magnitude (Table 11.4) and the sensitivity (value) of those receptors as a result of potential impacts. The sensitivity (value) of the known marine heritage receptors potentially impacted by sediment disturbance as a result of draw-down effects is detailed in Table 11.20.

SIGNIFICANCE OF EFFECT

11.14.21 As per mitigation outlined in Table 11.17 locations on the seabed of potential and confirmed marine heritage receptors are informed by the archaeological assessment of geophysical and geotechnical data and AEZs have been recommended as outlined in Volume 9, Report 19: Outline Marine Written Schemes of Investigation.

11.14.22 Mitigation by avoidance aims to ensure that there is no direct, indirect, or permanent impact on marine heritage receptors of the proposed VE development meaning a **negligible** magnitude of impact as defined in Table 11.4.

11.14.23 Where avoidance is not possible or in case of not yet located marine heritage receptors further mitigation and archaeological works will be a requirement under Volume 9, Report 19: Outline Marine Written Schemes of Investigation and associated documents, to ensure **negligible** magnitude of impact as defined in Table 11.4.

11.14.24 It is predicted that the sensitivity (value) of known heritage receptors impacted by draw-down effects is **negligible** to **very high** (Table 11.20).

11.14.25 Considering the magnitude of impact and receptor sensitivity (value) within the significance of effect matrix on marine heritage receptors potentially effected by draw-down effects, the magnitude of impact is assessed as **negligible** (**neutral**) and the sensitivity (value) of the receptor as **negligible** to **high**. The significance of effect has therefore been assessed as **minor** to **negligible** and the effect is consequently considered **not significant** in EIA terms.

OVERLAP BETWEEN ARRAY AREAS IMPACTS AND OFFSHORE ECC IMPACTS

11.14.26 Impacts will occur within the Array Areas only. The impacts will be localised with no significant additive spatial overlap.

IMPACT 15: INDIRECT IMPACTS CAUSING CHANGES TO THE HISTORIC SEASCAPE CHARACTER AS A RESULT OF DECOMMISSIONING ACTIVITIES AND THE REMOVAL OF WIND FARM COMPONENTS INDIRECTLY LEADING TO CHANGES TO THE PERCEIVED HISTORIC USE OF THE SEASCAPE DURING THE DECOMMISSIONING PHASE

ARRAY AREAS IMPACTS AND OFFSHORE ECC IMPACTS

MAGNITUDE OF IMPACT

11.14.27 Magnitude of indirect impact on the HSC during the decommissioning phase has been assessed according to the criteria outlined in Table 11.4 and is taking into account the mitigations as outlined in Table 11.17.

11.14.28 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 the perception surrounding them.

11.14.29 The historic character of a seascape can be defined by its dynamic nature and ability to accommodate change. Perceptions of the seascape are also dynamic and subject to public awareness, time, and place. The intertidal and marine zones are ever changing due to physical processes such as currents, tidal range, and sediment mobility. Considering this dynamism and the multiple dimensions defined by HSC, people create complex spatial relationships within and across all marine levels, reflected within the sites of cultural activity and their material imprints.

11.14.30 The presence of decommissioning vessels is considered to be comparatively inconsequential considering the current marine activity within the marine archaeology study area. The inshore activities at landfall will be short term and small scale with temporary use of larger decommissioning vessels, as outlined in the assumed maximum impact table (Table 11.16).

11.14.31 The presence of cables on the sub-sea floor and sea floor is unlikely to enter the perception of the public, and therefore are unlikely to change the public perception of seascape. The removal of the foundations from the water column and sea surface will likely contribute to a change in people's perception of the HSC. This can be a positive, negative, or neutral change which is dependent on personal experience of the area and will continue to be a subjective perception over time.

11.14.32 The magnitude of impact on marine heritage receptors on HSC, specifically the presence of cables on the sub-sea floor and sea floor, removal of foundations from the water column and sea surface and turbines above the sea surface during the decommissioning phase is therefore assessed as a narrative using the Broad Historic Character Types, as summarised in Section 11.7.

11.14.33 It should be noted that changes to the visible elements of the shore and the sea surface have been assessed further in Volume 6, Part 2, Chapter 10: Seascape, Landscape and Visual Impact Assessment, and therefore this chapter only considers the historic aspects of Seascape Characterisation.

SENSITIVITY (VALUE) OF THE RECEPTOR

11.14.34 The sensitivity (value) of the Broad Historic Character Types identified within proposed development is assessed in terms of their ability to adapt to change, as outlined in Section 11.7.

11.14.35 The existing seascape of VE marine archaeology study area is known for its marine and intertidal historic character utilised mainly for Navigation, Industry, Fishing, Ports and Docks, Coastal Infrastructure, Military, Settlements and Recreation.

11.14.36 HSC relates to the historic dimension of the present-day seascape and considers the added effect of VE within the multiple dimensions of the marine environment (sub-sea floor, sea floor, water column, sea surface, coastal land and previous historic character) in combination with the existing activity within the Broad Historic Character Types, as detailed in Section 11.7.and Volume 6, Part 5, Annex 11.1: Offshore Archaeology and Cultural Heritage Technical Report and their capacity to accommodate change.

11.14.37 As there are existing active wind farms in the area surrounding the proposed development area, the impact to this character has already occurred, and the capacity of the seascape to accommodate change has been illustrated. The decommissioning of VE will contribute to, rather than alter the perception of the seascape.

SIGNIFICANCE OF EFFECT

11.14.38 The commitment to undertake further archaeological works throughout the life of the project will be a requirement under Volume 9, Report 19: Outline Marine Written Schemes of Investigation and associated documents (Table 11.17). This includes ensuring that HSC assessments where relevant are included throughout the life of the project.

11.14.39 It is therefore predicted that the ability to accommodate change is mainly a positive perceived change equalling a negligible magnitude. The significance of effect is therefore assessed as **negligible**, and the effect is consequently considered **not significant** in EIA terms.

11.15 ENVIRONMENTAL ASSESSMENT: CUMULATIVE EFFECTS

11.15.1 This cumulative impact assessment for Offshore Archaeology and Cultural Heritage has been undertaken in accordance with the methodology provided in Volume 6, Part 1, Annex 3.1: Cumulative Effects Assessment Methodology.

11.15.2 The allocation of ‘tiers’ is described in detail in Volume 6, Part 1, Annex 3.1: Cumulative Effects Assessment Methodology and outlined here in Table 11.21, and refers to the development stage of the projects assessed.

Table 11.21: Description of Tiers of other developments considered for cumulative effect assessment.

Tiers	Development Stage
Tier 1	Projects under construction.
	Permitted applications, whether under the Planning Act 2008 or other regimes, but not yet implemented.
	Submitted applications, whether under the Planning Act 2008 or other regimes, but not yet determined.
Tier 2	Projects on the Planning Inspectorate's Programme of Projects where a Scoping Report has been submitted.
	Projects under the Planning Act 2008 where a PEIR has been submitted for consultation.
Tier 3	Projects on the Planning Inspectorate's Programme of Projects where a Scoping Report has not been submitted.
	Identified in the relevant Development Plan (and emerging Development Plans with appropriate weight being given as they move closer to adoption) recognising that much information on any relevant proposals will be limited.
	Identified in other plans and programmes (as appropriate) which set the framework for future development consents/ approvals, where such development is reasonably likely to come forward.

11.15.3 For marine archaeology and cultural heritage, cumulative interactions may occur with other planned projects and developments in the study area.

11.15.4 The Zone of Influence (ZOI) for cumulative impacts is based on the distance away from VE which suspended sediment plumes may be advected (and meaningfully interact with potentially sensitive receptors) which has been defined by a spring tidal excursion ellipse buffer around the Array Areas and Offshore ECC, see Volume 6, Part 2, Chapter 2: Marine Geology, Oceanography and Physical Processes.

11.15.5 The projects and plans selected as relevant to the assessment of impacts to Offshore Archaeology and Cultural Heritage 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. For the purposes of assessing the impact of the VE on Offshore Archaeology and Cultural Heritage in the region, the cumulative effect assessment technical note submitted through the EIA Evidence Plan and forming Technical Annex 1.3.1 of this ES screened in a number of projects and plans as presented in Table 11.22.

Table 11.22: Projects considered within the Offshore Archaeology and Cultural Heritage cumulative effect assessment

Development type	Project	Status	Data confidence assessment/ phase	Tier
Aggregates Production Area	> Tarmac Marine Ltd (509/1) > Tarmac Marine Ltd (509/2) > CEMEX UK Marine Ltd (510/2) > Tarmac Marine Ltd (509/3) > CEMEX UK Marine Ltd (510/1) > Britannia Aggregates Ltd (508) > DEME Building Materials Ltd (524) > CEMEX UK Marine Ltd (507/1) > CEMEX UK Marine Ltd (507/3) > CEMEX UK Marine Ltd (507/4) > Britannia Aggregates Ltd (498) > Volker Dredging Ltd (498) > Westminster Gravels Ltd (501)	Operational	Medium - Third party project details published in the public domain and confirmed as being 'accurate'	Tier 1

Development type	Project	Status	Data confidence assessment/ phase	Tier
	> CEMEX UK Marine Ltd (507/2) > CEMEX UK Marine Ltd (507/6) > CEMEX UK Marine Ltd (507/5)			
Sea Disposal Sites	> Inner Gabbard (TH052) > Harwich Haven (TH027) > Horsey (TH230) > Inner Gabbard East (TH056) > EA One Route EC-2 (TH221) > EA One Route EC-1 (TH220) > Copperas (TH216) > Erwarton Track (TH217) > Orwell East Track (TH219) > Wrabness Beach East (TH229) > Orwell West Track (TH218) > Wrabness Beach (TH213) > Levington Site 3 (TH227) > River Orwell (ABP) (TH034)	Open	Medium - Third party project details published in the public domain and confirmed as being 'accurate'	Tier 1

Development type	Project	Status	Data confidence assessment/ phase	Tier
	> Levington Site 4 (TH228) > Levington Site 2 (TH226) > Levington Site 1 (TH225) > EA One Route EC-3 (TH222) > South Falls (TH070) > East Anglia One (TH023) > EA One Route EC-5 (TH224) > EAOW3 (HU212)			
Offshore Wind Farm Export Cable	> EA2 Transmission Asset	In planning	High - Third party project details published in the public domain and confirmed as being 'accurate' by The Crown Estate	Tier 1
	> East Anglia Three Transmission Asset > EA1N Transmission Asset	Consented		
Interconnector and Telecommunication Cables	> NueConnect Interconnector > Nautilius MPI > Mercator > Belgium Energio Nordsoon Denmark > Gridlink	Proposed	Medium - Third party project details published in the public domain but not confirmed as being 'accurate'	Tier 2

Development type	Project	Status	Data confidence assessment/ phase	Tier
Offshore Wind Farm	> East Anglia TWO	Consented	High - Third party project details published in the public domain and confirmed as being 'accurate' by The Crown Estate	Tier 1
	> North Falls	Pre-planning application	High - Third party project details published in the public domain and confirmed as being 'accurate' by The Crown Estate	Tier 2
World Ports Index (WPI)	> Harwich	Active	High - Third party project details published in the public domain and confirmed as being 'accurate' by The Crown Estate	Tier 1
Military, aviation, and radar: Live Firing, Demolition of UXO, Pilotless Target Aircraft and Unmanned Aircraft Systems (VLOS/ BVLOS) and	> X5121 - X5120 - X5119 N+S Galloper Kentish Knock > X5118 Gunfleet > D138b Shoeburyness > D138a Shoeburyness > D139 Fingringhoe X5117 Outer Gabbard	Active	High - Third party project details published in the public domain and confirmed as being 'accurate' by The Crown Estate	Tier 1

Development type	Project	Status	Data confidence assessment/ phase	Tier
Mine Counter Measures.				

Table 11.23: Cumulative MDS for Offshore Archaeology and Cultural Heritage

Impact	Scenario	Justification
Impact 16: Direct cumulative impact of sediment removal containing undisturbed archaeological contexts during seabed preparation ahead of construction activities leading to the total or partial loss of marine heritage receptors.	Tier 1: > Aggregates Production Areas > Sea Disposal Sites > Offshore Wind Farm Export Cables > Telecommunication Cables > Offshore Wind Farms > World Ports Index (WPI)s > Military, Aviation and Radar > Live Firing, Demolition of UXO and Unmanned Aircraft Systems (VLOS) > Live Firing, Demolition of UXO, Pilotless Target Aircraft and Unmanned Aircraft Systems (VLOS/ BVLOS) > Mine Counter Measures > Outfall pipes Tier 2: > Telecommunication Cables > NueConnect Interconnector > Nautilius MPI > Mercator	Intrusive seabed activities as well as vessel operations during all project phases of VE cumulatively with activities undertaken by the projects listed in Table 11.22 have the potential to contribute direct impacts on marine heritage receptors.

Impact	Scenario	Justification
	> Belgium Energio Nordsoon Denmark > Gridlink > Offshore Wind Farms > North Falls Tier 3: No Tier 3 projects are included in this assessment	
Impact 17: Indirect cumulative impact causing disturbance of sediment containing potential marine heritage receptors (material and contexts) leading to the exposure of those marine heritage receptors to natural, chemical, or biological processes and indirectly causing or accelerating their loss.	Tier 1: > Aggregates Production Areas > Sea Disposal Sites > Offshore Wind Farm Export Cables > Offshore Wind Farm Export Cables > Telecommunication Cables > Offshore Wind Farms > World Ports > Military, Aviation and Radar > Live Firing, Demolition of UXO and Unmanned Aircraft Systems (VLOS)	Seabed activities contributing to sediment movement or disturbance during all project phases of VE cumulatively with activities undertaken by the projects listed in Table 11.22 have the potential to contribute indirect impacts on marine heritage receptors. .

Impact	Scenario	Justification
	> Live Firing, Demolition of UXO, Pilotless Target Aircraft and Unmanned Aircraft Systems (VLOS/ BVLOS) > Mine Counter Measures Tier 2: > Telecommunication Cables > NueConnect Interconnector > Nautilius MPI > Mercator > Belgium Energio Nordsoon Denmark > Gridlink > Offshore Wind Farms > North Falls Tier 3: No Tier 3 projects are included in this assessment	
Impact 18: Indirect impact causing changes to the Historic Seascape Character as a result of cumulative	Tier 1: > Aggregates Production Areas > Sea Disposal Sites	Indirect impact on the Historic Seascape Character during all project phases of VE cumulatively with activities undertaken by the projects listed in Table 11.22 have the

Impact	Scenario	Justification
effects indirectly leading to changes to the perceived historic use of the seascape.	> Offshore Wind Farm Export Cables > Offshore Wind Farm Export Cables > Telecommunication Cables > Offshore Wind Farms > World Ports > Military, Aviation and Radar > Live Firing, Demolition of UXO and Unmanned Aircraft Systems (VLOS) > Live Firing, Demolition of UXO, Pilotless Target Aircraft and Unmanned Aircraft Systems (VLOS/ BVLOS) > Mine Counter Measures > Outfall pipes Tier 2: > Telecommunication Cables > NueConnect Interconnector > Nautilius MPI > Mercator > Belgium Energio Nordsoon Denmark > Gridlink	potential to change the historic character and the perception surrounding them.

Impact	Scenario	Justification
	> Offshore Wind Farms > North Falls Tier 3: No Tier 3 projects are included in this assessment	

AGGREGATES PRODUCTION AREAS AND SEA DISPOSAL SITES

11.15.6 Indirect impacts from cumulative sediment changes during all VE project phases and the presence of active aggregate production areas and sea disposal sites in the locality, as set out in Table 11.23 may result in loss or accumulation of sediment, thereby altering or destabilising archaeological sites and contexts, including paleoenvironmental material, and exposing such material to natural, chemical, or biological processes, causing or accelerating loss of the receptor.

11.15.7 Despite the intrusive nature of dredging operations and disposal activities on the sea floor, no direct cumulative impacts on marine heritage receptors within the VE ES Order Limits are expected as there is no spatial overlap with aggregate production areas and the VE ES Order Limits.

11.15.8 The cumulative effects during all VE project phases and the described active aggregate production areas and disposal sites are therefore predicted to be of local spatial extent, long term duration, continuous and limited reversibility.

11.15.9 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 (Crown Estate, 2017). The Guidance Note also ensures that known and unlocated marine heritage receptors are addressed at every stage of marine aggregate development and production.

OFFSHORE WIND FARMS

11.15.10 There are four proposed offshore windfarms within the ZOI, with an additional 10 operational at the time of writing and included in the baseline rather than cumulative assessment. The potential impacts on marine archaeological receptors during the construction phase of the 10 operational projects is considered to have been assessed by the individual projects, and no cumulative effect of sediment movement is expected between VE and the operational projects. Therefore, the operational offshore wind farms are not further considered in this cumulative assessment.

11.15.11 The four offshore windfarms outlined in Table 11.23 are in pre-application through to production stages. Offshore wind farms normally consist of sub-sea cables and permanent structures on the seabed. It is expected that all offshore wind farm construction phases, as well as the operation and maintenance phases, have the potential to cause seabed disturbance as cables and foundation structures require regular planned and unplanned maintenance.

11.15.12 Therefore, cumulative sediment changes during all VE project phases could result in the loss or accumulation of sediment. This disturbance could alter or destabilise archaeological sites and contexts, including paleoenvironmental material and expose such material to natural, chemical, or biological processes, causing or accelerating loss of these receptors.

11.15.13 Cumulative impacts may also occur indirectly through the cumulative lack of access to the historic environment and palaeoenvironmental evidence. The total coverage of the VE infrastructure (foundations and cables), as detailed in Table 11.16 will cover 403,116m^2 of the seabed which would impede direct access below the infrastructure for up to 30 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 (Volume 9, Report 19: Outline Marine Written Schemes of Investigation).

11.15.14 The parameters of total seabed coverage in cumulation with other offshore wind farms, especially the nearby North Falls, are not yet known. As stated below each windfarm has or will undertake a marine archaeology impact assessment that outlines and confirms maximum design parameters, potential impact on marine heritage receptors and specific mitigation strategies.

11.15.15 No direct cumulative impacts on marine heritage receptors within the VE proposed project boundary are expected; the offshore wind farms outlined in Table 11.23 are in relatively close proximity but do not have spatially overlapping boundaries.

11.15.16 Offshore wind farms are considered Nationally Significant Infrastructure Projects (NSIPs) and therefore require a development consent; as part of the application process each offshore windfarm has or will undertake a marine archaeology impact assessment that outlines and confirms mitigation strategies and ensures that marine heritage receptors have or will either be avoided or further investigated.

11.15.17 Potential cumulative impacts are, therefore, predicted to be of local spatial extent, long term duration, continuous and limited reversibility.

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

TELECOMMUNICATION CABLES AND OUTFALL PIPES

11.15.19 Direct or indirect impacts from penetration, compression, and disturbance or cumulative sediment changes during all VE project phases and the presence of sub-sea cables and pipelines as outlined in Table 11.23 may result in the loss or accumulation of sediment over time.

11.15.20 There are an additional 12 operational telecommunication cables and 41 operational outfall pipes within the ZOI. The potential impacts on marine archaeological receptors during the construction phase of the operational projects is considered to have been assessed by the individual projects, and no cumulative effect of sediment movement is expected between VE and the operational projects. Therefore, the operational telecommunication cables and outfall pipes are not further considered in this cumulative assessment.

11.15.21 Maintenance operations of sub-sea cables and pipelines, if undertaken, may alter or destabilise unknown marine heritage receptors, archaeological sites, and contexts, including paleoenvironmental information and exposing such material to natural, chemical, or biological processes, and causing or accelerating loss of these receptors.

11.15.22 No direct cumulative impacts on marine heritage receptors within the VE proposed project boundary are expected as no sub-sea cables or pipelines are located within the proposed project boundary.

11.15.23 There is currently limited detail on archaeological data and assessments within the impact assessments undertaken ahead of the sub-sea cables and pipelines detailed in Table 11.23 and therefore it is not possible to make a comprehensive assessment of the significance of effect. However, given that construction activities do not overlap and disturbance from operational and maintenance of VE is expected to be short term and localised to the offshore part of the proposed project boundary, it is not anticipated that any effects will result in a significant impact.

11.15.24 Potential cumulative effects during all VE project phases and the described presence of sub-sea cables and pipelines (Table 11.23) are therefore predicted to be of local spatial extent, long term duration, continuous and limited reversibility.

PORTS

11.15.25 There is one working port within the ZOI, the port of Harwich. Cumulative sediment changes during all VE project phases and activities within the port areas could result in the loss or accumulation of sediment. This disturbance could alter or destabilise archaeological sites and contexts, including paleoenvironmental material and expose such material to natural, chemical, or biological processes, causing or accelerating loss of these receptors.

11.15.26 No direct cumulative impacts on marine heritage receptors within the VE proposed project boundary are expected; the port of Harwich does not have spatially overlapping boundaries.

11.15.27 Ahead of activities within the port boundary an Impact Assessment must be undertaken. The Impact Assessment for Harwich Haven Authority in 2021 ahead of dredging activities included a marine archaeological assessment that concluded that *"with mitigation in place, the impacts are predicted to be of negligible to minor significance"* (Harwich Haven Authority website, accessed October 2022).

11.15.28 Potential cumulative impacts are, therefore, predicted to be of local spatial extent, long term duration, continuous and limited reversibility.

MILITARY, AVIATION AND RADAR

11.15.29 There are nine sites associated with military, aviation, and radar within the ZOI, as outlined in Table 11.23.

11.15.30 The activities include parachute dropping, bombing, live firing, air firing, demolition of UXO, high energy manoeuvres and unmanned aircraft systems.

11.15.31 While some of the military, aviation and radar activities have the potential to cause seabed disturbance, cumulative sediment changes during all VE project phases could result in the loss or accumulation of sediment. This disturbance could alter or destabilise archaeological sites and contexts, including paleoenvironmental material and expose such material to natural, chemical, or biological processes, causing or accelerating loss of these receptors.

11.15.32 No direct cumulative impacts on marine heritage receptors within the VE proposed project boundary are expected; the military, aviation and radar activity areas outlined in Table 11.23 are in relatively close proximity but do not have spatially overlapping boundaries.

11.15.33 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 however not apply to constructing, altering, and improving works or dredging and disposal of waste where, if impact on marine heritage receptors is expected, an impact assessment should outline mitigations measures.

11.15.34 Potential cumulative impacts of military, aviation and radar and VE are predicted to be of local spatial extent, long term duration, continuous and limited reversibility.

11.15.35 The magnitude of impact of cumulative effects as a result military, aviation and radar activities is therefore expected to be avoided or indistinguishable from natural variation, meaning negligible as defined in Table 11.4.

CUMULATIVE ASSESSMENT SUMMARY

11.15.36 The mitigation, as outlined in Table 11.17 aims to avoid and mitigate direct, indirect, and permanent impact on marine heritage receptors (known, unlocated and HSC) within the VE Order Limits and ensure that archaeological input is of paramount importance throughout the life of the VE project.

11.15.37 Considering the magnitude of the cumulative effects during all phases of VE and the outlined other developments (Table 11.22) as well as receptor sensitivity (value) within the significance of effect matrix on marine heritage receptors potentially affected by the cumulative effects, the magnitude of impact is assessed as **negligible** (**neutral**) and the sensitivity (value) of the receptor as **negligible** to **high**. The significance of effect has therefore been assessed as **minor** to **negligible** and the effect is consequently considered **not significant** in EIA terms.

11.16 CLIMATE CHANGE

11.16.1 The information provided in this section will be drawn upon and summarised in Volume 6, Part 4, Chapter 1: Climate change. As outlined in Volume 6, Part 4, Chapter 1: Climate Change, the operational phase of VE would enable the use of renewable electricity which would result in a positive greenhouse gas impact, resulting in a significant beneficial effect.

EFFECT OF CLIMATE CHANGE ON THE LOCAL ENVIRONMENT

11.16.2 The main changes contributed by climate change have been identified as: sea level changes leading to collapse or exposure; sea temperature and/ or pH changes leading to increased degradation through chemical and biological factors; and increased storm surges and wave energy creating greater sediment movement and leading to an increase rate of degradation of exposed receptors. These impacts are further detailed in Volume 6, Part 4, Chapter 1: Climate Change.

11.16.3 The effect of climate change within the marine archaeology study area, a 1 km buffer up to Mean High Water Springs around the VE proposed development area may be direct and indirect and of local extent.

- Increased sea level may contribute with effects to intertidal marine heritage receptors by submersion. Sea level rise may also contribute changes to the HSC coastal use of the area;
- Increase in storm surge and greater wave energy may contribute to direct impacts resulting in an increased rate of degradation of heritage receptors through physical factors;
- Increase in sea temperatures and/ or pH levels may contribute to an increased rate of degradation of exposed marine heritage receptors through chemical and biological factors.

EFFECT OF CLIMATE CHANGE AND THE PROJECT ON THE LOCAL ENVIRONMENT

11.16.4 There is potential that the cumulative impacts of climate change will contribute to the impacts of VE identified as affecting marine heritage receptors, including physical remains of wrecks and debris, historic seascape characteristics and palaeolandscapes. However, the project will not contribute to the impacts of climate change in the local area. Accordingly, climate change does not alter the basis or conclusions of the assessments made in relation to Offshore Archaeology and Cultural Heritage.

11.17 INTER-RELATIONSHIPS

11.17.1 The inter-relationships assessment considers likely significant effects from multiple impacts and activities from the construction, operation, and decommissioning of VE on the same receptor, or group of marine heritage receptors.

11.17.2 The greatest potential for direct spatial impact on marine heritage receptors is likely to occur during contact with the seabed during the construction and decommissioning phases. The individual impacts were assigned a significance of **negligible** due to the implementation of mitigations.

11.17.3 While there is potential for some disturbance within the operational phase, these activities will avoid known marine heritage receptors as per the mitigation (Table 11.17). It is therefore considered that impacts during the operation phase will not contribute to inter-relationships.

11.17.4 It is concluded that there will be no integration of effect between construction and decommissioning phases as they are undertaken during separate temporal phases and there will therefore be no inter-relationships of greater significance compared to the impacts considered alone.

11.18 TRANSBOUNDARY EFFECTS

11.18.1 Due to the localised nature of any potential impacts on known marine heritage receptors, transboundary impacts are unlikely to occur.

11.18.2 However, it should be noted that should wrecks or aircrafts of non-British nationality be impacted by VE further archaeological investigations may be warranted as outlined in the Volume 9, Report 19: Outline Marine Written Schemes of Investigation, and further discussions on protection of non-British marine heritage receptors should include the pertinent organisation(s) in the country of relevance.

11.18.3 There is also 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 VE and will be mitigated and offset by archaeological assessments of available geophysical and geotechnical data.

11.19 SUMMARY OF EFFECTS

11.19.1 Table 11.24 presents a summary of the assessment of significant effect on marine heritage receptors, any relevant mitigation, and residual effects.

Table 11.24: Summary of effects for Offshore Archaeology and Cultural Heritage

Description of Impact	Effect	Additional mitigation measures	Residual impact
Construction			
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 the marine heritage receptors.	Not applicable – no additional mitigation required	No significant adverse residual effects
2	Direct impact by penetration, compression, and disturbance of piling foundations leading to the total or partial loss of marine heritage receptors.	Not applicable – no additional mitigation required	No significant adverse residual effects
3	Direct impact by penetration, compression, and disturbance of stratigraphic contexts containing archaeological material from the combined weight of the Wind Turbine Generators (WTG) and associated foundations leading to total or partial loss of marine heritage receptors within the Array Areas.	Not applicable – no additional mitigation required	No significant adverse residual effects

Description of Impact	Effect	Additional mitigation measures	Residual impact
4	Direct impact by penetration, compression, and disturbance of cable laying operations leading to total or partial loss of marine heritage receptors within the Array Areas.	Not applicable – no additional mitigation required	No significant adverse residual effects
5	Direct impact by penetration, compression, and disturbance effects of jack-up barges and anchoring of construction vessels during construction activities leading to total or partial loss of marine heritage receptors.	Not applicable – no additional mitigation required	No significant adverse residual effects
6	Indirect impact causing disturbance of sediment containing potential marine heritage receptors (material and contexts) leading to the exposure of those marine heritage receptors areas to natural, chemical or biological processes and indirectly causing or accelerating their loss.	Not applicable – no additional mitigation required	No significant adverse residual effects
7	Indirect impacts causing changes to the Historic Seascape Character	Not applicable – no additional mitigation required	No significant adverse residual effects

Description of Impact	Effect	Additional mitigation measures	Residual impact
	as a result of construction and survey vessel activities and the addition of cables, foundations and turbines indirectly leading to changes to the perceived historic use of the seascape during construction activities.		
Operation			
8	Direct impact by penetration, compression and disturbance effects of maintenance activities at WTG substation foundations and along inter-array cables and export leading to total or partial loss of marine heritage receptors.	Not applicable – no additional mitigation required	No significant adverse residual effects
9	Indirect impacts causing disturbance of sediment containing potential marine heritage receptors during maintenance activities leading to the exposure of those marine heritage receptors to natural, chemical or biological processes and indirectly causing or	Not applicable – no additional mitigation required	No significant adverse residual effects

Description of Impact	Effect	Additional mitigation measures	Residual impact
	accelerating their loss.		
10	Direct impact by penetration, compression, and disturbance effects of jack-up barges and anchoring of operation and maintenance vessels during the operation and maintenance phase leading to total or partial loss of marine heritage receptors .	Not applicable – no additional mitigation required	No significant adverse residual effects
11	Indirect impacts causing scour effects as a result of the presence of WTG substation foundations and the exposure of inter-array cables and export cables or the use of cable protection measures leading to the exposure of those marine heritage receptors to natural, chemical, or biological processes and indirectly causing or accelerating their loss.	Not applicable – no additional mitigation required	No significant adverse residual effects
12	Indirect impacts causing changes to the Historic Seascape Character as a result of	Not applicable – no additional mitigation required	No significant adverse residual effects

Description of Impact	Effect	Additional mitigation measures	Residual impact
	operation and maintenance vessel activities and the presence of the completed wind farm indirectly leading to changes to the perceived historic use of the seascape during the operation phase.		
Decommissioning			
13	Direct impact by penetration, compression and disturbance effects of jack-up barges and anchoring of decommissioning vessels leading to total or partial loss of marine heritage receptors.	Not applicable – no additional mitigation required	No significant adverse residual effects
14	Indirect impacts creating draw-down of sediment into voids left by removed WTG foundations leading to loss of sediment or destabilisation of archaeological sites and contexts indirectly leading to exposing marine heritage receptors to natural, chemical, or biological processes and causing or accelerating loss of these receptors.	Not applicable – no additional mitigation required	No significant adverse residual effects

Description of Impact	Effect	Additional mitigation measures	Residual impact
15	Indirect impacts causing changes to the Historic Seascape Character as a result of decommissioning activities and the removal of wind farm components indirectly leading to changes to the perceived historic use of the seascape during the decommissioning phase.	Not applicable – no additional mitigation required	No significant adverse residual effects
Cumulative effects			
16	Direct cumulative impact of sediment removal containing undisturbed archaeological contexts or by penetration, compression, and disturbance leading to total or partial loss of marine heritage receptor.	Not applicable – no additional mitigation required	No significant adverse residual effects
17	Indirect cumulative impact causing disturbance of sediment containing potential marine heritage receptors (material and contexts) exposing the receptors to natural, chemical, or biological processes and causing or	Not applicable – no additional mitigation required	No significant adverse residual effects

Description of Impact	Effect	Additional mitigation measures	Residual impact
	accelerating loss of these receptors.		
18	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.	Not applicable – no additional mitigation required	No significant adverse residual effects

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