Morven South Offshore Wind Array Project

Environmental Impact Assessment Report

Volume 2, Chapter 14: Marine Archaeology

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Table of contents

List of tables

List of figures

14 Marine Archaeology

14.1 Introduction

14.1.1.1 This chapter of the Morven South Offshore Wind Array Project (hereafter "Morven South") Environmental Impact Assessment (EIA) Report (hereafter, the EIA Report) presents the assessment of the likely significant effects (LSE[1]) (as per the EIA Regulations) on marine archaeology. Specifically, this chapter considers the potential impacts of Morven South seaward of Mean High Water Springs (MHWS) during the construction, operations and maintenance (O&M) and decommissioning phases.

14.1.1.2 The assessment presented in this chapter has relied upon, or informed the following technical chapters and reports:

- Volume 2, Chapter 7: Physical Processes;
- Volume 3, Chapter 7.1: Physical Processes Shared Technical Report;
- Volume 3, Annex 14.1: Marine Archaeology Shared Technical Report;
- Volume 4, Chapter 6: Offshore Written Scheme of Investigation (WSI) and Protocol for Archaeological Discoveries (PAD).

14.1.1.3 Marine archaeology was reported on in the EIA Scoping Report for the Morven Option Lease Agreement Site (hereafter the "Morven Site Scoping Report") (MvOWL, 2023)). As described in Volume 1, Chapter 3: Site Selection and Consideration of Alternatives, the Morven Option Lease Agreement Site has since been divided into two smaller projects, Morven North and Morven South.

14.1.1.4 Potential impacts on marine archaeology were proposed to be scoped out in the Scoping Report for the Morven Site Scoping Report. However, the advice provided by the Marine Directorate Licensing Operations Team (MD-LOT) in the Morven Option Lease Agreement Site Scoping Opinion (hereafter "Morven Site Scoping Opinion") (MD-LOT, 2023) relevant to Morven South, stated that all relevant impacts on marine archaeology should be scoped in. This advice has been considered for the development of this chapter and consequently all relevant impacts on marine archaeology will be assessed in this EIA Report.

14.1.1.5 This chapter presents and assesses up-to-date parameters for Morven South and explains if and how any assessment aspects differ from the information set out in the Morven Site Scoping Report.

14.2 Study areas

14.2.1.1 A single study area has been defined for marine archaeology:

- The Morven South Marine Archaeology Study Area.

14.2.1.2 The study area defined for marine archaeology is shown in Figure 14.1 and is defined as follows:

- The Morven South Marine Archaeology Study Area includes the Morven South Boundary, plus a buffer extending 2km from the Morven South Boundary. This buffer has been defined to incorporate potential Zone of Influence (ZoI) from indirect effects, to provide marine archaeology context over a slightly wider area, and to capture marine archaeology receptors that may have been inaccurately or imprecisely geolocated.

14.2.1.3 The study area for marine archaeology for the Morven Option Lease Agreement Site (hereafter "Morven Site") was presented and agreed during the scoping process for the Morven Site. The underlying principles used to define the study area for Morven South have not changed, other than the limits have been applied relative to the Morven South Boundary, rather than the Morven Site boundary. The study area for Morven South for marine archaeology was presented to and confirmed by the Marine Directorate Licencing Operations Team (MD-LOT) via a "Targeted Consultation Exercise" undertaken in March 2025 and as detailed in Table 14.5.

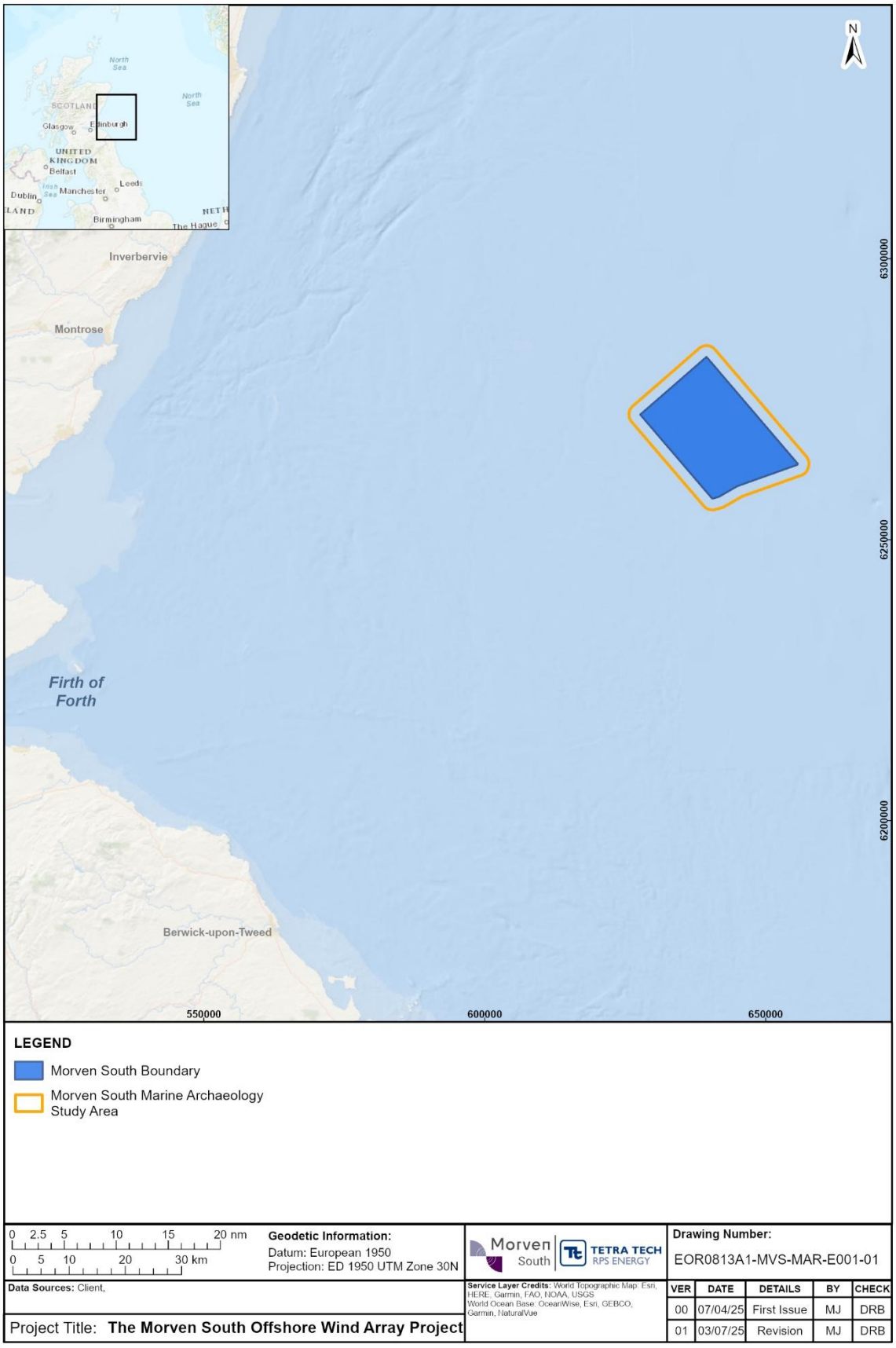

Figure 14.1: The Morven South Marine Archaeology Study Area

14.3 Legislative and policy context

14.3.1.1 Policy and legislation on renewable energy infrastructure is presented in Volume 1, Chapter 2: Policy and Legislation. Policy specific to marine archaeology is contained in the Sectoral Marine Plan for Offshore Wind Energy (SMP) (Scottish Government, 2020), the Scottish National Marine Plan (NMP) (Scottish Government, 2015) and the United Kingdom (UK) Marine Policy Statement (MPS) (UK Government, 2011). Legislation specific to marine archaeology is contained in the Protection of Military Remains Act 1986 and the Merchant Shipping Act 1995. A summary of the legislative provisions relevant to marine archaeology are provided in Table 14.1 below, with other relevant policy provisions set out in Table 14.2 to Table 14.4.

14.3.1.2 The provisions relevant to marine archaeology of the Protection of Wrecks Act 1973, the Ancient Monuments and Archaeological Areas Act 1979 and the Marine (Scotland) Act 2010 only apply within the limits of Scottish Territorial Waters, so are not applicable to Morvan South.

Table 14.1: Summary of provisions within various legislation of relevance to marine archaeology

Summary of relevant legislation	How and where considered in the EIA Report
Protection of Military Remains Act 1986 Under Protection of Military Remains Act 1986, all aircraft that have crashed in military service are automatically protected as a "protected place". Named vessels can also be designated even if the position of the wreck is not known. Maritime vessels lost during military service are not automatically protected, although the Secretary of State has powers to protect the wreck of any vessel or aircraft that was in military service when lost as a "controlled site".	The marine archaeology baseline, which includes all known maritime vessels and military aircraft in the Morven South Marine Archaeology Study Area is summarised in Section 14.2. No sites designated under Protection of Military Remains Act 1986 are present in the Morven South Marine Archaeology Study Area. Should material from an aircraft which crashed whilst in military service be present in the Morven South Marine Archaeology Study Area it will be automatically subject to legal protection under the Protection of Military Remains Act 1986. The mitigation measures to be adopted as part of the Morven South (Section 14.10) include the development of and adherence to an outline Written Scheme of Investigation (WSI) and Protocol for Archaeological Discoveries (PAD)(Volume 4, Chapter 6: Offshore WSI and PAD) which outlines the reporting procedure for archaeological discoveries including aircraft material.
Merchant Shipping Act 1995 This Act details the procedures for determining the ownership of maritime finds that turn out to be 'wreck'. 'Wreck' is defined as any flotsam, jetsam, derelict and lagan and includes all craft, parts of these, their cargo or equipment. Section 236 of the Merchant Shipping Act 1995 stipulates that all wreck within the UK's territorial waters (up to 12 nm) and any wreck landed in the UK from outside the UK's territorial waters must be declared to the Receiver of Wreck (RoW). If any wreck is recovered, the RoW must be notified, and the wreck material must be kept until the RoW determines ownership or requests that they be given to the RoW. All items which are raised from the seabed, regardless of age or importance, must	The mitigation measures adopted as part of Morven South (Section 14.10) include the development of and adherence to an outline WSI and PAD (Volume 4, Chapter 6: Offshore WSI and PAD). The outline WSI details the procedure for contacting and reporting to the RoW.

Summary of relevant legislation	How and where considered in the EIA Report
be reported to the RoW who will act to settle questions of ownership and salvage.	

Table 14.2: Summary of provisions within the Marine Policy Statement of relevance to marine archaeology

Summary of relevant policy	How and where considered in the EIA report
Ensure a sustainable marine environment which promotes healthy, functioning marine ecosystems and protects marine habitats, species and our heritage assets.	Heritage assets will be protected through the designed-in measures and mitigation adopted as part of Morven South including avoidance through the implementation of Archaeological Exclusion Zones (AEZs), archaeological analysis of any future geophysical surveys to be undertaken and the reporting of discoveries of heritage assets through the PAD will produce new archaeological data and understanding of our past (Section 14.10).

Table 14.3: Summary of provisions within the Sectoral Marine Plan of relevance to marine archaeology

Summary of relevant policy	How and where considered in the EIA report
SMP Section4.1 "The following types of potential negative impacts… will require further consideration (in addition to any specific potential impacts appropriate to the proposed development) at a project-level… Loss of/damage to historic environment features and their settings"	The loss of and damage to historic environment features have been assessed as part of the assessment of significant effects in Section 14.11 of this chapter. Effects on setting of onshore heritage assets were scoped out of the assessment in the Morven Site Scoping Report due to the distance and limited visibility of Morven South from the onshore heritage assets (MvOWL, 2023`, Section 9.7.6).

Table 14.4: Summary of provisions within the Scottish NMP of relevance to marine archaeology

Summary of relevant policy	How and where considered in the EIA report
NMP Policy GEN 6 "Development and use of the marine environment should protect and, where appropriate, enhance heritage assets in a manner proportionate to their significance."	The EIA Report has assessed the impacts on all known and potential heritage assets within the Morven South Marine Archaeology Study Area using their archaeological significance (Section 14.10). Designed-in measures and mitigation adopted as part of Morven South will ensure protection of heritage assets in a manner proportionate to their significance (Section 14.10).
NMP Section 4.23 "Marine planners and decision makers should consider implications and opportunities for the historic environment taking into account the potential impacts of development and use on: • Designated heritage assets – representing sites of national or international significance for which statutory requirements apply.	The marine archaeology baseline, which includes all known maritime vessels in the Morven South Marine Archaeology Study Area is presented in Section 14.7. Full details are given in Volume 3, Annex 14.1: Marine Archaeology Shared Technical Report. No designated sites are present in the Morven South Marine Archaeology Study Area.

Summary of relevant policy	How and where considered in the EIA report
Designated assets should be protected in situ within an appropriate setting. Substantial loss or harm to designated assets should be exceptional and should only be permitted if this is necessary to deliver social, economic or environmental benefits that outweigh the harm or loss • Undesignated heritage assets – those that meet designation criteria or make a positive contribution should also be protected in situ, wherever possible, and consideration given to the potential for new discoveries of historic or archaeological interest to arise."	Known undesignated heritage assets are protected in situ through the implementation of AEZs (Section 14.10). The potential for new discoveries to arise has been discussed in the marine archaeology baseline (Section 14.7). Mitigation for the reporting and protection of currently unknown archaeological receptors is included in Section 14.10.
NMP Section 4.24 Proposals for development that may "affect the historic environment should provide information on the significance of known heritage assets and the potential for new discoveries to arise. They should demonstrate how any adverse impacts will be avoided, or if not possible, minimised and mitigated. Where it is not possible to minimise or mitigate impacts, the benefits of proceeding with the proposal should be clearly set out"	The significance of all known heritage assets within the Marine Archaeology Study Area and the potential for as yet unknown archaeological material to be encountered is presented in Volume 3, Annex 14.1: Marine Archaeology Shared Technical Report and summarised in Section 14.7. Avoidance is the preferred approach to known heritage assets, as such, the Applicant will adopt AEZs around all anomalies identified through the geophysical survey to be of medium or high archaeological potential so that there is no potential for direct damage to these receptors (Section 14.10). The methods of minimising and mitigating unavoidable direct impacts are set out in Section 14.10.
NMP Section 4.25 "Where the case for substantial change to heritage asset is accepted, marine decision-making authorities should require applicants to undertake suitable mitigating actions to record and advance understanding of the significance of the heritage asset before it is lost, in a manner proportionate to that significance"	The measures adopted as part of Morven South including archaeological analysis of any future geophysical surveys to be undertaken and the reporting of discoveries of heritage assets through the PAD will produce new archaeological data and understanding of our past (Section 14.10). The methods of minimising and mitigating unavoidable direct impacts are set out in Section 14.11. Such measures will be done on a case-by-case basis, in consultation with MD-LOT, but could include, inter alia, recovery, relocation, excavation, conservation, stabilisation and/or recording of the receptor.

14.4 Consultation

14.4.1.1 The approach to consultation for Morven South is set out in Volume 1, Chapter 5: Consultation. A summary of the issues raised during consultation activities undertaken to date specific to marine archaeology is presented in Table 14.5, together with how these issues have been considered in the production of this Marine Archaeology EIA Report chapter. Further detail is presented within Volume 3, Annex 5.1: Consultation Annex.

Table 14.5: Summary of key consultation issues raised during consultation activities undertaken for Morven South of relevance to marine archaeology

Date	Consultee and type of consultation	Summary of issue(s) raised	Applicant's response to issue raised and, if applicable, where considered in this chapter
10 August 2023	Archaeology Service, Planning and Economy, Environment and Infrastructure Services, Aberdeenshire Council: Scoping Consultee Response	Agreement that impacts on marine archaeology can be scoped out of assessment. Agreement with the designed-in measures and mitigation for marine archaeology.	All impacts have been scoped into this EIA and are assessed in Section 14.11 as a result of the scoping opinion of MD-LOT dated 30 November 2023. Designed-in measures and mitigation are outlined in Section 14.10.
24 August 2023	Historic Environment Scotland (HES): Scoping Consultee Response	Marine archaeology should be scoped into further detailed assessment in the EIA process.	All impacts have been scoped into this EIA and are assessed in Section 14.11.
24 August 2023	HES: Scoping Consultee Response	Analysis of geophysical survey data is required to know what the full potential impacts of the proposed development in the Marine Archaeology Study Area might be and therefore also whether effects on marine archaeology might be significant.	The geophysical surveys have undergone detailed assessment by an appropriately experienced archaeologist. The methodology and results are presented in Volume 3, Annex 14.1: Marine Archaeology Shared Technical Report.
24 August 2023	HES: Scoping Consultee Response	Agreement that mitigation measures including WSI, PAD and AEZs may be appropriate once the baseline data for marine archaeology is fully known and the design of the proposed development is developed.	All impacts have been scoped into this EIA and are assessed in Section 14.11. The proposed mitigation measures are set out in Section 14.10. These are justified through a full analysis of the baseline environment in Volume 3, Annex 14.1: Marine Archaeology Shared Technical Report and the assessment of the impacts on marine archaeology receptors in Section 14.11. An outline offshore WSI and PAD has been produced and is

Date	Consultee and type of consultation	Summary of issue(s) raised	Applicant's response to issue raised and, if applicable, where considered in this chapter
			included in the application (Volume 4, Chapter 6: Offshore WSI and PAD)
24 August 2023	HES: Scoping Consultee Response	Cumulative effects on marine archaeology should also be assessed.	Cumulative impacts and inter-related effects have been included in the assessment and are considered in Section 14.13.
30 November 2023	MD-LOT: Scoping Opinion	Paragraph 5.12.1: Agreement with the study area for marine archaeology. Advised that further information and assessment is required to inform the baseline.	Further assessment was undertaken to inform the baseline, including archaeological analysis of site-specific geophysical surveys. This is contained in Volume 3, Annex 14.1: Marine Archaeology Shared Technical Report and summarised in Section 14.7.
30 November 2023	MD-LOT: Scoping Opinion	Paragraph 5.12.2: Potential impacts to marine archaeology should not be scoped out of assessment in the EIA Report.	All impacts have been scoped into this EIA and are assessed in Section 14.11.
30 November 2023	MD-LOT: Scoping Opinion	Paragraph 5.12.3: Further evidence is required to support the justification for the suitability of proposed measures to mitigate potential effects on the marine archaeological receptors from the proposed development.	The proposed mitigation measures are set out in Section 14.10. These are justified through a full analysis of the baseline environment in Volume 3, Annex 14.1: Marine Archaeology Shared Technical Report and an assessment of the impacts on marine archaeology receptors in Section 14.11.
30 November 2023	MD-LOT: Scoping Opinion	Paragraph 5.12.4: Advised that cumulative effects must be scoped into the EIA Report.	Cumulative impacts and inter-related effects have been included in the assessment and are considered in Section 14.13.
21 July 2025	MD-LOT: response to the Morven Arrays targeted consultation letter issued by MvOWL on 13 March 2025.	MD-LOT is content with the Morven North Marine Archaeology Study Area.	The Morven North Marine Archaeology Study Area is described in Section 14.2.
21 July 2025	MD-LOT: response to the Morven Arrays proposed approach to mitigation and post-consent plans	MD-LOT is content with MvOWL's proposed approach to mitigation and post-consent plans.	An outline offshore WSI and PAD has been produced and is included in the application (Volume 4, Chapter 6: Offshore WSI and PAD).
28 August 2025	HES: response to targeted consultation letter issued by	HES no longer provide advice on undesignated underwater cultural heritage unless HES	Targeted consultation letter sent on to MD-LOT on 28 August 2025. No response received at

Date	Consultee and type of consultation	Summary of issue(s) raised	Applicant's response to issue raised and, if applicable, where considered in this chapter
	MvOWL on 25 August 2025 regarding scoping out the O&M and decommissioning phases from assessment for the direct damage to deeply buried marine archaeology receptors impact	are written into existing conditions and MD-LOT request their advice. HES would therefore need to receive the request for advice from MD-LOT.	time of submission. This does not alter the outcome of the assessment presented in Section 14.11.

14.5 Scope of the assessment

14.5.1 Impacts scoped into the assessment

14.5.1.1 The scope of this EIA Report has been developed in consultation with relevant statutory and non-statutory consultees as detailed in Table 14.5. The scope of the assessment includes direct and indirect effects on marine archaeology receptors. Taking into account the scoping and consultation process, Table 14.6 summarises the potential impacts which have been scoped into this assessment. Where an impact is likely to occur within a specific development phase of the project, this is indicated within each relevant topic chapter (a '✓' is used to denote the phase the potential impact can occur, conversely a 'X' outlines there is no impact within this project phase), where relevant.

Table 14.6: Potential impacts scoped into the marine archaeology assessment

C= Construction, O= Operations and Maintenance, D= Decommissioning phases

"✓" is used to denote the phase the potential impact can occur, a "X" outlines there is no impact within this project phase

Potential impact	Phase			Activity
	C	O	D	
Increased suspended sediment concentrations (SSC) and sediment deposition leading to indirect impacts on marine archaeology receptors	✓	✓	✓	Site preparation including sandwave clearance
				Foundation installation
				Cable installation
				Maintenance operations (e.g. cable repair/reburial, use of jack-up vessels to facilitate wind turbine component repairs etc.)
				Decommissioning activities (e.g. foundation removal)
Alteration of sediment transport regimes leading to indirect impacts on	×	✓	×	The presence of foundation structures, associated scour

Potential impact	Phase			Activity
	C	O	D	
marine archaeology receptors				protection and cable protection
Direct damage to marine archaeology receptors	✓	✓	✓	Site preparation including sandwave clearance and Unexploded Ordinance (UXO) clearance
				Cable installation and cable protection
				Wind turbine and Offshore substation platform (OSP) foundation installation and scour protection
				Ancillary activities such as placement of spud-can legs from jack-up operations.
				Decommissioning activities
Direct damage to deeply buried marine archaeology receptors	✓	×	×	Wind turbine and OSP installation activities, particularly piling.

14.5.2 Impacts scoped out of the assessment

14.5.2.1 Taking into account the scoping and consultation process, no impacts have been scoped out. However, some impacts have not been assessed in certain phases of the project, as there is no pathway for impact. A summary of the impacts not assessed, together with justification for not assessing them and whether the approach has been agreed with key stakeholders through either scoping or consultation, is presented in Table 14.7.

Table 14.7: Impacts scoped out of the assessment for marine archaeology

C= Construction, O= Operations and Maintenance, D= Decommissioning phases

"✓" is used to denote the phase the potential impact can occur, a "X" outlines there is no impact within this project phase

Potential impact	Phase			Justification
	C	O	D	
Alteration of sediment transport regimes	×	✓	×	The presence of infrastructure (e.g. wind turbines and OSPs) provides the largest obstruction to flow in the water column. For this reason, construction and decommissioning activities are not assessed for this impact as there are no, or fewer, obstructions during these phases. This has not been agreed with key stakeholders via either scoping or additional consultation specifically for marine archaeology, however this approach has been agreed with stakeholders for the physical processes assessment (Volume 2, Chapter 7: Physical Processes).

Potential impact	Phase			Justification
	C	O	D	
Direct damage to deeply buried marine archaeology receptors	✓	×	×	The impact-receptor pathway is through construction activities, such as piling, that penetrate the shallower marine sediments to those which represent potentially submerged palaeolandscapes. There are no activities during the O&M and decommissioning phases that will do this. For this reason, this impact is assessed for the construction phase but not assessed for the O&M and decommissioning phases. This has yet to be agreed with key stakeholders via either scoping or additional consultation.

14.6 Approach to baseline characterisation

14.6.1.1 The marine archaeology baseline environment has been characterised through site specific geophysical and geotechnical data analysis and a literature review of key desktop datasets and reports. The key datasets are listed in Table 14.8 and Table 14.9. A full list is presented within Volume 3, Annex 14.1: Marine Archaeology Shared Technical Report.

14.6.2 Relevant guidance

14.6.2.1 There are a number of guidance documents that are relevant to marine archaeology in the context of offshore renewable development which have been considered in the production of this Marine Archaeology EIA Report. These include:

- Code of Practice for Seabed Development (JNAPC, 2006);
- Historic Environment Guidance for the Offshore Renewable Energy Sector (Wessex Archaeology, 2007);
- Conservation Principles, Policies and Guidance ((English Heritage, 2008) now Historic England);
- Offshore Geotechnical Investigation and Historic Environment Analysis: Guidance for the Renewable Energy Sector (Gribble, 2011);
- Ships and Boats: Prehistory to Present – Designation Selection Guide (Historic England, 2012)
- Protocol for Archaeological Discoveries: Offshore Renewables Projects (The Crown Estate, 2014);
- Code of Conduct (CIfA, 2014);
- Standard and Guidance for Historic Environment Desk-Based Assessment (CIfA, 2014) ;
- Environmental Impact Assessment Handbook (Scottish Natural Heritage and Historic Environment Scotland, 2018);
- Designation Policy and Selection Guidance (Historic Environment Scotland, 2019a);
- Standard and Guidance for Commissioning Work or Providing Consultancy Advice on Archaeology and the Historic Environment (CIfA, 2020);
- Archaeological Written Schemes of Investigation for Offshore Wind Farm Projects (The Crown Estate, 2021);
- Principles of Cultural Heritage Impact Assessment (IEMA, 2021).

14.6.3 Desktop study

14.6.3.1 Information on marine archaeology within the Morven South Marine Archaeology Study Area was collected through a detailed desktop review of existing studies and datasets. These are summarised in Table 14.8 below.

Table 14.8: Summary of key desktop reports used to characterise the marine archaeology baseline

Title	Source	Year	Author
GeoIndex (Offshore)	British Geological Society (BGS)	2023	BGS
National Record of the Historic Environment (NRHE) records (Canmore)	Canmore	2023	HES
Submerged Landscapes Data	European Marine Observation and Data Network (EMODnet) Geology	2023	BGS

Title	Source	Year	Author
United Kingdom Hydrographic Office (UKHO) Wreck and Obstructions Data	Admiralty Marine Data Portal	2023	UKHO
Protected places and Controlled sites and Historic Marine Protected Areas datasets	Marine Scotland	2023, 2018	Marine Scotland and HES

14.6.4 Identification of designated sites

14.6.4.1 No designated sites relevant to marine archaeology have been identified within the datasets for the Morven South Marine Archaeology Study Area.

14.6.5 Site specific surveys

14.6.5.1 A summary of the surveys undertaken to inform the marine archaeology assessment of effects is outlined in Table 14.9 and further detail of the survey methodologies and results are included within Volume 3, Annex 14.1: Marine Archaeology Shared Technical Report. The site specific surveys were conducted on the Morven Site and therefore encapsulated all of the Morven South Boundary.

Table 14.9: Summary of site-specific surveys

Title	Extent of survey	Overview of survey	Survey contractor	Date	Reference to further information
Offshore geophysical survey	Morven Site	Multibeam Echo Sounder (MBES), Sidescan Sonar (SSS), transverse gradiometer (TVG) magnetometer, parametric Sub-bottom Profiler (SBP) and two dimensional Ultra High Resolution Seismic (2D UHRS).	Gardline	11 April 2022 to 14 August 2022	Volume 3, Annex 14.1: Marine Archaeology Shared Technical Report
Offshore geotechnical survey	Morven Site	Geotechnical site investigations; shallow seafloor cone penetration tests (CPTs) followed by 23 deep boreholes from 13 locations within the Morven	Fugro Marine Limited	CPTs 2022, Boreholes 2024.	Volume 3, Annex 14.1: Marine Archaeology Shared Technical Report

Title	Extent of survey	Overview of survey	Survey contractor	Date	Reference to further information
		Option Agreement Area.			

14.7 Baseline environment

14.7.1 Overview of baseline environment

Submerged Prehistory

14.7.1.1 The potential for submerged prehistoric archaeology to be present within the Morven South Marine Archaeology Study Area, which includes receptors such as chance finds, deposits containing archaeological material, or submerged landscapes, was characterised through the analysis of site specific geophysical and geotechnical data and a desk-based review (Volume 3, Annex 14.1: Marine Archaeology Shared Technical Report).

14.7.1.2 There are no known submerged prehistoric archaeology receptors in the Morven South Marine Archaeology Study Area.

14.7.1.3 The potential for the survival of submerged prehistoric archaeology within the Morven South Marine Archaeology Study Area is very low. Pleistocene deposits which are predominantly either glacial or marine have been identified in the geophysical and geotechnical survey data. The stages of marine transgression indicate that the Morven North Marine Archaeology Study Area has remained submerged from shortly after the last glacial maximum (LGM). This indicates that the environment was likely inhospitable for humans during the Palaeolithic and Mesolithic periods.

14.7.1.4 Geoarchaeological analysis of 23 boreholes from 13 locations across the Morven Site has taken place, with Stage 1 geoarchaeological assessment undertaken on all cores. Stage 2 analysis has also been done on five of the cores. These analyses found shallow marine to marine depositional environments in the relevant deposits, with some associated proglacial environments (Volume 3, Annex 14.1: Marine Archaeology Shared Technical Report). There is therefore no potential for the survival of prehistoric archaeological material within the Morven South Marine Archaeology Study Area, and only the likelihood for deposits of low geoarchaeological potential.

Known Maritime Archaeology and Aviation Receptors

14.7.1.5 There are no known aviation archaeology receptors, and one known maritime record from the UKHO dataset in the Morven South Marine Archaeology Study Area (Volume 3, Annex 14.1: Marine Archaeology Shared Technical Report).

14.7.1.6 This single record is of the *Ailsa*, a steamship previously named *Twilight* which was captured by a German submarine in 1915 and scuttled. The actual location of the scuttling of *Ailsa* is uncertain, but there is a potential for wreck remains or debris in the vicinity of the recorded position. The record for *Ailsa* is more than 100m outside the Morven South Boundary and therefore was not observed by the site specific geophysical survey.

14.7.1.7 A geophysical anomaly is classified as having high archaeological potential if it is almost certainly of anthropogenic origin and likely to be of archaeological significance (Volume 3, Annex 14.1: Marine Archaeology Shared Technical Report). These tend to be the remains of wrecks, the suspected remains of wrecks, or known structures. No high potential anomalies were identified in the geophysical survey data in the Morven South Marine Archaeology Study Area.

14.7.1.8 A geophysical anomaly is classified as having medium archaeological potential if it is believed to be of anthropogenic origin but would require further investigation to establish its archaeological significance (Volume 3, Annex 14.1: Marine Archaeology Shared Technical Report). Examples may include larger unidentifiable debris or clusters of debris, unidentifiable structures, or significant magnetic anomalies. Four medium potential anomalies were identified in the Morven South Marine Archaeology Study Area (Figure 14.2).

14.7.1.9 A geophysical anomaly is classified as having low archaeological potential if it is potentially of anthropogenic origin but is unlikely to be of archaeological significance (Volume 3, Annex 14.1: Marine Archaeology Shared Technical Report). Examples may include discarded modern debris such as rope, cable, chain, or fishing gear; small, isolated anomalies with no wider context; or small boulder-like features with associated magnetometer readings. There are 59 low potential anomalies present in the Morven South Marine Archaeology Study Area (Figure 14.3). Three are within the Morven South Marine Archaeology Study Area and also within the Morven North Boundary, these are assessed in the Morven North Offshore Wind Array Project EIA Report. With the current data these are thought to be unlikely to be of archaeological significance, however there is the potential that some of these anomalies represent receptors with archaeological significance.

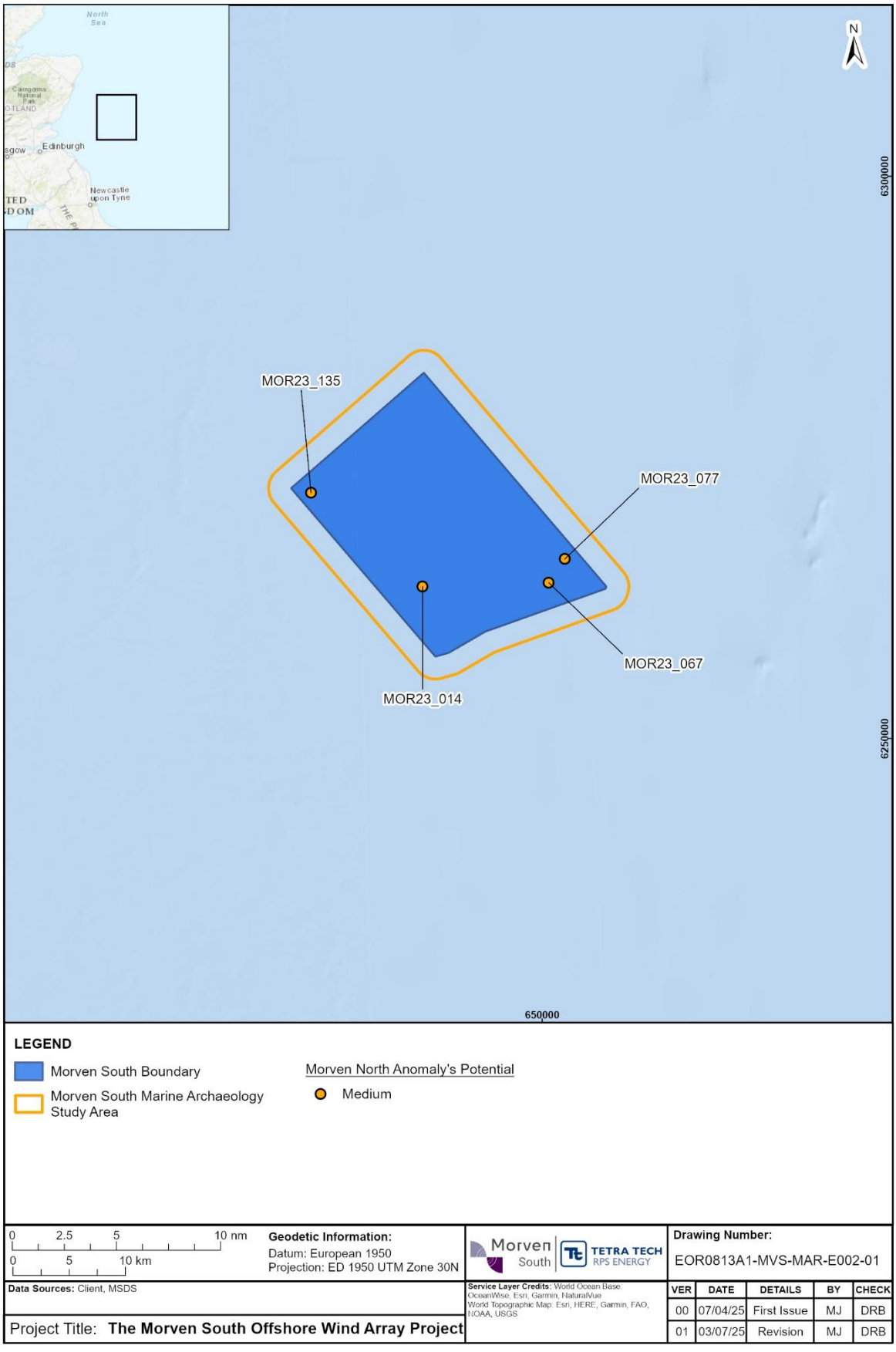

Figure 14.2: Distribution of medium potential marine archaeology receptors

Figure 14.3: Distribution of low potential marine archaeology receptors

Maritime Archaeology and Aviation Potential

14.7.1.10 There is the potential for currently unknown maritime archaeology receptors from all periods to be present in the Marine Archaeology Study Area (Volume 3, Annex 14.1: Marine Archaeology Shared Technical Report). There is also the potential for previously unknown aviation wreck sites to be present in the Marine Archaeology Study Area.

14.7.2 Future baseline scenario

14.7.2.1 The EIA Regulations require the following to be included within the EIA Report: "a description of the relevant aspects of the current state of the environment (baseline scenario) and an outline of the likely evolution thereof without development as far as natural changes from the baseline scenario can be assessed with reasonable effort, on the basis of the availability of environmental information and scientific knowledge."

14.7.2.2 In the event that Morven South does not come forward, an assessment of the future baseline conditions has been carried out and is described within this section.

14.7.2.3 The baseline environment of the Marine Archaeology Study Area as described in Section 14.7.1 above should be considered as a snapshot of gradually changing marine archaeology receptors within a gradually changing environment. All marine archaeology receptors will be subject to natural processes, physical, chemical and biological, and so will deteriorate over time. The greatest change will typically be seen in upstanding metal wrecks, which will corrode and collapse over time. In addition, sediment mobility will likely continue, and this natural process will potentially expose marine archaeology receptors, allowing their deterioration to accelerate. It is also possible that sediment mobility will bury or rebury marine archaeology receptors, resulting in a deceleration of their deterioration. The effects of climate change on the marine environment may also cause impacts on marine archaeology receptors in the mid to long term (DECC, 2016).

14.7.2.4 The current baseline as described in Section 14.7.1 will change, albeit very slowly. It is unlikely that significant change will occur to marine archaeology within the Marine Archaeology Study Area over the next few decades (over the lifespan of Morven South).

14.7.3 Data limitations and assumptions

14.7.3.1 The records held by the UKHO, HES and other sources used in this assessment are not a record of all surviving archaeological assets, but a record of discovery of a diverse range of archaeological and historical components of the marine environment. The datasets used are incomplete records of the totality of potential marine archaeology present on the seabed and do not preclude the subsequent discovery of further elements of the historic environment that are, at present, unknown.

14.7.3.2 The interpretation of geophysical and hydrographic data is, by its very nature, subjective. However, with experience and by analysing the form, size, and characteristics of an anomaly, a reasonable degree of certainty as to the origin of an anomaly can be achieved. Measurements can be taken in most data processing software; whilst this is reasonably accurate, some discrepancies may occur. Where there is uncertainty of an anomaly's potential or origin, a precautionary approach is taken to ensure the most appropriate mitigation for the historic environment is recommended. There may be instances where a receptor may exist on the seabed but is not visible in the geophysical data. This may be due to the anomaly being buried or out of the sonar's line-of-sight. The desktop sources and the site specific data examined represent a comprehensive and robust sequence of datasets and observations that allow for a detailed assessment of archaeological constraints, however, there remains the possibility that as yet unknown marine archaeology receptors are present within the Morven South Marine Archaeology Study Area.

14.8 Methodology for assessment of effects

14.8.1 Overview

14.8.1.1 The marine archaeology assessment of effects has followed the methodology set out in Volume 1, Chapter 4: EIA Methodology. Specific to the marine archaeology assessment of effects, the following guidance documents have also been considered:

- Designation Policy and Selection Guidance (Historic Environment Scotland, 2019a);
- Historic Environment Policy for Scotland(Historic Environment Scotland, 2019b);
- Principles of Cultural Heritage Impact Assessment (IEMA, 2021).

14.8.2 Assessment criteria

14.8.2.1 The approach for determining the significance of effects is a two-stage process that involves defining the magnitude of the potential impacts and the sensitivity of the receptors. This section describes the criteria applied in this chapter to assign values to the magnitude of potential impacts and the sensitivity of the receptors. The terms used to define magnitude and sensitivity are based on those which are described in further detail in Volume 1, Chapter 6: EIA Methodology.

14.8.2.2 The criteria for defining magnitude in this chapter are outlined in Table 14.10 below.

Table 14.10: Definition of terms relating to the magnitude

Magnitude of impact	Definition
High	Loss of resource and/or quality and integrity of resource; severe damage to key characteristics, features or elements; loss of cultural significance (Adverse).
	Large scale or major improvement or resource quality; extensive restoration or enhancement; major improvement of attribute quality; enhancement of cultural significance; a considerable enhancement to the archaeological or historical interest and knowledge of the asset (Beneficial)
Medium	Loss of resource, but not adversely affecting integrity of resource; partial loss of/damage to key characteristics, features or elements; partial loss of cultural significance (Adverse)
	Benefit to, or addition of, key characteristics, features or elements; improvement of attribute quality; enhancement to the archaeological or historical interest and knowledge of the asset (Beneficial)
Low	Some measurable change in attributes, quality or vulnerability, minor loss or, alteration to, one (maybe more) key characteristics, features or elements; slight loss of cultural significance (Adverse)
	Minor benefit to, or addition of, one (maybe more) key characteristics, features or elements; some beneficial impact on attribute or a reduced risk of negative impact occurring; slight enhancement to the archaeological or historical interest and knowledge of the asset (Beneficial)
Negligible	Very minor loss or detrimental alteration to one or more characteristics, features or elements; cultural significance not materially affected (Adverse)
	Very minor benefit to, or positive addition of one or more characteristics, features or elements; cultural significance not materially affected (Beneficial)

14.8.2.3 The capability of a receptor to accommodate change and its ability to recover, if affected, is a function of its sensitivity. Receptor sensitivity is typically assessed by its:

- adaptability: the degree to which a receptor can avoid or adapt to an effect;
- tolerance: the ability of a receptor to accommodate temporary or permanent change without significant adverse impact;
- recoverability: the temporal scale over and extent to which a receptor will recover following an effect;
- value: a measure of the receptor's importance, rarity and worth (Highways England, 2019).

14.8.2.4 For indirect impacts such as smothering, burial or exposure, marine archaeology receptors can typically tolerate some temporary change without significant adverse impact.

14.8.2.5 However, marine archaeology receptors cannot typically adapt, tolerate, or recover from impacts resulting in damage or loss to the receptors themselves, or their context and relationship with their wider environment. As a result, the sensitivity of a marine archaeology receptor to direct damage can only be determined through its value.

14.8.2.6 Based on current policy and guidance, the cultural significance (i.e. value) of a historic asset means the aesthetic, historic, scientific or social value for past, present or future generations (Historic Environment Scotland, 2019b). Cultural significance can be embodied in a place itself, its fabric, setting, use, associations, meanings, records, related places and related objects.

14.8.2.7 Criteria of value for assessing if marine historic assets are of cultural significance for designation purposes in Scotland are:

- **Intrinsic characteristics**: how the physical remains of a marine historic asset contributes to our understanding of the past;
- **Contextual characteristics**: how a marine historic asset relates to its surroundings and/or to our existing knowledge of the past;
- **Associative characteristics**: how a marine historic asset relates to people, events and/or historic and social movements (Historic Environment Scotland, 2019a).

14.8.2.8 The understanding of the value of a receptor can be revised as more information becomes available (e.g. though further investigation). Both designated and undesignated receptors can hold value, as can both known and unknown receptors.

14.8.2.9 The criteria for defining sensitivity in this chapter are outlined in Table 14.11 below.

Table 14.11: Definition of terms relating to the sensitivity of the receptor

Value (sensitivity of the receptor)	Description
Very High	Very high cultural significance, importance and rarity. "International" significance. Wrecked ships and aircraft that are protected under relevant legislation, as well as as-yet undesignated sites that are demonstrably of equivalent value. Known submerged prehistoric sites and landscapes with a confirmed presence of largely in situ artefactual material or palaeogeographic features with demonstrable potential to include artefactual and/or palaeoenvironmental material, possibly as part of a prehistoric site or landscape.

Value (sensitivity of the receptor)	Description
	For indirect effects, this may include receptors with a very high level of vulnerability.
High	High cultural significance, importance and rarity, "National" significance. This category includes sites designated by the laws as above, as well as as-yet undesignated sites that do not have statutory protection or equivalent significance but have a high potential archaeological interest based on an assessment of their importance in terms of relevant designation criteria (Historic Environment Scotland, 2019a). Prehistoric deposits with high potential to contribute to an understanding of the palaeoenvironment. For indirect effects, this may include receptors with a high level of vulnerability.
Medium	High or medium cultural significance, importance and rarity. 'Regional' significance. Includes wrecks of ships and aircraft that do not have statutory protection or equivalent significance but have moderate archaeological interest. Also includes isolated finds of wreck material. Prehistoric deposits with moderate potential to contribute to an understanding of the palaeoenvironment. For indirect effects, this may include receptors with a medium level of vulnerability.
Low	Low or medium cultural significance, importance and rarity. "Local" significance. Includes wrecks of ships and aircraft that do not have statutory protection or equivalent significance and have a low archaeological interest. Also includes isolated finds of wreck material with little context or potential. Prehistoric deposits with low potential to contribute to an understanding of the palaeoenvironment. For indirect effects, this may include receptors with a low level of vulnerability.
Negligible	Very low cultural significance, importance and rarity. Assets with little or no surviving archaeological interest. For indirect effects, this may include receptors with a very low level of vulnerability.

14.8.2.10 The significance of the effect upon marine archaeology is determined by correlating the magnitude of the impact and the sensitivity of the receptor. The particular method employed for this assessment is presented in Table 14.12.

14.8.2.11 In cases where a range is suggested for the significance of effect, there remains the possibility that this may span the significance threshold (i.e. the range is given as minor to moderate). In such cases the final significance is based upon the expert's professional judgement as to which outcome delineates the most likely effect, with an explanation as to why this is the case.

14.8.2.12 For the purposes of this assessment:

- a level of effect of moderate or more will be considered a "significant" effect in terms of the EIA Regulations;
- a level of effect of minor or less will be considered "not significant" in terms of the EIA Regulations.

14.8.2.13 Effects of moderate significance or above are therefore considered important in the decision-making process, whilst effects of minor significance or less warrant little, if any, weight in the decision-making process.

Table 14.12: Matrix used for the assessment of the significance of the effect

Sensitivity of receptor	Magnitude of impact			
	Negligible	Low	Medium	High
Negligible	Negligible	Negligible to minor	Negligible to minor	Minor
Low	Negligible to minor	Negligible to minor	Minor	Minor to moderate
Medium	Negligible to minor	Minor	Moderate	Moderate to major
High	Minor	Minor to moderate	Moderate to major	Major
Very high	Minor	Moderate to major	Major	Major

14.9 Parameters for assessment

14.9.1 Maximum Design Scenario

14.9.1.1 The Maximum Design Scenarios (MDSs) identified in Table 14.13 have been selected as those having the potential to result in the greatest effect on an identified receptor or receptor group. These scenarios have been selected from the details provided in Volume 1, Chapter 4: Project Description. Effects of greater adverse significance are not predicted to arise should any other development scenario, based on details within the Project Design Envelope (PDE) (e.g. different infrastructure layout), to that assessed here, be taken forward in the final design scheme.

14.9.1.2 The assessment of indirect effects within this chapter is informed by assessments undertaken for Volume 2, Chapter 7: Physical Processes.

Table 14.13: Maximum Design Scenario considered for the assessment of potential impacts on marine archaeology

C= construction, O= O&M, D= decommissioning phases

"✓" is used to denote the phase the potential impact can occur, "X" outlines there is no impact within this project phase

Potential impact	Phase			Maximum Design Scenario	Justification
	C	O	D		
Increased SSC and sediment deposition leading to indirect impacts on marine archaeology receptors	✓	✓	✓	**Construction phase** Site Preparation Foundations: • Sandwave clearance activities undertaken over an approximate 15 month duration within the wider five year construction programme. • Wind turbines and OSP foundations: sandwave clearance has been calculated based on the assumption of clearance at up to 80% of locations. Spoil volume per location has been calculated on the basis of 58 locations supporting the three-legged suction bucket wind turbine foundations and five locations supporting Gravity Base OSP foundations. This equates to a total sandwave clearance area for Morven South of 3,753,226m^2 or 11,259,679m^3 based on sandwaves 3m in height. The single greatest sandwave clearance area may occur due to the bridge linked Gravity Base (HVDC) foundations, with a clearance area up to 597,800m^2 or volume of up to 1,793,400m^3. Site Preparation Cabling: • Inter-array cables: sandwave clearance along 63.6km of cable length, with a base	Sediment disturbance arising from construction, maintenance and decommissioning activities may result in indirect impacts on marine archaeology receptors due to temporary increases in SSCs and associated sediment deposition (i.e. smothering effects). MDS is taken from the equivalent physical processes pathway. **Construction phase** Site preparation Foundations and Cabling: • The volume of material to be cleared from individual sandwaves will vary according to the local dimensions of the sandwave (height, length, and shape) and the level to which the sandwave must be reduced. These details are not fully known at this stage, however based on the available data, it is anticipated that the sandwaves requiring clearance in the Morven South Boundary are likely to be circa 3m in height. • The MDS for sandwave clearance to allow the installation of wind turbines and OSPs and their associated scour protection has been selected in line with standard practice and based on the greatest potential volume of suspended sediments at an individual location, rather than over the OWF. Maximum concentrations of suspended sediments within the water column at a particular location during a tidal cycle are considered critical with regards to the maximum potential deposition on the sea bed. Note that although sediment plumes from a sandwave clearance operation at an individual foundation may extend and interact with sediment plumes resulting from similar works at an adjacent wind turbine location, if these

Potential impact	Phase			Maximum Design Scenario	Justification
	C	O	D		
				width of 20m, to an average depth of 3m. Total spoil volume of 8,400,000m^3. • Interconnector cables: sandwave clearance along 72.6km of cable length, with a base width of 20m, to an average depth of 3m. Total spoil volume of 5,280,000m^3. • Total Cabling spoil volume of 9,849,600m^3, which assumes that 15% of total length of inter-array and interconnector cables will require sandwave clearance. • Removal of up to 5km of disused cables. Foundation installation • Undertaken over an approximate 21 month duration • Wind turbines: installation of up to 34 monopiles of 16 m diameter, drilled to a depth of 64m at a rate of up to 1.5m/h. Three monopiles installed concurrently. Spoil volume of 14,358m^3 per pile • OSPs: installation of four Type 1 AC OSP with foundations consisting of 16m diameter monopiles, drilled to a depth of 64m at a rate of up to 1.5m/h. Two monopiles installed concurrently. Spoil volume of 14,357m^3 per pile. • OSPs: installation of 24 Type 2 HVDC OSP with six-legged jacket foundations, each with a pile diameter of 5m, drilled to a	operations are undertaken simultaneously, sediment plumes will align with the tidal currents, with concentration rapidly diminishing with increasing distance from the works. Thus, selection of the MDS is based upon maximum concentrations and the maximum potential sea bed deposition at any one location. For all scenarios considered, this will be the Gravity base HVDC OSP, thus MDS selection has also focused on the maximum potential concentrations at individual wind turbine foundations. On consideration of the total area over the site as a whole, the selected MDS covers in excess of 80% of the alternative option with the greatest site coverage. • Similarly, the MDS for sandwave clearance to allow for the installation of cables and associated cable protection has been selected in line with standard practice, based on the greatest potential volume of suspended sediments at an individual location. However, as sandwave clearance width, proportion of cables requiring clearance and sandwave heights remain the same for all scenarios considered under the PDE, the selected MDS is also capable of producing the largest sandwave clearance areas and volumes over the site as a whole. • Site clearance activities may be undertaken using a range of techniques, the suction hopper dredger will result in the greatest increase in suspended sediment and largest plume extent as material is released near the water surface during the disposal of material. • Boulder clearance activities will result in minimal increases in SSC and have therefore not been considered in the assessment. Foundation installation:

Potential impact	Phase			Maximum Design Scenario	Justification
	C	O	D		
				depth of 80m at a rate of up to 1.4m/h. Three piles installed concurrently. Spoil volume of 1,888m^3 per pile. Cable installation • Inter-array cables: Installation via trenching of up to 420km of cable, with a trench width of up to 3 m and a depth of up to 3m. Total spoil volume of 1,260,000m^3 assuming triangular cross-section of the trench. Installed over a period of one year. • Interconnector cables: installation via trenching of up to 264km of cable, with a trench width of up to 3m and a depth of up to 3m. Total spoil volume of 792,000m^3 assuming triangular cross section of the trench. Installed over a period of one year. **Operational and maintenance phase** Project lifetime of 35-years • Inter-array cables: repair of up 10km of cable in two events every five years. Reburial of up to 17km of cable in a maximum of one event every year. • Interconnector cables: repair of up to 2km of cable in each of 10 events every 25 years. Reburial of up to 19km of cable in a maximum of one event every year.	• Installation of foundations via augured (drilled) operations results in the release of the largest volume of sediment. The greatest volume of sediment disturbance by drilling at individual foundation locations and across the site as a whole is associated with monopiles for wind turbines. The selected OSP scenario represents the greatest volume of sediment to be released for a drilling event. • The greatest drilling rate represents the maximum level of increase in suspended sediment concentration. Maximum drilling rates are similar for all scenarios. Cable installation: • Cable routes inevitably include a variety of seabed material and in some areas 3m depth may not be achieved or may be of a coarser nature which settles in the vicinity of the cable route. The assessment therefore considers the upper bound in terms of suspended sediment and dispersion potential • Cables may be buried by ploughing, trenching or jetting with trenching or jetting mobilising the greatest volume of material to increase SSC. **Operation and maintenance phase** • The greatest foreseeable number of cable reburial and repair events is considered to the MDS for sediment dispersion. **Decommissioning phase** • The removal of cables may be undertaken using similar techniques to those employed during installation,

Potential impact	Phase			Maximum Design Scenario	Justification
	C	O	D		
				Decommissioning phase • Inter-array and interconnector cables will be removed where it is possible and appropriate to do so. The MDS will assess the removal of all cables.	therefore the potential increases in SSC and deposition would be in-line with the construction phase. • Scour and cable protection are anticipated to remain in-situ.
Alteration of sediment transport regimes leading to indirect impacts on marine archaeology receptors	×	✓	×	**Operation and maintenance phase** Foundations • Wind turbines: 95 installations with monopile foundations, each with a 15m diameter with scour protection to a height of 2.5m. Total footprint of 3,578m^2 per wind turbine. • OSPs: four HVAC collector substations with circular footprint gravity base foundations, each with a diameter of 17m at the surface and 67m at the bed, with a caisson diameter of 51m and with scour protection to a height of 4.0m. Total footprint of 40,471m^2 per OSP. • OSPs: one bridge linked HVDC converter substations, composed of a single bridge linked OSP with two topsides and associated foundations, with rectangular footprint gravity base foundations, with dimensions of 180m x 240m at the surface and 195m x 255m at the bed and with scour protection to a height of 4.0m. Total footprint of 74,725m^2 per OSP. Cabling • Inter-array cables: cable protection along 42km of the cable, with a height of up to	The presence of foundation structures, associated scour protection and cable protection may introduce localised changes to the tidal flow and wave climate, resulting in potential changes to the sediment transport pathways and associated effects on marine archaeology receptors. MDS is taken from the equivalent physical processes impact to sediment transport pathway. **Operation and maintenance phase** Physical processes are comprised of tides, waves and sediment transport and these aspects are integrated (i.e. without the influence of tides and waves there would be no sediment transport) as outlined below: • The tidal regime is influenced by changes in bathymetry due to the placement of scour protection and the obstruction of tidal flow due to foundation structures within the water column • The wave climate is influenced by obstruction within the water column however changes in bathymetry would only cause effects in shallow water • The sediment transport regime is affected by obstructions in the sediment transport pathways and also potential changes to the littoral currents which drive this process (i.e. those factors which also affect tide and wave climate)

Potential impact	Phase			Maximum Design Scenario	Justification
	C	O	D		
				3m and up to 10m width. Up to five cable crossings, each crossing has a height of up to 4m, a width of up to 36m and a length of up to 80m. • Interconnector cables: cable protection along 26.4km of the cable, with a height of up to 3m and up to 10m width. Up to five cable crossings, each crossing has a height of up to 4m, a width of up to 36m and a length of up to 80m. • The inclusion of five cable crossings within the MDS is a conservative assumption, as it is unlikely there will be any crossings in reality.	A holistic approach has therefore been applied to assessing the MDS. With regard to the wind turbines, the greatest surface blockage to influence wave climate is generally from the monopile foundations, which also provide the largest obstruction to tidal flows over the Morven South Boundary. Three-legged suction bucket foundations have the largest footprint at each wind turbine and over the site as a whole in terms of scour protection and provide the greatest influence on bathymetry. Monopiles have been selected as the MDS due to the magnitude of the water column obstruction over the site as a whole, compounded with the largest surface obstruction over the Morven South Boundary. When considering the OSPs, the greatest in-water column blockage to influence tidal flow and wave climate from the AC and HVDC OSPs are the gravity base foundations, which also present the largest footprints to affect changes in bathymetry and sediment transport pathways. The gravity base foundations also result in the greatest-surface blockage which will predominantly affect wave climate and overall have been selected as the MDS for both AC and HVDC OSPs.
Direct damage to marine archaeology receptors	✓	✓	✓	**Construction Phase** Up to 22,323,672m^2 of seabed impact in total across the Morven South. • A footprint area of 4,423,300m^2 due to sand wave clearance for wind turbine and OSP foundations and scour protection; • Up to 221,572m^2 due to installation of wind turbine and OSP foundations and scour protection in the residual area not impacted by sandwave clearance comprising:	**Construction Phase** There is the potential for direct damage to marine archaeology receptors during the construction phase as a result of site preparation activities in advance of installation activities (including UXO detonation, pre-cabling seabed clearance and anchor placements), cable installation activities and cable protection activities, wind turbine and OSP installation activities and scour protection, and ancillary activities such as placement of spud-can legs from jack-up operations. The MDS is the maximum area of impact on the seabed of the development. Where impacts overlap, the smaller impact is captured within the larger impact (e.g. boulder clearance and cable

Potential impact	Phase			Maximum Design Scenario	Justification
	C	O	D		
				– installation of 95 wind turbines with suction bucket 3-legged jacket foundations; – installation of four AC Collector Substations and one HVDC Converter substation with gravity bases. • A footprint area of 11,628,000m^2 due to disturbance caused by the installation of inter-array and interconnector cables in area not impacted by sandwave clearance; – Width of seabed disturbance from cable installation tool 20m. • A footprint area of 3,283,200m^2 due to sand wave clearance for cables; • Up to 28,800m^2 for installation of up to 10 cable crossings; • Jack-up events: up to 1,900,800m^2 of disturbance from the use of jack-up vessels during foundation installation, with up to three jack-up events at each foundation. • Up to 684,000m^2 of disturbance from anchor placement during cable installation; • Up to 100,000m^2 of disturbance from removal of up to 5km of disused cables; • In addition, up to 54,000m^2 of seabed disturbance could occur due to crater formation from the clearance of up to 15 UXO.	protection installation are all within the footprint of cable installation and sandwave clearance). Impacts include: • Sandwave clearance and dredging area for OWF for foundations (encompassing 80% of area impacted by Foundations of wind turbines and OSPs and Scour protection for wind turbines and OSPs) assuming Suction Bucket 3-legged Jacket (Option 1) for wind turbines and Gravity Bases for OSPs • 20% of Foundations of wind turbines and OSPs and Scour protection for wind turbines and OSPs not covered by sandwave clearance • Cable sandwave clearance and dredging (encompassing 15% of Inter array and interconnector cable installation impacts). • 85% of Inter array and interconnector cable installation not covered by sandwave clearance • Cable crossings • Jack up operations • Anchor disturbance • Disused cable removal • UXO clearance **Operation and Maintenance Phase** There is the potential for direct damage to marine archaeology receptors during the operations and maintenance phase as a result of operations (e.g. use of jack-up vessels to facilitate wind turbine component repairs etc). The impacts associated with these operations are likely to be similar in nature to those associated with the construction phase although of reduced area, and in locations that may have already been subject to construction phase impacts.

Potential impact	Phase			Maximum Design Scenario	Justification
	C	O	D		
				Operation and Maintenance Phase Up to 592,000m^2 of seabed impact in total across Morven South. • O&M phase up to 35 years; • a footprint area of 260,800m^2 due to jack up vessel usage for wind turbine maintenance activities; • a footprint area of 331,200m^2 due to jack up vessel usage for OSP maintenance activities. **Decommissioning Phase** • Impacts are only expected in areas that have already been impacted during the construction and O&M phases.	The MDS is the maximum area of impact on the seabed of the development. Where impacts overlap, the smaller impact is captured within the larger impact. Impacts include: • Jack up events for wind turbine and OSP maintenance. Cable maintenance has been excluded from the MDS as this occurs entirely within the footprint of cable installation. **Decommissioning Phase** There is potential for direct damage to marine archaeology receptors due to decommissioning activities. The impacts associated with these operations are likely to be similar in nature to those associated with the construction phase although of reduced area, and in locations that have already been subject to construction phase impacts.
Direct damage to deeply buried marine archaeology receptors	✓	×	×	**Construction Phase** Wind turbine foundations: • Up to 58 wind turbines with piled 3-legged jacket foundations requiring 174 piles of 5.3m diameter with up to 100% drilled to a depth of 83m. OSP foundation installation: • Four AC Collector Substation OSPs with 6-legged piled jacket foundations requiring 96 piles of 4.5m diameter with up to 100% drilled to a depth of 65m.	**Construction Phase** There is the potential for direct damage to deeply buried marine archaeology receptors, particularly seabed prehistory receptors, during the construction phase as a result of wind turbine and OSP installation activities, particularly piling. The MDS is the maximum pile penetration depth of the project.

Potential impact	Phase			Maximum Design Scenario	Justification
	C	O	D		
				• One HVDC Converter Substation OSP with 6-legged piled jacket foundation requiring 24 piles of 5m diameter with up to 100% drilled to a depth of 80m.	

14.10 Designed-in measures and mitigation

14.10.1.1 As part of the project design process, a number of measures (primary and tertiary) have been adopted to reduce the potential for impacts on marine archaeology (see Table 14.14). For the purposes of the EIA process, the term "designed-in measure" is used to include the following measures (adapted from (adapted from \IEMA, 2016 ;and \IEMA, 2024):

- Measures included as part of the design of Morven South. These include modifications to the location or design of Morven South, which are integrated into the application for consent. These measures are considered standard industry practice for this type of development and are referred to as primary mitigation in IEMA, 2016 and IEMA, 2024.
- Measures required to meet legislative requirements, or actions that are generally standard practice used to manage commonly occurring environmental effects. These measures are secured through the conditions of the marine licences and referred to as tertiary mitigation in IEMA, 2016 and IEMA, 2024.

14.10.1.2 As there is a commitment to implementing these measures, they are considered inherently part of the design of Morven South and have therefore been considered in the assessment presented in Section 14.11 (i.e. the determination of magnitude and therefore significance assumes implementation of these measures).

14.10.1.3 The requirement for any additional mitigation measures is dependent on the significance of the effects on marine archaeology. Where significant effects have been identified, further mitigation measures (referred to as secondary mitigation in IEMA, 2016 and IEMA, 2024) have been identified to reduce the significance of effect to acceptable levels following the initial assessment. These are measures that could further prevent, reduce and, where possible, offset any adverse effects on the environment. These measures are set out, where relevant, in Section 14.11.

14.10.1.4 All designed-in measures and mitigation are detailed in Volume 3, Annex 6.4: Morven South EIA Commitments Register.

Table 14.14: Designed-in (primary and tertiary) measures adopted as part of Morven South

Reference number	Designed-in measures adopted as part of Morven South	Justification	Primary or tertiary
MM-25	Implementation of Archaeological Exclusion Zones (AEZs) and Temporary Exclusion Zones (TEZs) around receptors identified as having high and medium archaeological potential.	To reduce potential for direct impact of the Morven South project on archaeological sites. AEZs and TEZs will ensure offshore infrastructure and activities avoid any known wrecks and other marine archaeology receptors, including those discovered during development activities. The size of the AEZ or TEXs will be evidence based and established using the precautionary principle to ensure that it is of sufficient size to protect the site from the nature of impact (Wessex Archaeology, 2007; Wessex Archaeology for The Crown Estate, 2021). Monitoring of AEZs will be carried out to confirm that no impact has occurred to the archaeological receptors within AEZs as a result of Morven South.	Tertiary

Reference number	Designed-in measures adopted as part of Morven South	Justification	Primary or tertiary
MM-26	Archaeological input into specifications for, and archaeological analysis of, any future pre-construction geophysical surveys, preconstruction remotely operated vehicle or diver surveys.	To reduce impacts to marine archaeology and to identify any sites of archaeological importance that may require further investigation, avoidance and engagement with MD-LOT. Should further archaeological anomalies be found that have high or medium archaeological potential then AEZs or TEZs may be implemented.	Tertiary
MM-27	Operational awareness of the location of those archaeological anomalies identified as having a low potential and designing or micrositing to avoid them if possible.	To reduce impacts to potential marine archaeology receptors through avoidance.	Primary
MM-30	Mitigation of unavoidable direct impacts on marine archaeological receptors will be applied on a case-by-case basis, in consultation with MD-LOT, but could include, inter alia, recovery, relocation, excavation, conservation, stabilisation and/or recording of the receptor.	To ensure impacts are reduced through beneficial impacts.	Tertiary
MM-31	Development, agreement and implementation of an archaeological Offshore Written Scheme of Investigation and Protocol for Archaeological Discoveries.	To ensure all development activities avoid significant impacts on marine archaeology receptors, and to ensure reporting and further mitigation is applied to discoveries on marine archaeology receptors. Commitment to preparation and implementation of a WSI & PAD prior to any licensable activities within Morven South, and to update the WSI as appropriate throughout the lifetime of the development. The WSI will contain the agreed procedures for mitigation (Wessex Archaeology for The Crown Estate, 2021). A 'Retained Archaeologist' will be appointed to implement the WSI. The PAD will provide the mechanism for the reporting of unexpected finds of potential archaeological interest.	Tertiary

14.11 Assessment of Likely Significant Effects

14.11.1.1 The potential impacts arising from the construction, O&M and decommissioning phases of Morven South are listed in Table 14.13, along with the MDS against which each impact has been assessed.

14.11.1.2 An assessment of the likely significance of the effects of Morven South on marine archaeology receptors caused by each identified impact is given below.

14.11.2 Increased suspended sediment concentrations and sediment deposition leading to indirect impacts on marine archaeology receptors

14.11.2.1 The seabed activities associated with the construction, O&M and decommissioning phases of Morven South may lead to sediment disturbance and deposition leading to indirect impacts on marine archaeology receptors. The MDS includes site preparation activities such as sand wave clearance, foundation installation and cable installation in the construction phase, cable repair and reburial in the O&M phase and decommissioning activities, such as cable and foundation removal. These activities are presented in Table 14.13.

14.11.2.2 The disturbance of sediment/seabed deposits can result in the exposure or further exposure of known marine archaeology receptors (e.g. wreck sites and geophysical anomalies) and the exposure of as yet unknown marine archaeology receptors. Such activities can also result in the burial or smothering of known and unknown receptors.

All phases

Magnitude of impact

14.11.2.3 The installation of Morven South infrastructure may lead to increased SSC and associated deposition (Volume 3, Chapter 7.1: Physical Processes Shared Technical Report).

14.11.2.4 The project design includes the provision of site preparation/sandwave clearance activities which have the potential to increase SSC in the construction phase with associated deposition. Seabed preparation activities may be undertaken using a range of techniques, but the suction hopper dredger will result in the greatest increase in suspended sediment and largest plume extent as material is released near the water surface during the disposal of material. In practice plough dredging may be undertaken however this type of operation would have less impact in terms of both SSC and sedimentation footprint.

14.11.2.5 The MDS for SSC has been selected based on the greatest potential volume of suspended sediments at an individual sandwave clearance location, rather than the total sandwave clearance to be undertaken within the Morven South Boundary. The SSC from foundation sandwave clearance is greater than cable sandwave clearance and so is set out here. The SSC vary greatly during the course of the dredge and disposal campaign of foundation sandwave clearance. During the dredging phase when only 3% of the material is released the plume is very small with concentrations less than <210mg/l within the Morven South Boundary. During the disposal phase the plume is larger with concentrations reaching 17,200mg/l at the release site within the Morven South Boundary. The most extensive increases are seen as the deposited material is redistributed on the successive tides, where sedimentation occurs on the slack tide reducing the SSC completely and resuspension and transport occurs when the tidal currents increase. Under these circumstance large areas with concentrations in the order of 500mg/l are seen within the Morven South Boundary. The average SSC during the course of the dredge and disposal campaign has values of <1mg/l with a plume width of circa 26km within the Morven South Boundary. The deposited material is focussed within circa 200m of the site of release with a maximum depth 0.5m to 2.0m whilst the finer sediment fractions are distributed in the vicinity at much smaller depths circa 5mm to 50mm. The dispersion of the released material would continue on successive tides and be incorporated into the baseline sediment transport regime.

14.11.2.6 For foundation installation the largest potential release would be from augured (drilled) piles relating to the wind turbine monopile foundations, where the material would be jetted and released to the water column as a plume. The average suspended sediment shows concentrations <0.2mg/l at the discharge locations within the Morven South Boundary. Due to the fine sandy nature of the material, it is clear that the sediment will be dispersed. It will be transported mid-tide, settle on slack water and be re-suspended and further dispersed on the resumption of tidal flow. Sediment levels after the cessation of construction would not be discernible from the background sediments due to the limited magnitude of deposition and the similar nature of the material.

14.11.2.7 The SSC from cable installation shows the average suspended sediment concentration over the course of the trenching phase with peak values up to 0.1mg/l. The average sedimentation is greatest at the location of the trenching and is up to 0.004mm in depth within the Morven South Boundary

14.11.2.8 The MDS for the operations and maintenance phase is represented by repair and reburial of cables. For the purposes of this assessment, the impacts of operations and maintenance activities are predicted to be no greater than those for construction.

14.11.2.9 The MDS for the decommissioning phase is represented by the removal of cables in which increases in SSC would by similar to those experienced during the construction phase, as retrieval would be undertaken using similar techniques to installation. In the case of piled foundations, there is no significant disturbance of the seabed during decommissioning as piles are cut off just below the seabed surface and the foundation will be removed in a single lift. Decommissioning of gravity bases would involve the removal of ballast, including sand sequestered during construction. This material, which may include rock, will be disposed of off-site and therefore a small proportion of sediment may be released during the removal/dredging operations. Decommissioning of the foundations is assumed to result in increases in suspended sediments and associated deposition that are no greater than those predicted for the construction phase. For the purposes of this assessment, the impacts of decommissioning activities are therefore predicted to be no greater than those for construction.

14.11.2.10 In all cases, the material released was native to the bed sediments and, although there are short periods of increased turbidity, the material is expected to be subsequently assimilated into the existing sediment transport regime.

14.11.2.11 The greatest SSC impacts are therefore from foundation sandwave clearance and focussed within circa 200m of the site of release with a maximum depth 0.5m to 2.0m. However, the dispersion of the released material would continue on successive tides and be incorporated into the baseline sediment transport regime, making the impact temporary and of limited duration.

14.11.2.12 For upstanding wrecks, overburden of 0.5m to 2m has the potential to compress and collapse the fabric of the wreck, leading to an adverse impact. For all other receptors, in general, burial will provide some level of protection from biological, chemical and physical erosion to the receptor and could be classified as beneficial.

14.11.2.13 The magnitude of impact is predicted to be of regional spatial extent, short term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore considered to be low.

Sensitivity of the receptor

14.11.2.14 Whilst marine archaeology receptors cannot typically adapt, tolerate, or recover from impacts resulting in damage or loss to the receptors themselves, they can tolerate some indirect impacts such as burial or exposure without significant adverse impact, particularly if these impacts are temporary and short term, and if they are subject to periodic burial/exposure through the normal physical processes of their environment. Marine archaeology receptors can typically tolerate some smothering caused by SSC.

14.11.2.15 However, marine archaeology receptors still cannot recover from any changes in their fabric or context caused by these indirect impacts, for instance collapse of their fabric through smothering effects. Upstanding wrecks, usually classified as high potential, are most susceptible to these impacts, however there are none within the Morven South Boundary (Section 14.7.1). However, these indirect impacts may affect any unknown marine archaeology receptor and so the MDS is that the value of the receptor is very high.

14.11.2.16 Marine archaeological receptors are deemed to be of medium vulnerability, medium recoverability and very high value. The sensitivity of the receptor is therefore, considered to be high.

Significance of the effect

14.11.2.17 Overall, for marine archaeology receptors the magnitude of the impact is deemed to be low and the sensitivity of the receptor is considered to be high. The effect will, therefore, be of **minor to moderate adverse** or **beneficial** significance, which is not significant in EIA terms.

14.11.2.18 Expert professional judgement has been used to treat the significance as minor rather than moderate which is not significant in EIA terms. This is due to the majority of receptors receiving a beneficial effect, with only high potential receptors susceptible to adverse effect. Due to the application of AEZs, which will limit the magnitude of impact on high potential receptors, the significance of effect is considered **minor adverse**.

Secondary mitigation and residual effect

14.11.2.19 No mitigation measures for marine archaeology are considered necessary because the likely effect in the absence of further mitigation (beyond the designed-in measures outlined in Table 14.14), is not significant in EIA terms.

14.11.3 Alteration of sediment transport regimes leading to indirect impacts on marine archaeology receptors

14.11.3.1 The presence of infrastructure on the seabed during the O&M phase has the potential to alter sediment transport regimes. As a result, changes in sediment may indirectly impact marine archaeology receptors present in the Marine Archaeology Study Area through burial or exposure. The MDS for the relevant activities are presented in Table 14.13.

14.11.3.2 The alteration of sediment transport regimes can result in the exposure or further exposure of known marine archaeology receptors (e.g. wreck sites and geophysical anomalies) and the exposure of as yet unknown marine archaeology receptors. Such processes can also result in the burial of known and unknown receptors.

Operations and maintenance phase

Magnitude of impact

14.11.3.3 The installation of Morven South infrastructure may lead to altered sediment transport pathways (Volume 3, Chapter 7.1: Physical Processes Shared Technical Report). The project design includes the installation of monopile wind turbine foundations and gravity base OSP foundations, these have the potential to alter sediment transport pathways in a manner that would impact marine archaeology receptors. Cable protection and cable crossings may also impact sediment transport pathways, but this will be to a much lesser magnitude than the foundations.

14.11.3.4 Numerical modelling has been used to quantify the changes in physical processes due to the installation of Morven South (Volume 3, Chapter 7.1: Physical Processes Shared Technical Report). The presence of the wind turbine foundations was found to redirect both waves and tidal flow and although some changes in sediment transport were revealed, these were limited in magnitude and represented an adjustment in the transport path alignment. The changes in sediment transport rates were found to be very small with a maximum of 0.04m^3/m over the course of a day within the Morven South Boundary.

14.11.3.5 The magnitude of impact is predicted to be of regional spatial extent, short term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore considered to be negligible.

Sensitivity of the receptor

14.11.3.6 Whilst marine archaeology receptors cannot typically adapt, tolerate, or recover from impacts resulting in damage or loss to the receptors themselves, they can tolerate some indirect impacts

such as burial or exposure without significant adverse impact, particularly if these impacts are temporary and short term, and if they are subject to periodic burial/exposure through the normal physical processes of their environment.

14.11.3.7 However, marine archaeology receptors still cannot recover from any changes in their fabric or context caused by these indirect impacts, for instance deterioration in their fabric through increased erosion or scour causing undermining and collapse. Upstanding wrecks, usually classified as high potential, are most susceptible to these impacts, however there are none within the Morven South Boundary (Section 14.7.1). However, these indirect impacts may affect any unknown marine archaeology receptor taking a precautionary approach the value of the receptor is considered to be very high.

14.11.3.8 Marine archaeological receptors are deemed to be of medium vulnerability, medium recoverability and very high value. The sensitivity of the receptor is therefore, considered to be high.

Significance of the effect

14.11.3.9 Overall, for marine archaeology receptors the magnitude of the impact is deemed to be negligible and the sensitivity of the receptor is considered to be high. The effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms.

Secondary mitigation and residual effect

14.11.3.10 No mitigation measures for marine archaeology are considered necessary because the likely effect in the absence of further mitigation (beyond the designed-in measures outlined in Table 14.14), is not significant in EIA terms.

14.11.4 Direct damage to marine archaeology receptors

14.11.4.1 Direct damage to marine archaeology receptors may arise through the construction, O&M and decommissioning phases. All activities that impact the seabed have the potential to directly impact archaeological material, and include seabed preparation, the installation of the wind turbine foundations, OSP foundations, inter-array cables, interconnector cables and any installation and vessel anchoring and jack-up activities associated with these. Marine archaeological receptors with height, such as shipwrecks, may also be impacted by activities that occur within the water column, including pre-installation activities and mooring/anchoring activities. Such activities may also impact the relationships between a receptor and the wider environment (archaeological context). The MDS for direct damage to marine archaeology receptors is presented in Table 14.13.

14.11.4.2 Activities in the O&M and decommissioning phases will generally only affect areas of seabed that have already been impacted during construction, although jack up events during the O&M phase have been included in the MDS.

Construction phase

Magnitude of impact

14.11.4.3 For known marine archaeology receptors, following the application of designed-in measures and mitigation as outlined in Section 14.10, impacts will be avoided. This is particularly the case through the implementation of AEZs around high and medium potential anomalies and known wrecks. These measures interrupt the impact pathway for direct impacts on known marine archaeology receptors.

14.11.4.4 Currently classified low potential geophysical anomalies are not presently believed to be of archaeological significance. Further investigation and classification of these can take place during the pre-construction phase and avoidance of receptors that transpire to be of archaeological significance can also take place, through the implementation of AEZs, temporary exclusion zones (TEZs) and micrositing.

14.11.4.5 It is not possible to plan to avoid heritage assets that have not yet been discovered and so the greatest potential magnitude of impact would involve impacts on potential receptors. However, much of the designed-in measures and mitigation set out in Section 14.10 will serve to reduce the likelihood of impacts, for instance archaeological assessment and interpretation of pre-construction geophysical data would reduce, as far as possible, the potential for unintended impacts on currently unknown receptors during construction phase activities. If features of archaeological interest are identified during these surveys, they would be subject to the same mitigation as described for known heritage assets. Where impacts to potential marine archaeology receptors are foreseen (particularly low potential geophysical anomalies), typically they are subject to pre-construction site investigation geophysical survey, UXO identification surveys by ROV or diver, or potentially targeted archaeological works. Similarly, the PAD attempts to ensure that features of archaeological interest identified during all construction activities are reported, following which the embedded mitigation can be applied as appropriate.

14.11.4.6 Furthermore, due to the offshore location of Morven South, there is relatively low potential for the discovery of unknown aviation receptors and high value maritime receptors, and negligible potential for unknown seabed prehistory receptors. This reduces the likelihood of impacts and therefore the magnitude of impact.

14.11.4.7 In the case where an unknown receptor is discovered during the construction phase and further impacts are unavoidable, the WSI and PAD set out a framework for further remedial measures which will be applied on a case-by-case basis, in consultation with MD-LOT, but could include, inter alia, recovery, relocation, excavation, conservation, stabilisation and/or recording of the receptor. This would also produce new information on a previously unknown receptor and would create the potential for the site to contribute to regional, national and/or international research objectives and provide considerable enhancement to the archaeological or historical interest and knowledge of the asset, allowing the application of a beneficial impact to reduce the magnitude of any adverse impact.

14.11.4.8 Direct impacts can occur from a range of activities, from the short term, intermittent seabed preparation activities, to the long term, continuous impacts of foundation installation. In all cases the initial impact to the marine archaeology receptor is likely to be of the highest magnitude, and in all cases will be irreversible. The likelihood of the impact, following application of the designed-in measures and mitigation and the relatively low potential for further unknown receptors to be present in Morven South, is low.

14.11.4.9 The magnitude of impact is predicted to be of local spatial extent, short to long term duration, intermittent and low reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore considered to be negligible adverse.

Sensitivity of the receptor

14.11.4.10 Following the application of designed-in measures and mitigation as outlined in Section 14.10, there is no impact pathway for impacts to known marine archaeology receptors. It is not possible to plan to avoid heritage assets that have not yet been discovered, and so the relevant receptors for this impact are potential (currently unknown) receptors. Potential receptors could include maritime or aviation assets. There is very low to no potential for seabed prehistory assets in the Marine Archaeology Study Area and so they will not be assessed further. Geophysical anomalies currently identified as being of low archaeological potential also have the possibility to be of higher archaeological value than is currently expected.

14.11.4.11 Marine archaeology receptors cannot typically adapt, tolerate, or recover from impacts resulting in damage or loss to the receptors themselves, or their context and relationship with their wider environment. As a result, the sensitivity of a marine archaeology receptor to direct damage can only be determined through its value.

14.11.4.12 Shipwrecks of all periods and aircraft material have the potential to be of very high value, and so in line with the MPS (UK Government, 2011: paragraph 2.6.6.5;UK Government, 2011) and

therefore applying the precautionary principle these receptors should be classed as very high sensitivity, at least until further characterisation can be undertaken (Table 14.11). However, due to the offshore location of Morven South, there is relatively low potential for the discovery of unknown aviation receptors and high value maritime receptors.

14.11.4.13 Isolated maritime, aviation and prehistoric artefacts in secondary contexts have slightly more capacity to tolerate impacts. As their relationship to their context is of lesser meaning than in situ remains and assemblages such as shipwrecks, impacts would result in a lesser loss of cultural significance. In the terminology of guidance in Scotland, such artefacts would have intrinsic characteristics, and possible associative characteristics, but fewer contextual characteristics (Historic Environment Scotland, 2019a). However, they still have the potential to be of medium archaeological value and so should be classified as having medium sensitivity.

14.11.4.14 The greatest sensitivity is therefore as follows: in-situ marine archaeology receptors are deemed to be of high vulnerability, low recoverability and very high value. The sensitivity of the receptor is therefore considered to be very high.

14.11.4.15 Isolated marine archaeology receptors are deemed to be of high vulnerability, low recoverability and medium value. The sensitivity of the receptor is therefore considered to be medium.

Significance of the effect

14.11.4.16 Overall, for in situ marine archaeology receptors the magnitude of the impact is deemed to be negligible adverse and the sensitivity of the receptor is considered to be very high. The effect will, therefore, be of **minor adverse** significance, which is significant in EIA terms.

14.11.4.17 For isolated marine archaeology receptors the magnitude of the impact is deemed to be negligible adverse and the sensitivity of the receptor is considered to be medium. The effect will, therefore, be of **negligible adverse** significance, which is not significant in EIA terms.

Secondary mitigation and residual effect

14.11.4.18 No mitigation measures for marine archaeology are considered necessary because the likely effect in the absence of further mitigation (beyond the designed-in measures outlined in Table 14.14), is not significant in EIA terms.

Operations and maintenance phase

Magnitude of impact

14.11.4.19 For known marine archaeology receptors, following the application of designed-in measures and mitigation as outlined in Section 14.10, impacts will be avoided. This is particularly the case through the implementation of AEZs around high and medium potential anomalies and known wrecks. These measures interrupt the impact pathway for direct impacts on known marine archaeology receptors.

14.11.4.20 Currently classified low potential geophysical anomalies are not believed to be of archaeological significance. Further investigation and classification of these can take place during the pre-construction phase and avoidance of receptors that turn out to be of archaeological significance can also take place, through the implementation of AEZs, TEZs and micrositing.

14.11.4.21 However, it is not possible to plan to avoid heritage assets that have not yet been discovered and so the greatest potential magnitude of impact would involve impacts on potential receptors.

14.11.4.22 However, much of the designed-in measures and mitigation set out in Section 14.10 will serve to reduce the likelihood of impacts, for instance archaeological assessment and interpretation of pre-construction geophysical data would reduce, as far as possible, the potential for unintended impacts on currently unknown receptors during construction phase activities. If features of

archaeological interest are identified during these surveys, they would be subject to the same mitigation as described for known heritage assets. Where impacts to potential marine archaeology receptors are foreseen (particularly low potential geophysical anomalies), typically they are subject to pre-construction site investigation geophysical survey, UXO identification surveys by ROV or diver, or potentially targeted archaeological works. Similarly, the PAD attempts to ensure that features of archaeological interest identified during all construction activities are reported, following which the embedded mitigation can be applied as appropriate.

14.11.4.23 Furthermore, due to the offshore location of Morven South, there is relatively low potential for the discovery of unknown aviation receptors and high value maritime receptors, and negligible potential for unknown seabed prehistory receptors. This reduces the likelihood of impacts and therefore the magnitude of impact.

14.11.4.24 In the case where an unknown receptor is discovered during the construction phase and further impacts are unavoidable, the WSI and PAD set out a framework for further remedial measures which will be applied on a case-by-case basis, in consultation with MD-LOT, but could include, inter alia, recovery, relocation, excavation, conservation, stabilisation and/or recording of the receptor. This would also produce new information on a previously unknown receptor and would create the potential for the site to contribute to regional, national and/or international research objectives and provide considerable enhancement to the archaeological or historical interest and knowledge of the asset, allowing the application of a beneficial impact to reduce the magnitude of any adverse impact.

14.11.4.25 Direct impacts can occur from jack-up vessel placement. All other O&M impacts take place entirely within the footprint of the construction impacts. Jack up events will create short term, intermittent impacts, in all cases this impact will be irreversible. The likelihood of the impact, following application of the designed-in measures and mitigation and the relatively low potential for further unknown receptors to be present in Morven South, is low.

14.11.4.26 The greatest magnitude of impact is predicted to be of local spatial extent, short term duration, intermittent and low reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore considered to be negligible adverse.

Sensitivity of the receptor

14.11.4.27 Following the application of designed-in measures and mitigation as outlined in Section 14.10, there is no impact pathway for potential effects to known marine archaeology receptors. It is not possible to plan to avoid heritage assets that have not yet been discovered, and so the relevant receptors for this impact are potential (currently unknown) receptors. Potential receptors could include maritime or aviation assets. There is very low to no potential for seabed prehistory assets in the Marine Archaeology Study Area and so they will not be assessed further. Geophysical anomalies currently identified as being of low archaeological potential also have the potential to be of higher archaeological value than is currently expected.

14.11.4.28 Marine archaeology receptors cannot typically adapt, tolerate, or recover from impacts resulting in damage or loss to the receptors themselves, or their context and relationship with their wider environment. As a result, the sensitivity of a marine archaeology receptor to direct damage can only be determined through its value.

14.11.4.29 Shipwrecks of all periods and aircraft material have the potential to be of very high value, and so in line with the MPS (UK Government, 2011: paragraph 2.6.6.5;UK Government, 2011) and therefore applying the precautionary principle these receptors should be classed as very high sensitivity, at least until further characterisation can be undertaken (Table 14.11). However, due to the offshore location of Morven South, there is relatively low potential for the discovery of unknown aviation receptors and high value maritime receptors.

14.11.4.30 Isolated maritime, aviation and prehistoric artefacts in secondary contexts have slightly more capacity to tolerate impacts. As their relationship to their context is of lesser significance than in-

situ remains and assemblages such as shipwrecks, impacts would result in a lesser loss of cultural significance. In the terminology of guidance in Scotland, such artefacts would have intrinsic characteristics, and possible associative characteristics, but fewer contextual characteristics (Historic Environment Scotland, 2019a). However, they still have the potential to be of medium archaeological value and so should be classified as having medium sensitivity.

14.11.4.31 The greatest sensitivity is therefore as follows: in-situ marine archaeology receptors are deemed to be of high vulnerability, low recoverability and very high value. The sensitivity of the receptor is therefore considered to be very high.

14.11.4.32 Isolated marine archaeology receptors are deemed to be of high vulnerability, low recoverability and medium value. The sensitivity of the receptor is therefore considered to be medium.

Significance of the effect

14.11.4.33 Overall, for in situ marine archaeology receptors the magnitude of the impact is deemed to be negligible adverse and the sensitivity of the receptor is considered to be very high. The effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms.

14.11.4.34 For isolated marine archaeology receptors, the magnitude of the impact is deemed to be negligible adverse and the sensitivity of the receptor is considered to be medium. The effect will, therefore, be of **negligible adverse** significance, which is not significant in EIA terms.

Secondary mitigation and residual effect

14.11.4.35 No mitigation measures for marine archaeology are considered necessary because the likely effect in the absence of further mitigation (beyond the designed-in measures outlined in Table 14.14), is not significant in EIA terms.

Decommissioning phase

14.11.4.36 For the purposes of this assessment, the impacts of decommissioning activities are predicted to be no greater than those for construction. As the construction phase represents the MDS, all impacts during decommissioning would take place entirely within the area impacted by construction activities. Therefore, there is no impact pathway to novel direct impacts on marine archaeology receptors during the decommissioning phase.

14.11.5 Direct damage to deeply buried marine archaeology receptors

14.11.5.1 The seabed activities associated with the construction phase, particularly piling, theoretically have the potential to directly damage palaeolandscapes and associated archaeological material deeply buried within the Marine Archaeology Study Area that would be unaffected by other more superficial seabed impacts. The relevant receptors for this impact would usually be Pleistocene or Holocene deposits with archaeological or geoarchaeological potential that underlie more recent Quaternary units as well as the surface seabed sediments. This impact would only occur during piling which only takes place in the construction phase of the project, therefore there is no pathway to impact deeply buried receptors during the O&M and decommissioning phases.

Construction phase

Magnitude of impact

14.11.5.2 All direct impacts that result in damage to, or disturbance of, in-situ prehistoric sites would result in a loss of resource and/or quality and integrity of resource or severe damage to key characteristics, features or elements. Any of these would result in the loss of cultural significance. Such an impact would therefore be of high adverse magnitude.

14.11.5.3 The impact is predicted to be of local spatial extent, long term duration, continuous and low reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore considered to be high.

Sensitivity of the receptor

14.11.5.4 Following the palaeolandscapes assessment in Volume 4, Annex 14.1: Marine Archaeology Technical Report, there is very low to no potential for the existence of palaeolandscapes in the Marine Archaeology Study Area and therefore no receptors of any value to be impacted.

14.11.5.5 The receptor is deemed to be of negligible value. The sensitivity of the receptor is therefore, considered to be negligible.

Significance of the effect

14.11.5.6 Overall, for deeply buried marine archaeology receptors the magnitude of the impact is deemed to be high and the sensitivity of the receptor is considered to be negligible. The effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms.

14.11.5.7 No mitigation measures for marine archaeology are considered necessary because the likely effect in the absence of further mitigation (beyond the designed-in measures outlined in Table 14.14), is **not significant** in EIA terms.

14.11.6 Proposed monitoring

14.11.6.1 This section outlines the proposed monitoring proposed for marine archaeology. Proposed monitoring measures are outlined in Table 14.15 below.

Table 14.15: Monitoring commitments for marine archaeology

Potential environmental effect	Monitoring commitment	Means of implementation
Direct or indirect impacts marine archaeological receptors within AEZs.	Monitoring of AEZs should be carried out to confirm that no impact has occurred to the archaeological receptors within AEZs (The Crown Estate, 2021, 44). This should be undertaken at a minimum: • post-construction; • post-decommissioning.	Through the archaeological assessment of relevant geophysical data (acquired by the Applicant for any purpose) or by other means (such as ROV survey) agreed with MD-LOT in a method statement. Further details are provided in Volume 4, Chapter 6: Offshore WSI and PAD.

14.12 Whole project assessment and cumulative effects assessment Methodology

14.12.1 Methodology

14.12.1.1 The Morven Programme comprises four distinct projects: Morven North, Morven South, Morven Hawthorn Pit Grid Connection Project (MHPGC Project), and Morven Branxton Area Grid Connection Project (MBAGC Project).

14.12.1.2 The following assessment scenarios have been considered to identify the LSE[1] of Morven South in combination with other projects on the same receptor, as follows (and summarised in Table 14.16):

- Whole project assessment: to identify the potential impacts associated with Morven South together with each grid connection option in turn, (Scenario 1: MHPGC and Scenario 2: MBAGC Project), each of which would comprise a "whole project";
- Morven Programme assessment: to identify potential impacts associated with all four components of the Morven Programme together with other relevant projects, plans and activities (Scenario 3);
- Cumulative effects assessment (CEA): to identify the potential impacts associated with Morven South together with other relevant projects, plans and activities including other components of the Morven Programme, using a tiered approach (Scenario 4).

14.12.1.3 The whole project assessment and CEA have been undertaken in accordance with the methodology described in Volume 1, Chapter 6: EIA Methodology.

Table 14.16: Scenarios to be considered in the Morven South whole project assessment and cumulative effects assessment for marine archaeology

Whole project assessment		Morven Programme assessment (OO and S&N ONLY)	Cumulative effects assessment
Scenario 1	**Scenario 2**	**Scenario 3**	**Scenario 4**
Morven South + MHPGC Project	Morven South + MBAGC Project	Morven North + Morven South + MHPGC Project + MBAGC Project	Morven South + Tier 1, Tier 2 and Tier 3 Plans/Projects screened in

14.12.1.4 For the purposes of this marine archaeology chapter, Scenarios 1, 2, and 4 have been taken forward for assessment; Scenario 3 has not been included as it is not applicable to this chapter. As discussed in Volume 1, Chapter 6: EIA Methodology, the Morven Programme assessment (Scenario 3) is only required for specific chapters to provide further context to, and to support, the conclusions of the CEA scenario (Scenario 4), in agreement with the relevant stakeholders for these topics. As Scenario 3 does not form the basis of the CEA conclusions, it is considered a supplementary assessment to the CEA scenario (Scenario 4) for these specific topics. The approach to cumulative effects assessment presented in this marine archaeology chapter complies with the requirements under the EIA Regulations to assess the LSE[1] on the environment arising from a project cumulatively with other relevant plans, projects and activities, and no supplementary assessment of the Morven Programme (Scenario 3) is required or has been requested by relevant stakeholders with regard to marine archaeology.

14.12.1.5 The projects and plans selected as relevant to the CEA presented within this chapter are based upon the results of a screening exercise (see Volume 3, Appendix 6.3: CEA Annex). Each project or plan has been considered on a case-by-case basis for screening in or out of this chapter's assessment based upon data confidence, effect-receptor pathways and the spatial/temporal scales involved.

14.12.1.6 In undertaking the CEA for Morven South, it should be noted that other projects and plans under consideration will have differing potential for proceeding to an operational stage and hence a differing potential to ultimately contribute to a cumulative impact alongside Morven South. Therefore, a tiered approach has been adopted, whereby all third-party projects and plans considered have been allocated into 'tiers' reflecting their current stage within the planning and development process. This provides a framework for placing relative weight upon the potential for each project/plan included in the CEA to ultimately be realised, based upon the project/plan's current

stage of maturity and certainty in the project/plan's parameters. The tiered approach utilised within the Morven South CEA employs the following tiers:

- Tier 1 assessment – Existing developments either built (operational) or under construction1; approved developments awaiting implementation; and permitted/submitted application(s), but not yet determined, plus Morven North.
- Tier 2 assessment – All plans/projects assessed under Tier 1, plus MHPGCP and plans/projects where a scoping report has been submitted and is in the public domain.
- Tier 3 assessment – All plans/projects assessed under Tier 1 and 2, plus MBAGCP and plans/projects that are reasonably foreseeable (e.g. projects identified in development plans, projects in other plans and programmes, offshore renewable energy projects that have a Crown Estate Scotland Lease Option Agreement).

14.12.1.7 There are no specific projects and plans screened into the CEA for marine archaeology.

14.12.1.8 The potential impacts that have been considered in the CEA (listed in Table 14.18) is a subset of those considered for the Morven South alone assessment. This is because some of the potential impacts identified and assessed for the Morven South alone assessment are localised and temporary in nature or have been assessed to have negligible significance. It is considered therefore, that these potential impacts have limited or no potential to interact with similar changes associated with other plans or projects. These have therefore been scoped out of the whole project and cumulative effects assessment. These impacts include:

- Alteration of sediment transport regimes leading to indirect impacts on marine archaeology receptors;
- Direct damage to deeply buried marine archaeology receptors.

14.12.1.9 Alteration of sediment transport regimes leading to indirect impacts on marine archaeology receptors has been scoped out as the magnitude of impact on marine archaeology receptors was considered to be negligible in the Morven South alone assessment (Section 14.11.3).

14.12.1.10 Direct damage to deeply buried marine archaeology receptors has been scoped out as there are no relevant receptors in Morven South.

14.12.1.11 Similarly, some of the potential impacts considered within the Morven South alone assessment are specific to a particular phase of development (e.g. construction, O&M or decommissioning). Where cumulative effects with other plans or projects only have potential to occur where there is spatial or temporal overlap with Morven South during certain phases of development, impacts associated with a certain phase may be omitted from further consideration where no plans or projects have been identified that have the potential for cumulative effects during this period. Both potential impacts assessed in the CEA for marine archaeology are assessed for all phases (Section 14.13).

[1] Note that existing developments are included in Tier 1 CEA long list but are generally screened out of the CEA assessments, aside from the following exceptions:

1) Existing developments which were not present at the time of baseline characterisation, where a potential cumulative impact-receptor pathway has been identified.

2) Existing developments are screened into tier 1 assessments for specific topics where there is a large conceptual, temporal and spatial overlap between project impacts. In these instances, the potential for ongoing effects through cumulative impact-receptor pathways throughout project lifetime, across the development phases, means that they are considered within quantitative assessment for these topic CEAs (e.g., offshore ornithology assessments consider the cumulative effects of operational offshore wind farms).

Table 14.17: List of other projects and plans considered within the CEA for marine archaeology

Project/plan	Status [i.e. Application, Consented, Under Construction, Operational]	Distance from Morven South (km)	Description of project/plan	Estimated dates of construction (If applicable)	Estimated dates of operation (If applicable)	Overlap with Morven South [e.g. Project construction phase overlaps with Morven South construction phase]
Tier 1						
Morven North Offshore Wind Array Project	Consenting/Pre-Construction	0	Morven North Offshore Wind Array Project is proposed for up to 96 wind turbines at an indicativeanticipated output capacity of 1500MW.	2033 - 2037	2038 onwards	All phases overlap temporally with all phases of Morven South.
Tier 2						
Morven Hawthorn Pit Grid Connection Project	Consenting/Pre-Construction	0	Potential transmission for Morven North/ Morven South.	Unknown	Unknown	Construction phase potentially overlaps construction of Morven South. O&M will overlap temporally with O&M of Morven South.
Tier 3						
Morven Branxton Area Grid Connection Project	Pre-planning	0	Potential transmission for Morven North/ Morven South.	N/A	N/A	N/A

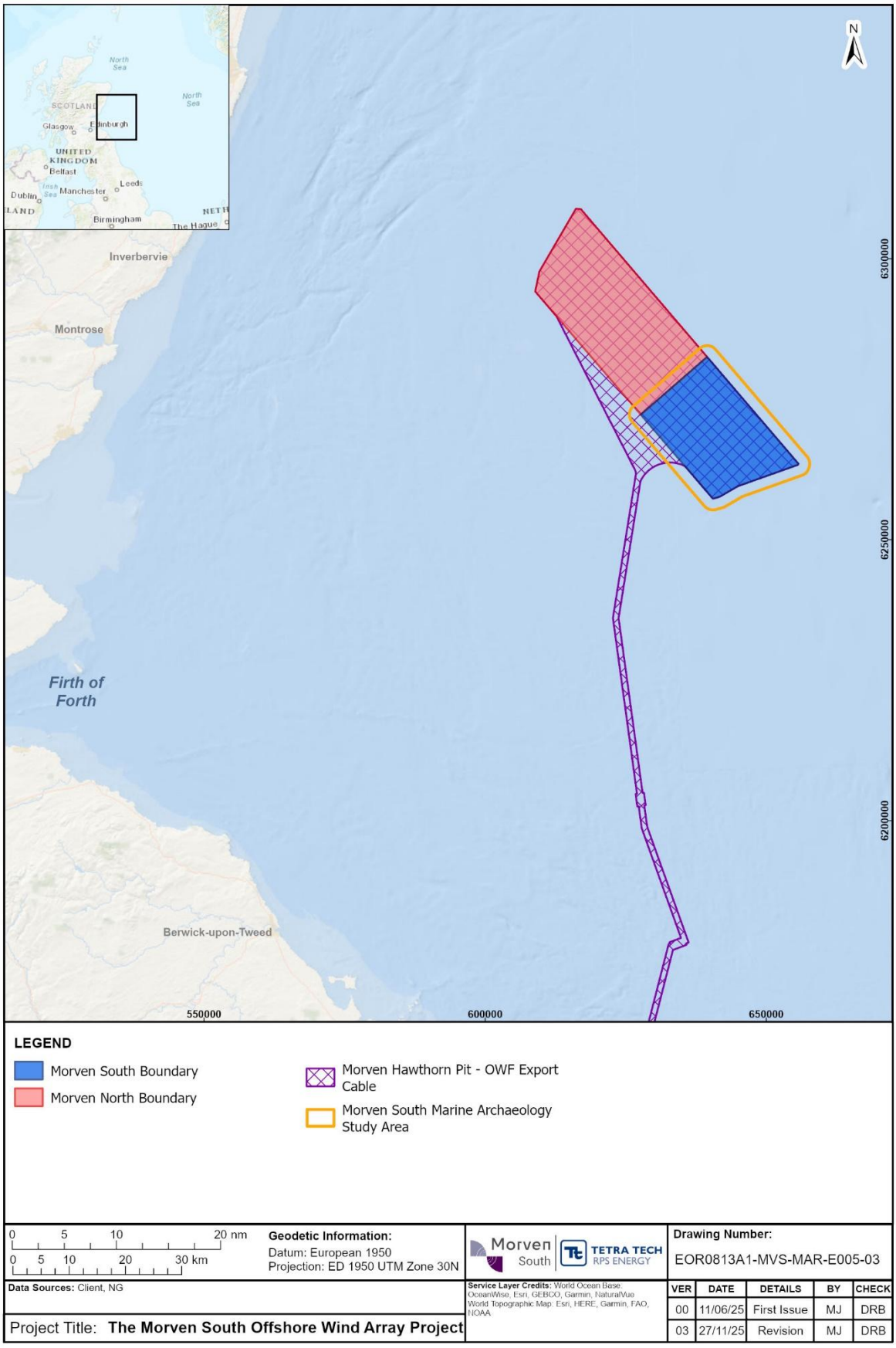

Figure 14.4: Other projects/plans screened into the Cumulative Effects Assessment for marine archaeology

14.12.2 Maximum Design Scenario

14.12.2.1 The cumulative MDSs identified in Table 14.18 have been selected as those having the potential to result in the greatest potential cumulative effect on an identified receptor or receptor group. The cumulative MDSs have been based on the Morven South alone assessment MDS (Table 14.13), as well as publicly available information on other third party projects and plans that have been screened into the CEA (Table 14.17)Table 14.17. Where applicable, the Morven North alone assessment MDS, the project description contained within the MHPGC Project Scoping Report and project information available for MBAGC Project have also informed the cumulative MDSs outlined in Table 14.18.

Table 14.18: MDS considered for the assessment of potential whole project and cumulative effects on marine archaeology

C= Construction, O= Operations and maintenance, D= Decommissioning phases

"✓" is used to denote the phase the potential impact can occur, "X" outlines there is no impact within this project phase

Potential Cumulative Effect	Phase			Maximum Design Scenario	Justification
	C	O	D		
Increased SSC and sediment deposition leading to indirect impacts on marine archaeology receptors	✓	✓	✓	**Scenario 1** MDS as described for Morven South (Table 14.13), assessed cumulatively with MHPGC Project. **Scenario 2** MDS as described for Morven South (Table 14.13), assessed cumulatively with MBAGC Project. **Scenario 4** MDS as described for Morven South (Table 14.13), assessed cumulatively with Morven North, MHPGC Project and MBAGC Project and the following other projects and plans: Tier 1 • Morven South; Tier 2 • MHPGC Project Tier 3 • MBAGC Project	Outcome of the CEA will be greatest when the greatest number of other schemes are considered

Potential Cumulative Effect	Phase			Maximum Design Scenario	Justification
	C	O	D		
Direct damage to marine archaeology receptors	✓	✓	✓	**Scenario 1** MDS as described for Morven South (Table 14.13), assessed cumulatively with MHPGC Project. **Scenario 2** MDS as described for Morven South (Table 14.13), assessed cumulatively with MBAGC Project. **Scenario 4** MDS as described for Morven South (Table 14.13), assessed cumulatively with the following other projects and plans: Tier 1 • Morven South; Tier 2 • MHPGC Project Tier 3 • MBAGC Project	Outcome of the CEA will be greatest when the greatest number of other schemes are considered

14.13 Whole project assessment and cumulative effects assessment

14.13.1 Overview

14.13.1.1 A description of the significance of whole project and cumulative effects upon marine archaeology receptors arising from each identified impact is given below. The whole project assessment and CEA for Morven South is presented in Table 14.19 to Table 14.22 (one for each potential impact).

14.13.1.2 The Morven South Marine Archaeology Study Area, which includes the Morven South Boundary plus a buffer extending 2km from the Morven North Boundary (Section 14.2), has also been used as the Marine Archaeology Whole Project/Cumulative Study Area. The Morven North Marine Archaeology Study Area was confirmed by MD-LOT through targeted consultation (Table 14.5). Different study areas for the different scenarios were not considered to add value.

Increased suspended sediment concentrations and sediment deposition leading to indirect impacts on marine archaeology receptors

14.13.1.3 There is potential for indirect impacts to marine archaeology receptors as a result of the Morven Programme's construction, operations and maintenance and decommissioning activities alongside other offshore cables within the Marine Archaeology Cumulative Study Area. The relevant activities include site preparation including sandwave clearance, foundation installation, cable installation, maintenance operations (e.g. cable repair/reburial, use of jack-up vessels to facilitate wind turbine component repairs etc.) and decommissioning activities (e.g. foundation removal), listed in full in Table 14.13. If any of these are undertaken concurrently with similar activities from the Morven Programme or other offshore cables, they could result in increased SSC, and associated deposition of sediment.

14.13.1.4 The summary of the whole project assessment for indirect impacts to marine archaeology receptors caused by SSC is presented in Table 14.19 and cumulative effects assessment for indirect impacts to marine archaeology receptors caused by SSC is presented in Table 14.20.

Table 14.19: Morven South whole project assessment for increased suspended sediment concentrations and sediment deposition leading to indirect impacts on marine archaeology receptors

	Whole project assessment	
	Scenario 1: Morven South + MHPGC Project	**Scenario 2: Morven South + MBAGC Project**
All phases		
Magnitude of impact	The whole project assessment for Scenario 1 considers Morven South together with MHPGC Project. It is not currently known whether the construction phase of MHPGC overlaps the Morven South construction phase, however, if it did impacts are likely to occur in different areas at different times, and so there is negligible potential for cumulative impacts from SSC to impact marine archaeology receptors. Impacts in the O&M phase, which will overlap, will be of a lesser degree than those in the construction phase, and would be more intermittent, limiting the magnitude of impact. The whole project impact is predicted to be of national spatial extent, short term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be negligible.	The whole project assessment for Scenario 2 considers Morven South together with MBAGC Project. It is not currently known whether the construction phase of MBAGC overlaps the Morven South construction phase, however, if it did impacts are likely to occur in different areas at different times, and so there is negligible potential for cumulative impacts from SSC to impact marine archaeology receptors. Impacts in the O&M phase, which will overlap, will be of a lesser degree than those in the construction phase, and would be more intermittent, limiting the magnitude of impact. The whole project impact is predicted to be of national spatial extent, short term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be negligible.
Sensitivity of receptor	In line with Section 14.11.2 marine archaeological receptors are deemed to be of medium vulnerability, medium recoverability and very high value. The sensitivity of the receptor is therefore, considered to be high.	
Significance of effect	Overall, the magnitude of the whole project impact is deemed to be negligible and the sensitivity of the	Overall, the magnitude of the whole project impact is deemed to be negligible and the sensitivity of the

	Whole project assessment	
	Scenario 1: Morven South + MHPGC Project	**Scenario 2: Morven South + MBAGC Project**
	receptor is considered to be high. The whole project effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms.	receptor is considered to be high. The whole project effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms.

Table 14.20: Morven South cumulative effects assessment for increased suspended sediment concentrations and sediment deposition leading to indirect impacts on marine archaeology receptors

	Cumulative effects assessment
	Scenario 4: Morven South and Tier 1, Tier 2 and Tier 3 Projects
All phases	
Magnitude of impact	The cumulative effects assessment for Scenario 4 considers Morven South together with the Tier 1, Tier 2 and Tier 3 projects below. **Tier 1** Tier 1 includes Morven North. **Tier 2** Tier 2 includes MHPGC. **Teir 3** Tier 3 includes MBAGC. The construction phase of Morven North overlaps that of Morven South. SSC impacts have been modelled for both projects Volume 3, Chapter 7.1: Physical Processes Shared Technical Report). In line with the project alone assessment (Section 14.11.2) the SSC material released will be native to the bed sediments and the material is expected to be subsequently assimilated into the existing sediment transport regime. In addition, the designed-in measures and mitigation in Morven South are expected to be replicated in Morven North. For upstanding wrecks, overburden has the potential to compress and collapse the fabric of the wreck, leading to an adverse impact. For all other receptors, in general, burial will provide some level of protection from biological, chemical and physical erosion to the receptor, and could be classified as beneficial.

	Cumulative effects assessment
	Scenario 4: Morven South and Tier 1, Tier 2 and Tier 3 Projects
	Construction activities on MHPGC and MBAGC, both long cable projects, are not likely to be in close proximity concurrently. There is therefore negligible potential for cumulative impacts from SSC to impact marine archaeology receptors. Impacts in the Morven South O&M phase, which will overlap with the O&M phases of Tier 1, 2 and 3 projects, will be of a lesser degree than those in the construction phase, and would be more intermittent, limiting the magnitude of impact. The cumulative effect is predicted to be of national spatial extent, short term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be negligible.
Sensitivity of receptor	In line with Section 14.11.2 marine archaeological receptors are deemed to be of medium vulnerability, medium recoverability and very high value. The sensitivity of the receptor is therefore, considered to be high.
Significance of effect	Overall, the magnitude of the whole project impact is deemed to be negligible and the sensitivity of the receptor is considered to be high. The whole project effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms.

Direct damage to marine archaeology receptors

14.13.1.5 There is potential for direct damage to marine archaeology receptors as a result of the Morven Programme's construction, operations and maintenance and decommissioning activities alongside other offshore cables within the Marine Archaeology Whole Project/Cumulative Study Area. The activities include seabed preparation, wind turbine and OSP installation, cable installation and others listed in Table 14.13.

14.13.1.6 Direct impacts to marine archaeology receptors will in most cases be limited by the location and extent of sensitive receptors. Due to the proposed designed-in mitigation measures detailed in Section 14.10, such as the implementation of AEZs, most impacts will be avoided, particularly to known receptors. It is assumed that the whole project will also follow such measures, as will other relevant cable projects, limiting the potential for cumulative effects. In addition, if a receptor does receive a direct impact from a project, the impact will likely be permanent and irreversible. Therefore, the significance of any further impact from a separate project will then be reduced.

14.13.1.7 The summary of the whole project assessment for direct damage to marine archaeology receptors is presented in Table 14.21, and cumulative effects assessment for direct damage to marine archaeology receptors is presented in Table 14.22.

Table 14.21: Morven South whole project assessment for direct damage to marine archaeology receptors

	Whole project assessment	
	Scenario 1: Morven South + MHPGC Project	**Scenario 2: Morven South + MBAGC Project**
Construction phase		
Magnitude of impact	The whole project assessment for Scenario 1 considers Morven South together with MHPGC Project. The construction of Morven South may overlap spatially and temporally with the construction of the MHPGC Project and also increase the footprint of the project impacts. However, known seabed features have been avoided through designed-in mitigation in Morven South. MHPGC will also go through the EIA process, and it is expected that known receptors will also be avoided through mitigation. Furthermore, whilst the general footprints of the projects overlap, activities will not likely affect the same receptors, largely affecting different areas of seabed. Finally, if receptor does receive a direct impact from a project (likely to be an unknown receptor), the impact is expected to be permanent and irreversible (Section 14.11.4). Therefore, the significance of any further impact from a separate project on the same receptor will then be negligible. The whole project impact is predicted to be of regional spatial extent, short to long term duration, intermittent or continuous and low reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be negligible.	The whole project assessment for Scenario 2 considers Morven South together with MBAGC Project. The construction of Morven South may overlap spatially and temporally with the construction of the MBACG Project and also increase the footprint of the project impacts. However, known seabed features have been avoided through designed-in mitigation in Morven South. MBAGC will also go through the EIA process, and it is expected that known receptors will also be avoided through mitigation. Furthermore, whilst the general footprints of the projects overlap, activities will not likely affect the same receptors, largely affecting different areas of seabed. Finally, if receptor does receive a direct impact from a project (likely to be an unknown receptor), the impact is expected to be permanent and irreversible (Section 14.11.4). Therefore, the significance of any further impact from a separate project on the same receptor will then be negligible. The whole project impact is predicted to be of regional spatial extent, short to long term duration, intermittent or continuous and low reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be negligible.
Sensitivity of receptor	In line with Section 14.11.4 the sensitivity of marine archaeology receptors is considered to be very high.	
Significance of effect	Overall, the magnitude of the whole project impact is deemed to be **negligible** and the sensitivity of the receptor is considered to be very	Overall, the magnitude of the whole project impact is deemed to be **negligible** and the sensitivity of the receptor is considered to be very

	Whole project assessment	
	Scenario 1: Morven South + MHPGC Project	**Scenario 2: Morven South + MBAGC Project**
	high. The whole project effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms.	high. The whole project effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms.
Operations and maintenance phase		
Magnitude of impact	The whole project assessment for Scenario 1 considers Morven South together with MHPGC Project. The operations and maintenance of Morven South may overlap spatially and temporally with the operations and maintenance of the MHPGC Project and also increase the footprint of the project impacts. However, known seabed features have been avoided through designed-in mitigation in Morven South. MHPGC will also go through the EIA process, and it is expected that known receptors will also be avoided through mitigation. Furthermore, whilst the general footprints of the projects overlap, activities will not likely affect the same receptors, largely affecting different areas of seabed. Finally, if receptor does receive a direct impact from a project (likely to be an unknown receptor), the impact is expected to be permanent and irreversible (Section 14.11.4). Therefore, the significance of any further impact from a separate project on the same receptor will then be negligible. The whole project impact is predicted to be of regional spatial extent, short to long term duration, intermittent or continuous and low reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be negligible.	The whole project assessment for Scenario 2 considers Morven South together with MBAGC Project. The operations and maintenance of Morven South may overlap spatially and temporally with the operations and maintenance of the MBACG Project and also increase the footprint of the project impacts. However, known seabed features have been avoided through designed-in mitigation in Morven South. MBAGC will also go through the EIA process, and it is expected that known receptors will also be avoided through mitigation. Furthermore, whilst the general footprints of the projects overlap, activities will not likely affect the same receptors, largely affecting different areas of seabed. Finally, if receptor does receive a direct impact from a project (likely to be an unknown receptor), the impact is expected to be permanent and irreversible (Section 14.11.4). Therefore, the significance of any further impact from a separate project on the same receptor will then be negligible. The whole project impact is predicted to be of regional spatial extent, short to long term duration, intermittent or continuous and low reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be negligible.
Sensitivity of receptor	In line with Section 14.11.4 the sensitivity of marine archaeology receptors is considered to be very high.	
Significance of effect	Overall, the magnitude of the Whole Project impact is deemed to be **negligible** and the sensitivity of the receptor is considered to be very	Overall, the magnitude of the Whole Project impact is deemed to be **negligible** and the sensitivity of the receptor is considered to be very

	Whole project assessment	
	Scenario 1: Morven South + MHPGC Project	**Scenario 2: Morven South + MBAGC Project**
	high. The Whole Project effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms.	high. The Whole Project effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms.
Decommissioning phase		
Magnitude of impact	The whole project assessment for Scenario 1 considers Morven South together with MHPGC Project. The decommissioning of Morven South may overlap spatially with the decommissioning of the MHPGC Project and also increase the footprint of the project impacts. However, known seabed features have been avoided through designed-in mitigation in Morven South. MHPGC will also go through the EIA process, and it is expected that known receptors will also be avoided through mitigation. Furthermore, whilst the general footprints of the projects overlap, activities will not likely affect the same receptors, largely affecting different areas of seabed. Finally, if receptor does receive a direct impact from a project (likely to be an unknown receptor), the impact is expected to be permanent and irreversible (Section 14.11.4). Therefore, the significance of any further impact from a separate project on the same receptor will then be negligible. The whole project impact is predicted to be of regional spatial extent, short to long term duration, intermittent or continuous and low reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be negligible.	The whole project assessment for Scenario 2 considers Morven South together with MBAGC Project. The decommissioning of Morven South may overlap spatially with the decommissioning of the MBACG Project and also increase the footprint of the project impacts. However, known seabed features have been avoided through designed-in mitigation in Morven South. MBAGC will also go through the EIA process, and it is expected that known receptors will also be avoided through mitigation. Furthermore, whilst the general footprints of the projects overlap, activities will not likely affect the same receptors, largely affecting different areas of seabed. Finally, if receptor does receive a direct impact from a project (likely to be an unknown receptor), the impact is expected to be permanent and irreversible (Section 14.11.4). Therefore, the significance of any further impact from a separate project on the same receptor will then be negligible. The whole project impact is predicted to be of regional spatial extent, short to long term duration, intermittent or continuous and low reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be negligible.
Sensitivity of receptor	In line with Section 14.11.4 the sensitivity of marine archaeology receptors is considered to be very high.	
Significance of effect	Overall, the magnitude of the Whole Project impact is deemed to be negligible and the sensitivity of the receptor is considered to be very	Overall, the magnitude of the Whole Project impact is deemed to be negligible and the sensitivity of the receptor is considered to be very

	Whole project assessment	
	Scenario 1: Morven South + MHPGC Project	**Scenario 2: Morven South + MBAGC Project**
	high. The Whole Project effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms.	high. The Whole Project effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms.

Table 14.22: Morven South Cumulative Effects Assessment for direct damage to marine archaeology receptors

	Cumulative effects assessment
	Scenario 4: Morven South and Tier 1, Tier 2 and Tier 3 Projects
Construction phase	
Magnitude of impact	The cumulative effects assessment for Scenario 4 considers Morven South together with the Tier 1, Tier 2 and Tier 3 projects below. **Tier 1** Tier 1 includes Morven South. **Tier 2** Tier 2 includes MHPGC. **Teir 3** Tier 3 includes MBAGC. Known seabed features have been avoided through designed-in mitigation in Morven South. The other Tier 1, Tier 2 and Tier 3 projects will also go through the EIA process, and it is expected that known receptors will also be avoided through mitigation. Furthermore, whilst the general footprints of the projects overlap, activities will not likely affect the same receptors, largely affecting different areas of seabed. Finally, if a receptor does receive a direct impact from a project (likely to be an unknown receptor), the impact is expected to be permanent and irreversible (Section 14.11.4). Therefore, the significance of any further impact from a separate project on the same receptor will then be negligible. The cumulative impact is predicted to be of regional spatial extent, short to long term duration, intermittent or continuous and low reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be negligible.
Sensitivity of receptor	In line with Section 14.11.4 the sensitivity of marine archaeology receptors is considered to be very high.

	Cumulative effects assessment
	Scenario 4: Morven South and Tier 1, Tier 2 and Tier 3 Projects
Significance of effect	Overall, the magnitude of the cumulative impact is deemed to be negligible and the sensitivity of the receptor is considered to be very high. The cumulative effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms.
Operations and maintenance phase	
Magnitude of impact	The cumulative effects assessment for Scenario 4 considers Morven North together with the Tier 1, Tier 2 and Tier 3 projects below. **Tier 1** Tier 1 includes Morven South **Tier 2** Tier 2 includes MHPGC. **Teir 3** Tier 3 includes MBAGC. Known seabed features have been avoided through designed-in mitigation in Morven South. The other Tier 1, Tier 2 and Tier 3 projects will also go through the EIA process, and it is expected that known receptors will also be avoided through mitigation. Furthermore, whilst the general footprints of the projects overlap, activities will not likely affect the same receptors, largely affecting different areas of seabed. Finally, if a receptor does receive a direct impact from a project (likely to be an unknown receptor), the impact is expected to be permanent and irreversible (Section 14.11.4). Therefore, the significance of any further impact from a separate project on the same receptor will then be negligible. The cumulative impact is predicted to be of regional spatial extent, short to long term duration, intermittent or continuous and low reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be negligible
Sensitivity of receptor	In line with Section 14.11.4 the sensitivity of marine archaeology receptors is considered to be very high.
Significance of effect	Overall, the magnitude of the cumulative impact is deemed to be negligible and the sensitivity of the receptor is considered to be very high. The cumulative effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms.
Decommissioning phase	
Magnitude of impact	The cumulative effects assessment for Scenario 4 considers Morven North together with the Tier 1, Tier 2 and Tier 3 projects below. **Tier 1**

	Cumulative effects assessment
	Scenario 4: Morven South and Tier 1, Tier 2 and Tier 3 Projects
	Tier 1 includes Morven South **Tier 2** Tier 2 includes MHPGC. **Teir 3** Tier 3 includes MBAGC. Known seabed features have been avoided through designed-in mitigation in Morven South. The other Tier 1, Tier 2 and Tier 3 projects will also go through the EIA process, and it is expected that known receptors will also be avoided through mitigation. Furthermore, whilst the general footprints of the projects overlap, activities will not likely affect the same receptors, largely affecting different areas of seabed. Finally, if receptor does receive a direct impact from a project (likely to be an unknown receptor), the impact is expected to be permanent and irreversible (Section 14.11.4). Therefore, the significance of any further impact from a separate project on the same receptor will then be negligible. The cumulative impact is predicted to be of regional spatial extent, short to long term duration, intermittent or continuous and low reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be negligible.
Sensitivity of receptor	In line with Section 14.11.4 the sensitivity of marine archaeology receptors is considered to be very high.
Significance of effect	Overall, the magnitude of the cumulative impact is deemed to be negligible and the sensitivity of the receptor is considered to be very high. The cumulative effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms.

14.13.2 Proposed monitoring

14.13.2.1 No marine archaeology monitoring to test the predictions made within the assessment of whole project and cumulative effects on marine archaeology is considered necessary.

14.13.2.2 Monitoring commitments for Morven South are set out in Section 14.11.6.

14.14 Transboundary effects

14.14.1.1 A screening of transboundary impacts has been carried out (see Volume 3, Annex 4: Transboundary Screening). This has identified that no likely significant transboundary effects with regard to marine archaeology would result from Morven South upon the interests of other European Economic Area States.

14.15 Inter-related effects

14.15.1.1 Inter-relationships are considered to be the impacts and associated effects of different aspects of Morven South on the same receptor. Inter-related effects are considered to be either:

- Lifetime effects: Assessment of the scope for effects that occur throughout more than one phase of Morven South (construction, O&M and decommissioning), to interact to potentially create a more significant effect on a receptor than if just assessed in isolation in these three project stages (e.g. underwater sound effects from piling, wind turbines, vessels and decommissioning);
- Receptor-led effects: Assessment of the scope for all effects to interact, spatially and temporally, to create inter-related effects on a receptor. As an example, all effects on marine archaeology, such as SSC and alteration of sediment transport regimes, may interact to produce a different, or greater effect on this receptor than when the effects are considered in isolation. Receptor-led effects may be short-term, temporary or transient effects, or incorporate longer-term effects.

14.15.1.2 A description of the likely inter-related effects arising from Morven South on marine archaeology is provided in Volume 2, Chapter 21: Inter-related and Ecosystem Effects.

14.15.1.3 For marine archaeology, the following potential impacts have been considered within the inter-related assessment:

- Increased SSC and sediment deposition leading to indirect impacts on marine archaeology receptors;
- Alteration of sediment transport regimes leading to indirect impacts on marine archaeology receptors.

14.15.1.4 Table 14.23 lists the inter-related effects (project lifetime effects) that are predicted to arise during the construction, O&M and decommissioning of Morven South and the inter-related effects (receptor-led effects) that are predicted to arise for marine archaeology receptors.

Table 14.23: Summary of likely significant inter-related effects on the environment from individual effects occurring across the construction, O&M and decommissioning phases of Morven South and from multiple effects interacting across all phases (receptor-led effects)

C= Construction, O= O&M, D= Decommissioning phases

"✓" is used to denote the phase the potential impact can occur, "X" outlines there is no impact within this project phase

Description of impact	Phase			Likely significant inter-related effect	Significance
	C	O	D		
Morven South lifetime effects					
Increased SSC and sediment deposition leading to indirect impacts on marine archaeology receptors	✓	✓	✓	When SSC and sediment deposition is considered additively across all phases, the volume of sediment deposited is larger than when considered across an individual phase (i.e. just construction). However, the effects are expected to be short term, and so the effects on marine archaeology receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase.	SSC and sediment deposition are anticipated to interact in such a way as to result in combined effects of minor adverse or beneficial significance in the construction phase and negligible significance in the O&M and decommissioning phases (i.e. not of greater significance than the assessments presented for each individual phase).
Receptor led effects					
Potential exists for spatial and temporal interactions between the effects arising from increased SSC and sediment deposition and alteration of sediment transport regimes on marine archaeology receptors during the lifetime of Morven South. The combination of sediment disturbance and deposition and alteration of transport regimes has the potential to further bury marine archaeology receptors. It is predicted that any inter-related effect will not be of any greater significance than those impacts already assessed in isolation (i.e. minor adverse) and would be generally beneficial in nature. As a result, the receptor-led effects are of **minor adverse** significance which is not significant in EIA terms.					

14.16 Summary of impacts, mitigation, likely significant effects and monitoring

14.16.1.1 Information on marine archaeology within the Morven South Marine Archaeology Study Area was collected through desk-based assessment and site specific surveys (Section 14.6).

14.16.1.2 Table 14.24 presents a summary of the potential impacts, mitigation measures and the conclusion of LSE[1] on marine archaeology in EIA terms. The impacts assessed include:

- Increased SSC and sediment deposition leading to indirect impacts on marine archaeology receptors.

- Alteration of sediment transport regimes leading to indirect impacts on marine archaeology receptors.
- Direct damage to marine archaeology receptors.
- Direct damage to deeply buried marine archaeology receptors.

14.16.1.3 Overall, it is concluded that there will be no LSE[1] arising from Morven South during the construction, O&M or decommissioning phases.

14.16.1.4 Table 14.25 presents a summary of the potential cumulative impacts, mitigation measures and the conclusion of LSE[1] on marine archaeology in EIA terms. The cumulative effects assessed include:

- Increased SSC and sediment deposition leading to indirect impacts on marine archaeology receptors.
- Direct damage to marine archaeology receptors.

14.16.1.5 Overall, it is concluded that there will be no likely significant cumulative effects from Morven South alongside other projects/plans.

14.16.1.6 No likely significant transboundary effects have been identified in regard to effects of Morven South.

Table 14.24: Summary of Likely Significant Effects, mitigation and monitoring

C= Construction, O= Operations and Maintenance, D= Decommissioning phases

"✓" is used to denote the phase the potential impact can occur, "✗" outlines there is no impact within this project phase

Description of impact	Phase			Designed-in measures	Magnitude of impact	Sensitivity of receptor	Significance of effect	Additional mitigation measures	Significance of residual effect	Proposed monitoring
	C	O	D							
Increased SSC and sediment deposition leading to indirect impacts on marine archaeology receptors	✓	✓	✓	Various including implementation of AEZs and implementation of a WSI and PAD (Section 14.10).	Low	High	Minor adverse	N/A	N/A	Monitoring of AEZs to confirm that no impact has occurred to the archaeological receptors within AEZs
Alteration of sediment transport regimes leading to indirect impacts on marine archaeology receptors	✗	✓	✗	Various including implementation of AEZs and implementation of a WSI and PAD (Section 14.10).	Negligible	High	Minor adverse	N/A	N/A	Monitoring of AEZs to confirm that no impact has occurred to the archaeological receptors within AEZs
Direct damage to marine archaeology receptors;	✓	✓	✓	Various including implementation of AEZs and implementation of a WSI and PAD (Section 14.10).	High	Very High / Medium	Minor adverse	N/A	N/A	Monitoring of AEZs to confirm that no impact has occurred to the archaeological receptors within AEZs

Description of impact	Phase			Designed-in measures	Magnitude of impact	Sensitivity of receptor	Significance of effect	Additional mitigation measures	Significance of residual effect	Proposed monitoring
	C	O	D							
Direct damage to deeply buried marine archaeology receptors.	✓	×	×	Various including implementation of AEZs and implementation of a WSI and PAD (Section 14.10).	High	Negligible	Minor adverse	N/A	N/A	None

Table 14.25: Summary of likely significant cumulative environment effects, mitigation and monitoring

C= Construction, O= Operations and Maintenance, D= Decommissioning phases

"✓" is used to denote the phase the potential impact can occur, "X" outlines there is no impact within this project phase

Description of impact	Phase			Designed-in measures	Magnitude of impact	Sensitivity of receptor	Significance of effect	Additional measures	Significance of residual effect	Proposed monitoring
	C	O	D							
Scenarios 1, 2 and 4										
Increased SSC and sediment deposition leading to indirect impacts on marine archaeology receptors	✓	✓	✓	Various including implementation of AEZs and implementation of a WSI and PAD (Section 14.10).	Negligible	High	Minor adverse	N/A	N/A	None
Direct damage to marine	✓	✓	✓	Various including implementation	Negligible	Very High	Minor adverse	N/A	N/A	None

Description of impact	Phase			Designed-in measures	Magnitude of impact	Sensitivity of receptor	Significance of effect	Additional measures	Significance of residual effect	Proposed monitoring
	C	O	D							
Scenarios 1, 2 and 4										
archaeology receptors;				of AEZs and implementation of a WSI and PAD (Section 14.10).						

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