MachairWind Offshore Windfarm

Chapter 8 Benthic Ecology

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GLOSSARY OF ACRONYMS

Term	Definition
BWM	Ballast Water and Sediments
CBRA	Cable Burial Risk Assessment
CEA	Cumulative Effects Assessment
Cefas	Centre for Environment, Fisheries and Aquaculture
DDV	Drop-Down Video
DECC	Department of Energy and Climate Change
ECC	Export Cable Corridor
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Reports
EMF	Electromagnetic field
EMP	Environmental Management Plan
EPS	European Protected Species
EUNIS	European Nature Information System
FLO	Fisheries Liaison Officer
GBS	Gravity base structure
GES	Good environmental status
GIS	Geographic Information System
HRA	Habitats Regulations Appraisal
HVDC	High-voltage direct current
IAC	Inter-array cables
IEF	Important ecological feature
INNS	Invasive Non-Native Species
INNSMP	Invasive Non-Native Species Mitigation
INTOG	Innovation and Targeted Oil & Gas
JNCC	Joint Nature Conservation Committee
LSE	Likely significant effects
MarLIN	Marine Life Information Network
MD-LOT	Marine Directorate - Licensing and Operations Team
MPA	Marine Protected Area
MPCP	Marine Pollution Contingency Plan
MSFD	Marine Strategy Framework Directive
NCMPA	Nature Conservation Marine Protected Area

Term	Definition
NMP	National Marine Plan
NMPi	National Marine Plan Interactive
OAA	Option Agreement Area
OnTDA	Onshore Transmission Development Area
OSP	Offshore Substation Platform
PDE	Project Design Envelope
PMF	Priority Marine Features
SAC	Special Area of Conservation
SEA	Strategic Environmental Assessment
SFF	Scottish Fishermen's Federation
SMP	Sectoral Marine Plan
SNH	Scottish Natural Heritage
SSC	Suspended Sediment Concentrations
SSS	Side Scan Sonar
UK	United Kingdom
WDA	Windfarm Development Area
WTG	Wind Turbine Generator
ZoI	Zone of Influence

GLOSSARY OF TERMS

Term	Definition
Benthic Ecology Study Area	The Benthic Ecology Study Area is defined by a tidal excursion that extends from the Windfarm Development Area in a southerly direction by approximately 7-11 km (i.e. the average distance travelled by tidal flow between low-water slack tide and high-water slack tide before the current direction reverses). The tidal excursion traverses only a short distance in all other directions (including approximately 4-7 km in the North and centre of the WDA). This encompasses the area over which suspended sediment could be transported following disturbance from the seabed.
Cable protection	Protective measure to minimise the effects of scour and hazards along the offshore cables (e.g. to prevent cable exposure or snagging of vessel anchors or fishing gear), as well as for protecting these cables at infrastructure crossing points.
Development Area	Application boundary for consenting purposes which, for the Project, consists of a Windfarm Development Area, Offshore Export Cable Corridor, and Onshore Transmission Development Area. Separate consent and marine licence applications will be submitted for each Development Area where applicable.
Environmental Impact Assessment (EIA)	The process of evaluating the likely significant environmental effects of a proposed development over and above the existing circumstances (or 'baseline').
Environmental Impact Assessment (EIA) Regulations	A collective term referring to The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017 and The Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017.
Embedded mitigation measure	Mitigation measures, including industry good practice measures, that are directly incorporated into the design for the MachairWind Windfarm Development Area to avoid or reduce environmental effects.
Habitats Regulations	A collective term used to describe the Conservation of Habitats and Species Regulations 2017 and The Conservation (Natural Habitats, &c.) Regulations 1994.
Inter-array cables (IACs)	Armoured cable containing electrical and fibre optic cores which link the wind turbine generators to each other and to the offshore substation platform(s).
MachairWind Offshore Windfarm	An offshore windfarm capable of exporting around 2 GW of renewable energy to the National Electricity Transmission System. MachairWind Offshore Windfarm comprises three Development Areas: · • The WDA – located on the west coast of Scotland to the northwest of Islay and west of Colonsay; • The Offshore Export Cable Corridor – a preliminary boundary extending from the WDA to mean high water springs at a landfall location near Girvan, South Ayrshire; and • The Onshore Transmission Development Area – a preliminary boundary which extends landward from mean low water springs and includes the land required for the landfall of the offshore export cables and their route up to but not including the proposed high voltage direct current switching station which will be developed and constructed by Transmission Owner, ScottishPower Transmission. Separate consent and licence applications will be submitted for each Development Area.
National Electricity Transmission System	The high-voltage electricity power transmission network serving Great Britain which receives electricity from generators (such as offshore windfarms) and transmits that electricity to anywhere on the National Electricity Transmission System to satisfy demand.
Offshore export cable	Armoured cable containing electrical cores between the offshore substation platform(s) and landfall. Offshore export cables will include bundled fibre optic cables. The offshore export cables are subject to Marine Licence applications under the Marine (Scotland) Act 2010. The

Term	Definition
	portion of the offshore export cable(s) located within the WDA is assessed as part of this MachairWind WDA EIA and a marine licence application to construct, alter or improve this portion has been submitted alongside the WDA application. A separate marine licence application will be submitted for the portion of the offshore export cable(s) from the WDA boundary to mean high water Mean High Water Springs.
Offshore Export Cable Corridor (ECC)	The preliminary boundary extending from the WDA to mean high water springs near Girvan, South Ayrshire and within which the offshore export cable(s) will be located. A separate marine licence application will be submitted for the offshore export cable(s) located within the Offshore ECC.
Offshore Substation Platform (OSP)	An offshore platform with a fixed foundation located within the WDA which houses electrical equipment such as transformers, switchgear, protection and control systems, and enables the windfarm's renewable electricity to be collected via inter-array cables and exported to the National Electricity Transmission System via offshore export cables.
Offshore Substation Platform (OSP) link cables	Electrical cables which link OSPs (if more than one OSP is required). These cables will include fibre optic cores or bundled fibre optic cables. OSP link cables will be wholly located within the WDA.
Onshore Transmission Development Area (OnTDA)	The preliminary boundary which extends landward from mean low water springs and includes the land required for the landfall of the offshore export cables and their route up to but not including the proposed high voltage direct current switching station which will be developed and constructed by Transmission Owner, ScottishPower Transmission. This Transmission Owner is responsible for consenting the high voltage direct current switching station. Onward connections to the National Electricity Transmission System will be consented by National Grid Electricity Transmission and ScottishPower Transmission. Where relevant, these are considered as part of cumulative effects assessment in the EIA.
Operational life	The operational life is the expected length of time from final commissioning of the WDA until the cessation of commercial operations. This is anticipated to be 35 years.
Option Agreement Area (OAA)	The seabed area awarded to ScottishPower Renewables in January 2022 through the Scotwind leasing round.
OSPAR	OSPAR started in 1972 with the Oslo Convention against dumping and was broadened to cover land-based sources of marine pollution and the offshore industry by the Paris Convention of 1974. These two conventions were unified, updated and extended by the 1992 OSPAR Convention. OSPAR is so named because of the original Oslo and Paris Conventions ("OS" for Oslo and "PAR" for Paris).
Pre-construction works	Pre-construction works are activities undertaken prior to formal commencement of construction. Examples include survey works such as geotechnical and geophysical surveys and seabed preparation activities.
Rochdale Envelope	An approach to environmental assessment which aims to take account of the need for flexibility in the future evolution of the detailed project proposal. The approach is named after two court rulings concerning outline planning applications for a proposed business park in Rochdale.
Safety zones	An area of water around or adjacent to a wind turbine generator or Offshore Substation Platform and associated substructure which is to be constructed, extended, operated or decommissioned, from which certain or all classes of vessels are excluded and within which activities can be regulated for the purpose of securing safety of the wind turbine generator, substructure or vessels in that vicinity, and individuals on both the wind turbine generator, substructure or vessel, in line with Section 95 of the Energy Act 2004.
Scottish Marine Area	The area of Scotland's territorial sea limit (up to 12 nautical miles from baseline) as defined in the Marine (Scotland) Act 2010.

Term	Definition
ScotWind	A Crown Estate Scotland seabed leasing round which enabled developers to propose offshore wind projects and apply for seabed rights to plan and build windfarms in Scottish waters.
Scour protection	Protective measures to avoid sediment being eroded away from the base of the wind turbine generator foundations as a result of the flow of water.
The Applicant	The legal entity submitting consent applications for the MachairWind Offshore Windfarm, namely MachairWind Limited.
The Lighthouse	The Dubh Artach lighthouse.
The Project	MachairWind Offshore Windfarm including all its Development Areas and associated infrastructure.
Windfarm Development Area (WDA)	The application boundary within the OAA where consent will be sought for the proposed WDA infrastructure. The WDA infrastructure is subject to Section 36 consent and marine licence applications (generation and transmission) which are being applied for separately from the Offshore ECC infrastructure and OnTDA infrastructure.
WDA infrastructure	The offshore generation and transmission infrastructure located within the WDA including but not limited to: WTGs, WTG fixed foundations (and associated scour protection), OSP(s), OSP fixed foundations (and associated scour protection), IACs, OSP link and offshore export cable(s) and their associated external cable protection (insofar as these are located within the WDA) and fibre optic cables.
Wind Turbine Generator (WTG)	A wind turbine generator which converts wind energy into electrical energy. Each wind turbine generator is a complex system composed of a high number of components. Typically, the main components include the rotor assembly (composed of three blades and a hub); the nacelle (containing a generator, shaft and gearbox, power electronic converter and transformer); and the tower (containing lifting equipment and the switchgear).

8 BENTHIC ECOLOGY

8.1 INTRODUCTION

1. This chapter presents an assessment of potential impacts and likely significant effects (LSE) on benthic ecology that may arise from the construction, operation and maintenance (O&M), and decommissioning of the MachairWind Windfarm Development Area (WDA) infrastructure.

2. The grid connection location for the Project was only confirmed in August 2025 following lengthy delays stemming from the National Electricity System Operator's 2022 Holistic Network Design (HND) process (see **Chapter 1 Introduction** for further information). Consequently, this topic chapter considers the WDA Study Area and existing environment only. Separate consent and marine licence applications will be sought for the Offshore Export Cable Corridor (ECC) and Onshore Transmission Development Area (OnTDA). A combined assessment of the construction, O&M and decommissioning of the WDA activities, Offshore Export Cable Corridor (ECC) and Onshore Transmission Development Area (OnTDA) activities (commensurate with the level of detail that is available at the time of carrying out that assessment) is also provided. This approach will ensure a holistic view is undertaken of the entire Project. As noted in **Chapter 1 Introduction**, the assessment of potential effects on all receptors associated with the Offshore ECC and OnTDA will be presented in individual Environmental Impact Assessment (EIA) Reports (EIARs) / Environmental Reports, which will be submitted separately in accordance with the relevant EIA Regulations.

3. This chapter considers the following WDA infrastructure: wind turbine generators (WTGs), offshore substation platforms (OSP) and associated fixed foundations and scour protection, inter-array cables (IAC), OSP link cables, the portion of the offshore export cable located within the WDA and associated cable protection.

4. This chapter has been prepared to provide Marine Directorate - Licensing and Operations Team (MD-LOT) (administering on behalf of the Scottish Ministers) and stakeholders with sufficient information to determine the likely significant effect(s) of the Project on the receiving environment.

5. This chapter should be read in conjunction with the following related EIAR chapters:

- **Chapter 7 Marine Physical Environment** – describes aspects of the abiotic environment that influences the nature of the benthic ecology environment; and
- **Chapter 9 Fish (Including Basking Shark) and Shellfish** – fish species, particularly demersal or bentho-pelagic species, rely on prey resources living under and on the seabed.

6. Key inter-relationships between this chapter and those listed above will be considered where relevant and presented in this chapter.

7. Additional information to support the Benthic Ecology assessment includes:

- **Appendix 8.1 2025 Habitat Assessment Report**;
- **Appendix 8.2 Benthic Characterisation Report; and**
- **Appendix 8.3 Geophysical and Habitat Interpretative Report.**

8. This chapter was prepared by Haskoning.

8.2 LEGISLATION, POLICY AND GUIDANCE

9. The overarching policy and legislation relevant to the EIA is described in **Chapter 2 Policy and Legislative Context**. **Table 8.1** sets out the relevant legislation, policy and guidance that informs the assessment for the Benthic Ecology.

Table 8.1 Summary of relevant legislation, policy and guidance for benthic ecology

Relevant Legislation, Policy, or Guidance	Relevance to the Assessment
Legislation	
Marine (Scotland) Act 2010	Applies to Marine Licences applications within the Scottish marine area (0-12 nautical miles (nm)). The Act provides a framework to help balance competing demands on Scotland's seas. It introduces a duty to protect and enhance the marine environment and includes measures to help boost economic investment and growth in areas such as marine renewables.
The Nature Conservation (Scotland) Act 2004	The Nature Conservation (Scotland) Act 2004 sets out a series of measures designed to conserve biodiversity, and to protect and enhance the biological and geological natural heritage. This Act also makes amendments to the Wildlife and Countryside Act (1981), strengthening the legal protection for threatened species to include 'reckless' acts.
Convention for the Protection of the Marine Environment of the North-East Atlantic (the 'Oslo and Paris Convention for the Protection of the Marine Environment of the North-East Atlantic Convention') 1992	Provides a legal framework to protect and conserve maritime ecosystems through the prevention and elimination of pollution from offshore sources.
Conservation of Habitats and Species Regulations 2017 and The Conservation (Natural Habitats, &c.) Regulations 1994 (as amended) (Habitats Regulations)	Applies to Marine Licences and Section 36 applications within the Scottish inshore region. It applies European Protected Species (EPS) protections in waters within 12 nm from shore.
Marine Strategy Regulations 2010	The Marine Strategy Framework Directive (MSFD) requires the UK to put in place measures to achieve or maintain good environmental status (GES) in the marine environment by 2020. The MSFD is transposed for the whole of the UK by the Marine Strategy Regulations 2010, providing a UK-wide framework for meeting the requirements of the Directive. The Regulations require the UK to monitor, assess and report progress towards GES; and to implement a programme of measures to achieve or maintain GES targets.
Policy	
National Planning Framework 4 (Scottish Government, 2023)	The National Planning Framework 4 (NPF4) sets out Scotland's spatial principles, regional priorities, national developments and national planning policy NPF4 presents Sustainable Places, Liveable Places and Productive Places to achieve national outcomes including benefits to the environment, communities, and health. NPF4 contains a notable focus on tackling both the climate and nature crises. **The key references are:** **Policy 3: Biodiversity** – *"Development proposals will contribute to the enhancement of biodiversity, including where relevant, restoring degraded habitats and building and strengthening nature networks*

Relevant Legislation, Policy, or Guidance	Relevance to the Assessment
	and the connections between them. Proposals should also integrate nature-based solutions, where possible…"
Scottish Biodiversity Strategy to 2045 (Scottish Government, 2024).	Sets out Scotland's national ambition to halt biodiversity loss by 2030 and restore ecosystems by 2045.
Sectoral Marine Plan for Offshore Wind Energy (Scottish Government, 2020b) and Scottish Government (2025) Draft updated Sectoral Marine Plan for Offshore Wind Energy, May 2025	The Sectoral Marine Plan (SMP) for Offshore Wind Energy identifies sustainable areas for the future development of commercial scale offshore wind energy in Scotland, including a spatial strategy to inform the seabed leasing process for the purposes of offshore wind energy. The WDA is located in Plan Option W1, as identified in the SMP for Offshore Wind. Plan Options including W1 were subject to testing, refinement and area reduction through Strategic Environmental Assessment (SEA), Habitats Regulations Appraisal (HRA) and plan development processes. The SEA identified relevant characteristics of Plan Option W1 and identified key risks to be addressed in consenting applications. A key risk factor identified for the W1 area was potential impacts on benthic habitats and species. The SMP should guide licensing and consenting decision-making and support projects to further progress through the leasing process, in accordance with the objectives and marine planning polices set out in the adopted National Marine Plan (NMP).
Scotland's National Marine Plan (Marine Scotland, 2015)	The following general policies apply to this benthic ecology assessment: **The key references are:** **GEN 9: Natural heritage**: *": Development and use of the marine environment must: (a) Comply with legal requirements for protected areas and protected species. (b) Not result in significant impact on the national status of Priority Marine Features.* **GEN 10: Invasive non-native species**: "*Opportunities to reduce the introduction of invasive non-native species to a minimum or proactively improve the practice of existing activity should be taken when decisions are being made."*
Argyll and Bute Local Development Plan 2 (2024)	**The relevant policies are:** **Policy 28: Supporting Sustainable Aquatic and Coastal Development** – *"Proposals for marine and freshwater aquaculture, marine and coastal developments will be supported where it can be demonstrated that there will be no significant adverse effects, directly, indirectly or cumulatively on: The landscape/coastal character, seascape or visual amenity (including Isolated Coast, Wild Land and National Scenic Areas) …"* **Policy 73: Development Impact on Habitats, Species and Biodiversity** – *"When considering development proposals Argyll and Bute Council will give full consideration to the legislation, policies and conservation objectives, contained within the following: i) Wildlife and Countryside Act 1981; (and as amended by the Nature Conservation (Scotland) Act 2004) …"* **Policy 74: Development Impact on Sites of International Importance** – *"Unless development is directly connected with or necessary to their conservation, proposals likely to have a*

Relevant Legislation, Policy, or Guidance	Relevance to the Assessment
	significantly adverse effect, including cumulative, upon an existing or proposed Special Protection Area, existing or candidate Special Area of Conservation, or Ramsar Site (i.e. European Sites), including development out with the site, shall require appropriate assessment…"
Guidance	
Marine Monitoring Handbook (JNCC, 2001)	These guidelines have been produced by Joint Nature Conservation Committee (JNCC) to promote good practice in marine monitoring.
Guidelines for the Conduct of Benthic Studies at Marine Aggregate Extraction Sites (Ware & Kenny, 2011)	This guidance has been produced to accompany any dredging application and designed to promote a comprehensive and consistent approach to the assessment of the benthic environment (i.e. sediments and associated benthic fauna).
Guidelines for Data Acquisition to Support Marine Environmental Assessments for Offshore Renewable Energy Projects (Cefas, 2012)	These guidelines assist in the design, review and implementation of environmental data collection and analytical activities associated with all stages of offshore renewable energy developments.
Guidance and publications from Scottish Natural Heritage (SNH) and Marine Scotland on Priority Marine Features and Marine Protected Area search features (Tyler-Walters *et al.,* 2016)	Provides guidance on the Priority Marine Features (PMF) and Marine Protected Area (MPA) features.
Guidelines for Ecological Impact Assessment in the United Kingdom and Ireland Terrestrial, Freshwater, Coastal and Marine. (CIEEM, 2022)	This guidance provides practical advice for all professionals involved with ecological evaluation and assessment for proposed developments in terrestrial, freshwater, marine and coastal environments.
NatureScot guidance on marine invasive non-native species (NatureScot, 2023)	This document provides guidance on marine Invasive Non-Native Species (INNS).
Code of Practice on Non-Native Species, approved by the Scottish Parliament (Scottish Government, 2012)	Provides guidance on INNS known to threaten Scotland.
Marine Information Network / Marine Evidence-Based Sensitivity Assessments approach to sensitivity (Tyler-Walters *et al.,* 2023)	The Marine Evidence-Based Sensitivity Assessments (MarESA) methodology provides a systematic process to compile and assess the best available scientific evidence to determine each sensitivity assessment.
Guidance on Environmental Considerations for Offshore Wind Farm Development (OSPAR Commission, 2008a)	This guidance note provides assistance to Oslo and Paris Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR) contracting parties, developers, consultants, regulators or any other interested parties or individuals in the identification and consideration of some of the issues associated with determining the environmental effects of offshore windfarm developments.
Assessment of the environmental impact of offshore wind-farms (OSPAR Commission, 2008b)	Describes the status of offshore windfarm development within the OSPAR area in terms of the current scale and planned potential schemes, and the environmental effects.
Marine Scotland Consenting and Licensing Guidance: For Offshore Wind, Wave and Tidal	Provides guidance on applying for Section 36 consents and marine licenses for offshore renewable energy projects within both Scottish

Relevant Legislation, Policy, or Guidance	Relevance to the Assessment
Energy Applications (Marine Scotland, 2018) and proposed revision	Territorial Waters (out to 12 nm) and Scottish Offshore Waters (12-200 nm).

8.3 CONSULTATION

10. This benthic ecology chapter has been informed by engagement with stakeholders, including those listed below:

- Argyll and Bute Council;
- MD-LOT;
- Marine Directorate Science, Evidence, Data and Digital;
- NatureScot; and
- Scottish Fishermen's Federation (SFF).

11. As part of the consultation process, the Applicant presented the approach to assessment to stakeholders to offer transparency around the scoping methodology and rationale, capture stakeholder advice and guidance, and incorporate stakeholder feedback, where appropriate. A summary of the approach to stakeholder communication and consultation is outlined in **Chapter 6 Consultation and Stakeholder Engagement**.

12. The consultation outcomes in relation to benthic ecology are outlined in **Table 8.2**, which summarises stakeholder feedback, outlines how the Applicant has responded to the feedback received, and details how it has been considered within this chapter.

13. In addition to the engagement outlined in **Table 8.2**, the points of agreement reached at scoping between the Applicant and NatureScot, and Argyll and Bute Council are listed below:

- The proposed approach to characterisation of the baseline environment;
- The proposed EIA methodology and approach to assessment;
- The scoping of potential impacts including that NatureScot are content for impacts from noise and vibration during construction and decommissioning to be scoped out with respect to benthic ecology;
- The proposed approach to consideration of benthic ecology receptors in HRA and Nature Conservation Marine Protected Area (NCMPA) Screening; and
  Agreement in principle with the preliminary results presented for the HRA and NCMPA Screening for benthic ecology receptors.

14. Other points of agreement communicated through stakeholder responses to the Scoping Opinion are detailed in **Table 8.2**.

Table 8.2 Summary of consultation relevant to benthic ecology

I.D.	Consultee	Date/ Engagement Activity	Stakeholder Comment	Applicant Response
Pre-Scoping Opinion (including Scoping Workshop and Expert Topic Groups)				
1.	NatureScot and Argyll and Bute Council	01 May 2024: Benthic Ecology Scoping Workshop (NatureScot) 13 May 2024: Written Feedback (Argyll and Bute Council)	NatureScot and Argyll and Bute Council advised that invasive non-native species (INNS) should be scoped in at this stage and noted the potential for WDA infrastructure to act as 'stepping-stones' for spread of INNS. • NatureScot advised potential impacts associated with the potential removal and spread of INNS are considered for the decommissioning phase.	Potential impacts from INNS have been scoped in for all phases (see **Sections 8.11.1.3** and **8.11.2.3**) and includes consideration of potential 'stepping stone' effects (i.e. the potential for Project infrastructure to act as a vector for INNS spread). Also, see **Appendix 8 Invasive Non-Native Species Mitigation Plan**.
2.	NatureScot and Argyll and Bute Council	01 May 2024: Benthic Ecology Scoping Workshop (NatureScot) 13 May 2024: Written Feedback (Argyll and Bute Council)	NatureScot advised that the proposed EIA methodology and approach to assessment is suitable, however advised that the benthic ecology study area should be the same as that for the Marine Physical Environment. Argyll and Bute Council agreed with this recommendation.	Due to changes in the WDA boundary since scoping, the extent of the tidal excursion area has changed in **Chapter 7 Marine Physical Environment** and therefore the Benthic Ecology Study Area has been updated (**Figure 8.1**) to align with the tidal excursion ellipse: • Approximately 4 to 7 km in the North and centre of the WDA; and • Between 7 to 11 km towards the South of the WDA.
			NatureScot advised that the National Marine Plan Interactive (NMPi) portal and OneBenthic portal should be added to the data sources list. Argyll and Bute Council agreed with this recommendation.	The Applicant has included both the National Marine Plan Interactive (NMPi) and Centre for Environment, Fisheries and Aquaculture (Cefas) OneBenthic Baseline tool as existing data sources in **Table 8.3**.
			NatureScot advised that the potential impacts on Benthic Ecology receptors from scour and changes in hydrodynamics be added.	Potential impacts on benthic receptors from scour and changes in hydrodynamics are considered in the assessment of increased suspended sediment concentrations and sediment re-deposition (see **Sections 8.11.1.1** and **8.11.2.1**).
3.	Argyll and Bute Council	13 May 2024: Written Feedback (Argyll and Bute Council)	Consider it important that Invasive Non-Native Species (INNS) should be scoped in at this stage. I do not agree that the introduction of marine INNS from vessel traffic be scoped out. It is important to consider all possible translocation transport pathways.	The introduction of Marine INNS has been assessed in **Section 8.11.1.3**.

I.D.	Consultee	Date/ Engagement Activity	Stakeholder Comment	Applicant Response
4.	NatureScot	03 June 2024: Benthic Ecology Scoping Workshop - Written Feedback	NatureScot advised that, in addition to O&M, noise and vibration impacts can also be scoped out for benthic receptors during construction and decommissioning.	Noise and vibration impacts have been scoped out for benthic receptors for all phases.
5.	NatureScot	26 July 2024: Benthic Ecology Scoping Workshop - Written Feedback	NatureScot advised that the Applicant include Benthic Ecology Characterisation Site Investigation Survey reports within the WDA Scoping Report.	The benthic characterisation survey reports were provided alongside the Scoping Report application as **Appendix B Third-Party Benthic Subtidal Survey Interpretative Report (Briggs, 2024[1])**, **Appendix C Contaminants Survey Report (Fugro, 2023a[2])** and **Appendix D MachairWind 2023 Benthic Characterisation Report (Fugro, 2023b[3])**. The additional Habitat Assessment Report conducted in 2025 is appended in **Appendix 8.1 2025 Habitat Assessment Report**. Only geophysical data was collected during this campaign; however, the report utilises data from the 2023 Benthic Characterisation Report (Fugro, 2023b) to characterise the marine habitats. Additionally, **Appendix 8.3 Geophysical and Habitat Interpretative Report** produced as part of the suite of reports for the Project's site investigation survey was not submitted with the scoping report but is submitted with this WDA application. It should be noted that Fugro 2023b has been updated since submission of the scoping report to include a stony reef assessment for station MCW-C-ST83 and MCW-C-ST91 which was not included in Fugro 2023b (see **Appendix 8.2 Benthic Characterisation Report**).

[1] Appendix B – Third-Party Benthic Subtidal Survey
[2] Appendix C – Contaminants Survey Report
[3] Appendix D – MachairWind 2023 Benthic Characterisation

I.D.	Consultee	Date/ Engagement Activity	Stakeholder Comment	Applicant Response
Scoping Opinion				
6.	Argyll and Bute Council	09 January Scoping Opinion	Do you agree that the embedded mitigation measures described provide a suitable means for managing and mitigating the potential effects of the WDA on benthic receptors? Yes, in agreement with the embedded mitigation measures described.	Noted.
7.	Argyll and Bute Council	09 January Scoping Opinion	Have all benthic ecology impacts resulting from the WDA been identified in the Scoping Report? All benthic ecology impacts appear to have been identified. With reference to M-8 Cable Plan, I would advise that where environmental conditions allow cable burial should be at a minimum depth of 1.5 m below the seabed. This would avoid significant effects on benthic receptors, as per discussed in Table 8.8 Potential impacts scoped in or scoped out for benthic ecology.	The purpose of cable burial is to ensure that the cables are protected from damage, either from human activities such as fishing and shipping, or from naturally occurring physical morphology processes acting on the seabed. Cable minimum Depth of Lowering (DoL) (i.e. the distance between mean seabed level and the top surface of the buried cable will be between 0.3 m and 3 m but is typically between 1.0 m and 2.0 m in seabed substrates consisting of granular material or soft clay. Where practicable, the Applicant will seek to achieve DoLs of 1.0 m to 2.0 m for all offshore cable types. DoLs of up to 3.0 m may be used for areas experiencing significant seabed mobility or due to an increased external threat, such as crossing shipping lanes. DoLs of 0.3 m may be used for IACs in challenging ground conditions such as shallow outcropping rock, due to the inherent protection it provides the cable at a shallower DoL. OSP link cables and offshore export cables would, as far as practicable, have a minimum DoL of 1 m. Otherwise, external cable protection methods would be considered such as concrete mattresses, rock placement, rock bags and nature inclusive design solutions (see **Chapter 3 Project Description** for further details). The preferred method of cable protection is through cable burial. The use of external cable protection methods would be avoided as far as practicable, and the Applicant is considering the use of nature inclusive design solutions (see **Chapter 3 Project Description** and the **Nature Positive Plan**).

I.D.	Consultee	Date/ Engagement Activity	Stakeholder Comment	Applicant Response
				Section 8.11.1.6 assesses the interaction of electromagnetic field (EMF) with benthic receptors in consideration of the minimum DoLs described above.
8.	Argyll and Bute Council	09 January Scoping Opinion	Do you agree with the benthic ecology impacts that have been scoped in and out from further consideration within the EIA? Yes, in agreement with the scoping in and out of the EIA.	Noted.
9.	Argyll and Bute Council	09 January Scoping Opinion	Have all the relevant data sources been identified in the Scoping Report? All relevant data sources appear to have been identified in the Scoping Report. NatureScot should be able to confirm this.	Noted.
10.	Argyll and Bute Council	09 January Scoping Opinion	Do you agree with the proposed approach to assessment? Yes, the approach to the assessment appears to be satisfactory.	Noted.
11.	Argyll and Bute Council	09 January Scoping Opinion	Do you have any other matters or information sources that you wish to be presented in the EIAR? No	Noted.
12.	MD-LOT	09 January Scoping Opinion	The Scottish Ministers are broadly content with the study area as defined in Section 8.6 of the Scoping Report and that the baseline data gathered for the assessment is appropriate. This view is supported by NatureScot.	Due to changes in the WDA boundary, the extent of the tidal excursion area has changed and therefore the Study Area has been updated (**Figure 8.1**).
13.	MD-LOT	09 January Scoping Opinion	In line with the representation from NatureScot, the Scottish Ministers broadly agree with the impacts to be scoped in and out as summarised in Table 8.8 of the Scoping Report. The Scottish Ministers highlight the representation made by SFF relating to impacts to benthic invertebrates from thermal emissions, disturbance from noise and vibration on fish and shellfish,	Potential impacts on benthic invertebrates due to heat from offshore cables has been assessed in **Section 8.11.1.7**. Disturbance from noise and vibration on fish and shellfish is assessed in **Chapter 9 Fish (including Basking Sharks) and Shellfish** (Section 9.11.1.3)

I.D.	Consultee	Date/ Engagement Activity	Stakeholder Comment	Applicant Response
			and foundation works and advise that consideration is given to these points in the EIA Report.	
14.	MD-LOT	09 January Scoping Opinion	With regard to the proposed approach to assessment as outlined in section 8.12 of the Scoping Report, the Scottish Ministers are broadly content with this approach, however highlights the representation from NatureScot regarding site-specific surveys, priority marine features and definition of value and request that this must be fully addressed and implemented in the EIA Report.	Noted. See response provided below (I.D. 15) and to NatureScot in I.D. 26.
15.	MD-LOT	09 January Scoping Opinion	The Scottish Ministers note that no sites with Annex 1 habitat features are located within the Proposed Development site boundary. However, the Scottish Ministers highlight the NatureScot representation which states that surveys identified stony reef with epifauna relating to this habitat immediately adjacent to the Proposed Development and therefore advise that potential impacts on this site should be considered further, and if necessary, included for assessment.	Noted. **Appendix 8.1 2025 Habitat Assessment Report** provides a review of the acquired geophysical data and benthic ecology within the survey area, which identified the potential for Annex I habitat. Therefore, potential impacts on Annex I habitat (i.e. stony or rock reef) within the Benthic Ecology Study Area / Zone of Influence (ZoI) have been included in the assessment (**Section 8.11**).
16.	MD-LOT	09 January Scoping Opinion	Section 8.10 of the Scoping Report considers potential cumulative impacts. In line with the NatureScot representation, the Scottish Ministers advise that the Cumulative Effects Assessment ("CEA") for benthic ecology should consider all proposal alone impacts deemed negligible. Additionally, the Scottish Ministers advise that the impacts of electromagnetic field ("EMF") are also considered in the cumulative assessment, and refer the Developer to the NatureScot representation for further details.	EMF is assessed for the WDA-alone in **Section 8.11.1.6**, the whole-Project in **Section 8.11.2.6** and cumulatively in **Section 8.12.3.6.** Also, see I.D. 30 regarding consideration of negligible effects in the CEA.
17.	MD-LOT	09 January Scoping Opinion	The Scottish Ministers highlight the representation from NatureScot regarding the proposed approach to mitigation and request that consideration is given to	See above response (I.D.7) to Argyll and Bute Council.

I.D.	Consultee	Date/ Engagement Activity	Stakeholder Comment	Applicant Response
			ensuring a target cable burial depth of at least 1m to mitigate the effects of EMF on benthic ecology receptors. In addition, the Scottish Ministers direct the Developer to the representation from Argyll and Bute Council with regards to cable burial depth for consideration.	
18.	MD-LOT	09 January Scoping Opinion	The Scottish Ministers are in agreement that transboundary impacts can be scoped out of the EIA for Benthic Ecology, as discussed in Section 8.11 of the Scoping Report.	Noted.
19.	NatureScot	09 January Scoping Opinion	The study area is defined by a 23km tidal excursion that extends from the WDA in a predominantly southerly direction. The benthic ecology study area reflects the marine physical environment study area as recommended during Scoping Workshop. As a result, we are satisfied with the study area proposed, whilst reiterating our comment above in the physical processes advice.	Due to changes in the WDA boundary since scoping, the extent of the tidal excursion area has changed in **Chapter 7 Marine Physical Environment** and therefore the Benthic Ecology Study Area has been updated (**Figure 8.1**) to align with the tidal excursion ellipse: • Approximately 4 to 7 km in the North and centre of the WDA; and • Between 7 to 11 km towards the South of the WDA.
20.	NatureScot	09 January Scoping Opinion	Section 8.7 provides information in relation to the existing environment using publicly available data sources along with site-specific survey data. We are content with the information presented, noting that the survey data provides good coverage of the WDA, particularly with the addition of the third-party (2021) survey work. The results of the Environmental DNA survey (Appendix E) has also been provided to compliment the baseline data, which is welcomed.	Noted.
21.	NatureScot	09 January Scoping Opinion	The proposed data sources and guidance documents as listed in Section 8.4 are comprehensive and reflect our advice during the Scoping Workshop. Therefore, we are content with the data sources identified in the Scoping Report.	Noted.

I.D.	Consultee	Date/ Engagement Activity	Stakeholder Comment	Applicant Response
22.	NatureScot	09 January Scoping Opinion	Scoping of potential impacts are discussed in Section 8.9 and we are content that the potential impacts relevant to benthic ecology have been identified.	Noted. As requested by the SFF (I.D.37) and MD-LOT (I.D.13), potential impacts on benthic invertebrates due to heat from offshore cables has been assessed in **Section 8.11.1.7.**
23.	NatureScot	09 January Scoping Opinion	We are generally content with the potential impacts that have been scoped in and out of assessment as per Table 8.8 subject to the following comment. It is noted in Paragraph 371 that "Impacts which span the entire lifetime of the Project (e.g. permanent habitat loss as a worst case) will only be considered as part of the O&M phase in the EIA to avoid duplication. It will be highlighted in the O&M section of the EIAR that impacts such as permanent habitat loss begin to occur in construction and potentially continue during and after decommissioning." Whilst we would normally expect impacts to be scoped in and assessed for all relevant phases of the development, this approach seems pragmatic given the uncertainty around decommissioning activities at this stage. We would expect assessment of this impact to be considered further in a decommissioning plan.	Permanent habitat loss impacts have been assessed for the O&M phase in **Section 8.11.1.4**. A Decommissioning Programme will be produced in the pre-construction period where further consideration of this potential impact will be provided (**Table 8.7**).
24.	NatureScot	09 January Scoping Opinion	The proposed approach to assessment is set out in Section 8.12, which we are generally content with subject to the following comments.	Noted.
25.	NatureScot	09 January Scoping Opinion	Two site-specific benthic surveys have been undertaken to help characterise the baseline environment and we welcome the inclusion of the Survey Reports (Appendices B – E). However, it would have been useful for the analysis of the surveys to have been incorporated into the Scoping Report to help inform the proposed assessment approach.	Noted. The analysis of the surveys has been incorporated into **Section 8.8**.
26.	NatureScot	09 January Scoping Opinion	A number of PMFs have been recorded within the WDA, although the location and extent / number of individuals	Noted. Relevant PMFs have been included in the assessment (see **Section 8.9**).

I.D.	Consultee	Date/ Engagement Activity	Stakeholder Comment	Applicant Response
			found is not clear. For the EIA Report, we recommend including greater detail in relation to which PMFs have been recorded, including locations and numbers. We also advise that assessments should be undertaken for all PMF habitats and species recorded within the WDA. The assessment should quantify, where possible, the likely impacts to PMFs and assess whether this could lead to a significant impact on the national status of each PMF.	
27.	NatureScot	09 January Scoping Opinion	Whilst it is noted that there are no areas of identified Annex 1 stony reef within the WDA, both surveys identified stony reef with epifauna relating to this habitat, immediately adjacent to the WDA and within the 23km study area. Potential impacts from the proposal could extend into this habitat (and benthic communities) and therefore should be considered further, and if necessary, included for assessment.	Noted. See response provided to MD-LOT in I.D. 15.
28.	NatureScot	09 January Scoping Opinion	With respect to the definitions of value for benthic receptors outlined in Table 8.11, it is advised that Annex I habitats, whether they are in a designated site such as a Special Area of Conservation (SAC) or ncMPA or not, should be considered as 'High' value. As a result, we recommend amending the table to note "Habitats (and species) protected under international law (e.g., all Annex I habitats, regardless of their location). Otherwise, we are generally content with the proposed approach to assessment for benthic ecology.	The criteria for 'High' value receptors in **Table 8.10** has been amended to 'Habitats (and species) protected under international law (e.g., all Annex I habitats, regardless of location).'
29.	NatureScot	09 January Scoping Opinion	Section 8.10 notes that the CEA will follow the approach outlined in Chapter 4 (Approach to Scoping and EIA), which is largely appropriate. One aspect that should be considered cumulatively is Electromagnetic Fields (EMF) both within the array and with the export cable and other cables. Whilst there are fewer proposed wind farms on	As described in **Chapter 1 Introduction**, for consenting purposes, the Project has been split into the following three Development Areas for which separate consents and/or licences will be sought by the Applicant for the respective infrastructure.

I.D.	Consultee	Date/ Engagement Activity	Stakeholder Comment	Applicant Response
			the west coast of Scotland, there are more electricity network cables. There has been a tendency for wind farm proposals to dismiss impacts from EMF from a cumulative perspective. We are concerned that the spatial and temporal scale is not being sufficiently considered cumulatively across the network of cables, including those outwith the proposed development. We therefore advise that EMF impacts should be considered in a cumulative assessment whether requested in the WDA or OfTDA scoping is a moot point as we anticipate there will be one EIA Report to cover all aspects at the application stage.	• The WDA for the installation and operation of the WDA infrastructure (noting this includes the portion of the offshore export cable(s) located therein); • The Offshore ECC, for the installation and operation of the Offshore ECC infrastructure; and • The OnTDA, for the installation and operation of the OnTDA infrastructure. Combined effects on benthic ecology between the WDA and the Offshore ECC are considered within **Section 8.11.2**, commensurate with the level of detail available at the time of undertaking the assessment. Within the subsequent EIAR for the Offshore ECC and planning application for the OnTDA, the impact assessments (including cumulative) from this WDA EIAR will be taken forward and refined. EMF is assessed cumulatively in **Section 8.12.3.6.**
30.	NatureScot	09 January Scoping Opinion	As with the majority of other receptors, it is noted in Section 8.10 that “impacts assessed as negligible will not be taken forward to CEA and it is possible that some will be screened out on the basis that they are highly localised or the risk of effects occurring is reduced, given management measures will be in place for the Project and other plans and projects.” We advise that proposal alone impacts could be deemed negligible, but when combined with others, the overall magnitude could be greater and therefore result in a cumulative effect. As such, further consideration should be given to negligible proposal alone impacts in the CEA. It is also noted in Chapter 4 that the Applicant will seek agreement with MD LOT on the list of projects and/or plans to be included in the CEA, which we support.	Where the potential significant effect for the WDA alone is assessed as negligible, or where an impact is predicted to be highly localised, these will not generally be considered within the CEA, as there is not considered to be a potential for significant cumulative effects with other plans, projects or activities. However, under certain circumstances, negligible effects may be taken forward in cases where it is deemed there is potential for negligible effects to compound and potentially lead to greater than negligible effects when considered cumulatively, based on expert judgement. The Applicant has consulted with MD-LOT on cumulative Projects in March 2026.
31.	NatureScot	09 January Scoping Opinion	We are content with the embedded mitigation measures proposed in Table 8.7 although as noted previously, the embedded mitigation includes adherence to post-consent	See: • **Appendix 6 Outline Environmental Management Plan**; • **Appendix 7 Marine Pollution Contingency Plan**; and

I.D.	Consultee	Date/ Engagement Activity	Stakeholder Comment	Applicant Response
			plans / programmes that will mitigate impacts for which no detail has yet been provided.	• **Appendix 8 Invasive Non-Native Species Mitigation Plan**. Appendix 7 and 8 have been developed in line with MD-LOT (2025) guidance and consultation with MCA and NatureScot respectively has been undertaken as advised in the guidance. With respect to an outline Cable Plan, this has not been submitted with the application; however in line with MD-LOT guidance (MD-LOT, 2025) this will be produced post-consent and will describe the technical specification of the offshore cables alongside measures that will be put in place to avoid or reduce the adverse effects of the Project on civilian and military marine navigation. It is also anticipated that the following will be described in the Cable Plan: • Consideration of the potential effect of EMF on civil and military marine navigation and ecological receptors. • Cable burial risk assessment • Locations and lengths of cable burial and burial depths; • Cable crossing location information; • Micro-siting requirements i.e. of cable routes to avoid, where practicable, for example, potential impacts on sensitive benthic features identified during pre-construction surveys; • External cable protection requirements (including consideration of reduction in navigable depth); and • Details of post-construction cable surveys for asset integrity purposes.
32.	NatureScot	09 January Scoping Opinion	In addition, should significant effects be identified during the EIA, the embedded mitigation measures proposed may not be sufficient to mitigate impacts.	No significant effects (taking account of embedded mitigation) on benthic ecology receptors have been identified (see **Table 8.26**).
33.	NatureScot	09 January Scoping Opinion	It is stated in Table 3.7 that the minimum target depth for cable burial is 0.5m. This is considerably shallower than what has been employed elsewhere and we are concerned that cables could therefore be vulnerable to	See above response (I.D.7) to Argyll and Bute Council.

I.D.	Consultee	Date/ Engagement Activity	Stakeholder Comment	Applicant Response
			re-exposure and damage. Moreover, we generally advise that the minimal target burial depth should be at least 1m to reduce potential EMF impacts.	
34.	NatureScot	09 January Scoping Opinion	Potential transboundary impacts are discussed in Section 8.11 - we are content for transboundary impacts for benthic interests to be scoped out from further consideration.	Noted.
35.	NatureScot	09 January Scoping Opinion	An HRA Screening Report has been submitted with the Scoping Report, which is welcomed. Section 4 concludes that as there are no SACs designated for benthic features within the Zone of Influence (ZoI) of the proposal, no European sites designated for benthic features have been screened in for assessment - we agree with these conclusions	Noted.
36.	NatureScot	09 January Scoping Opinion	An ncMPA Screening Report (Appendix H) has been provided alongside the Scoping Report. Having reviewed the information contained within the Screening Report, we agree that benthic features of the ncMPAs considered can be screened out from further assessment	Noted.
37.	Scottish Fishermen's Federation (SFF)	09 January Scoping Opinion	Q. Do you agree with the benthic ecology impacts that have been scoped in and out from further consideration within the EIA? SFF's response: No. SFF notes that the 'impacts to benthic ecology due to heat from subsea electrical cables' has not been scoped in. As there is no robust scientific evidence to reject the impacts of heat on benthic ecology; therefore, SFF would like to see the 'Impacts to benthic invertebrates due to thermal emissions from subsea electrical cables' to be scoped in. Any temperature change in the invertebrate's habitat	Potential impacts on benthic invertebrates due to heat from offshore cables has been assessed in **Section 8.11.1.7**.

I.D.	Consultee	Date/ Engagement Activity	Stakeholder Comment	Applicant Response
			would have adverse effects on their behaviour and increase their mortality rate.	
38.	SFF	09 January Scoping Opinion	We also propose that the 'Removal of hard substrates/Remobilisation of contaminated sediment during intrusive works' during construction should be scoped in as 'seabed preparation' for cabling (IACs) require seabed disturbance of at least along each cable. Foundation works also require seabed preparation, based on the size of the foundations, resulting in hard substrate removal.	The scoping of impacts has been agreed with MD-LOT. Remobilisation of contaminated sediments has been scoped out due to the Project's site investigation surveys indicating low levels of contaminants in the region (**Appendix C Contaminants Survey Report (Fugro, 2023a[4])**). Regarding removal of hard substrates during construction, the predominant sediment type throughout the WDA is sand with shell fragments, which forms the principal surface sediment across most of the site (**Section 8.8.1.1**). Localised depressions and several bathymetric highs contain coarser material, including gravelly sands, cobbles, and boulders. These features are particularly evident in the northern, southwestern, and southern parts of the area, where boulders are notably abundant. It is not anticipated that boulders would be removed and micro-siting around boulders is preferred to relocation. However, where relocation is required, the Project's Fisheries Liaison Officer (FLO) will liaise with the fishing industry on their locations. Therefore, removal of hard substrates during construction has not been assessed. Removal of the WDA infrastructure during decommissioning will be considered as part of the Decommissioning Programme to be produced in the pre-construction period.
Post Scoping Opinion				
39.	MD-SEDD	13 November 2025 / Expert Topic Group Meeting	Suggest the Project investigates Nature Inclusive Cable Enhancement and Protection (NICE) a project led by Cefas. alongside Nature Enhancement at Marine Offshore Energy Sites (NEMOES) as a case study for	Noted, this has been considered in preparation of the **Nature Positive Plan** submitted with this application.

[4] Appendix C – Contaminants Survey Report

I.D.	Consultee	Date/ Engagement Activity	Stakeholder Comment	Applicant Response
			Nature Inclusive Design (NID) around offshore energy structures.	

40.	NatureScot	24 February 2026 / Invasive Non-Native Species Mitigation Plan (INNSMP)
		
		Written Feedback
			NatureScot acknowledged that the INNSMP covers all likely marine INNS pathways and that the proposed control measures are adequate. Recommendations and advice were provided in relation to:
			• The following NBN Atlas records in close proximity to the WDA that should be highlighted as species of concern:
			  ○ One record of Pacific oyster (*Magallana gigas)* recorded on Oronsay approximately 15 km from the WDA. Pacific oyster is highly tolerant in offshore conditions and has the potential to expand its range using offshore structures.
			  ○ Four records of Japanese wireweed (*Sargassum muticum)* recorded on Colonsay, approximately 12 km from the WDA. While the risk of this INNS is likely to be low with respect to the WDA activities, there may be greater risk associated with the cable laying activities of the export cable corridor.
			• Table 3.1 identifies relevant legislation, policy, and guidance. Table 3.1 should highlight that under Section 14 of the Wildlife and Countryside Act 1981 accidental transfer of INNS is an offence, including for example, where site operations have allowed the spread of an INNS due to inadequate biosecurity.
			• It is important that all plans are actionable, and whilst the Contingency Plan (section 6.6) is thorough, it does miss some key contacts details from a user's perspective. For example, the Marine Directorate
				The Applicant shared a draft of **Appendix 8 Invasive Non-Native Species Mitigation Plan** with NatureScot on 27 January 2026 and the comments received on 24 February 2026 have been addressed in the version of the plan submitted with this application.

I.D.	Consultee	Date/ Engagement Activity	Stakeholder Comment	Applicant Response
			email for any non-native species concerns is MarineNonNativeSpecies@gov.scot. NatureScot would request notification via ENQUIRIES@Nature.scot to ensure the operational area is informed as well as the main contact. • It would be beneficial for the recording and reporting procedures included in the Contingency Plan (section 6.6) to also have associated indicative timeframes for the key actions identified. For example, in table 6.7, we anticipate that the actions set out in Stage One (including notifying Marine Directorate), are to be undertaken immediately/as soon as possible.	

8.4 EXISTING DATA SOURCES

15. **Table 8.3** sets out the information and data sources that have been used to inform this chapter.

Table 8.3 Summary of key datasets and information sources

Dataset	Description	Citation
Marine Protected Areas	MPA Mapper	JNCC, 2023
Priority Marine Habitats	Geodatabase of Marine features adjacent to Scotland Priority Marine Habitats (PMF) information.	Scottish Government, 2026
Priority Marine Features	Provides the characteristics, distribution and status of PMFs in Scotland.	Tyler-Walters *et al.,* 2016
	PMFs list, species and habitats on existing conservation.	JNCC, 2012
EUSeaMap	European Marine Observation and Data Network (EMODnet) seabed habitats mapping.	EMODnet, 2025
Marine Life Information Network	Marine Life Information Network (MarLIN) provides sensitivity and distribution information for receptors.	Marine Biological Association, 2026; Tyler-Walters *et al.,* 2023.
National Marine Plan Interactive	The NMPi is an interactive Geographic Information System (GIS)-based tool allowing you to view different types of information (as layers).	Marine Scotland, 2025
One Benthic Baseline Tool	Open Science open-access tool shows the faunal cluster identity of 0.1m^2 grab and core samples (processed using a 1mm sieve) held in the OneBenthic database.	Cefas, 2019

8.5 SITE-SPECIFIC SURVEY DATA

16. In addition to the existing data sources identified in (**Section 8.4**), the Project has undertaken site-specific surveys to inform the EIA (**Table 8.4**).

Table 8.4 Site-specific survey data

Dataset	Year(s)	Description
Third-party benthic survey	2021	A Benthic survey was undertaken by a third-party which overlaps with the Option Agreement Area (OAA). The benthic survey was undertaken by Briggs Marine and comprised the following: • 60 benthic sediment grab samples for contaminant, faunal, biomass and particle size distribution analysis; and • 20 transects of Drop-Down Video (DDV). This data has been acquired by the Applicant to supplement the Project's site investigation survey data which together has been used to characterise the Windfarm Development Area (WDA). See **Appendix B Third-Party Benthic Subtidal Survey Interpretative Report**[1].

Project's site investigation	2023	A site Investigation survey was undertaken by the Project across the OAA. The following works were undertaken by Fugro:
		• Geophysical survey:
		  ○ Side Scan Sonar;
		  ○ Multibeam Echosounder;
		  ○ Sub Bottom Profiler; and
		  ○ Magnetometer.
		• 57 benthic sediment grabs for contaminant, faunal, biomass and particle size distribution analysis;
		• 59 transects of DDV with seabed photographs; and
		• 29 water samples for environmental DNA analysis.*
		See **Appendix 8.2 Benthic Characterisation Report** and **Appendix 8.3 Geophysical and Habitat Interpretative Report** for further information. In addition, see **Appendix C Contaminants Survey Report**[2] and **Appendix E Environmental DNA Survey Interpretative Report**[5] submitted with the Project's Scoping Report.[6]

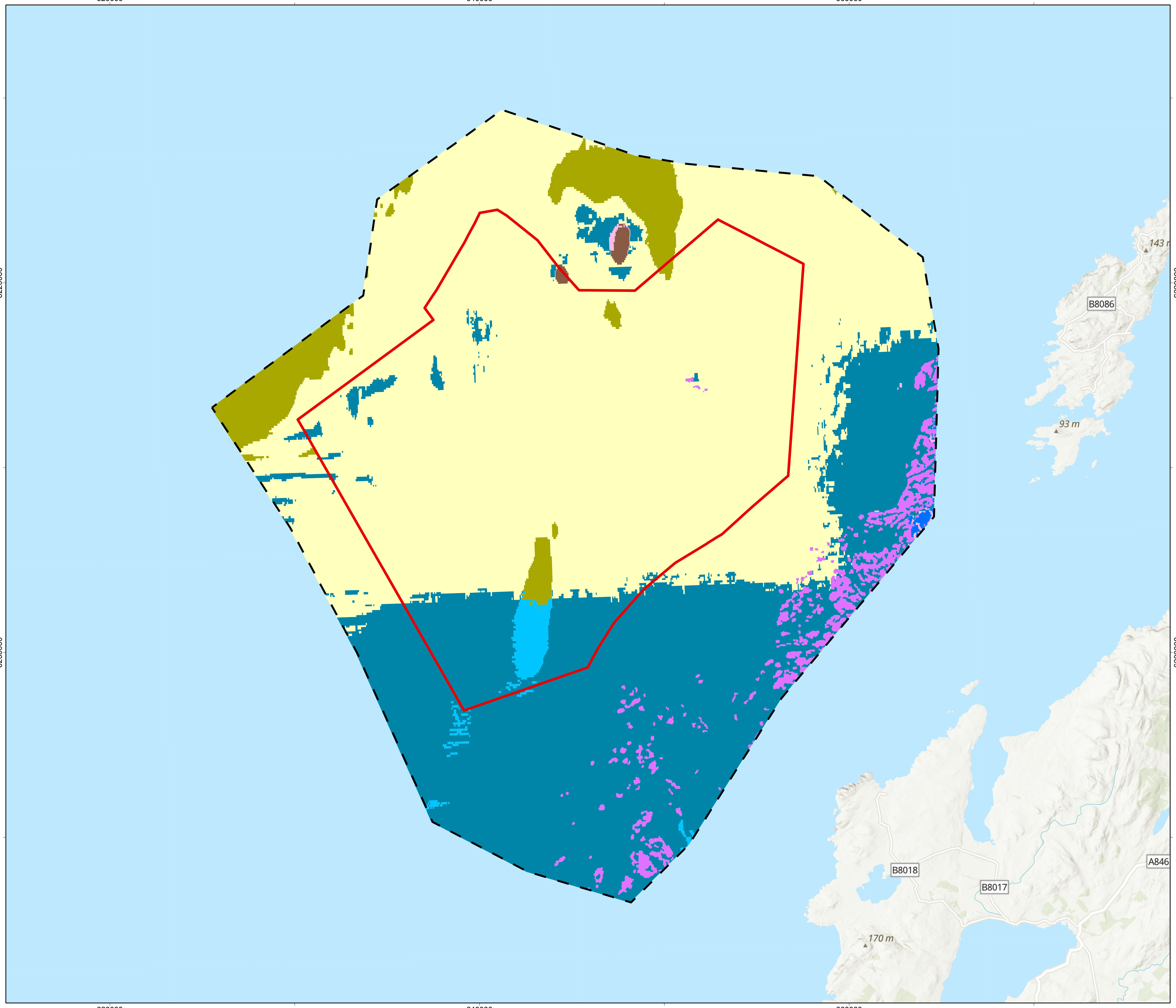
Project's geophysical survey	2025	A geophysical survey covering a portion of the WDA was undertaken in 2025 and included: • Side Scan Sonar (SSS); • Multibeam Echosounder; • Sub Bottom Profiler; and • Magnetometer. See **Appendix 8.1 2025 Habitat Assessment Report.**
* Note that eDNA has not been considered for baseline characterisation because there is no NatureScot guidance on its use within EIA.		

[5] Appendix E – Environmental DNA Survey Interpretative
[6] MachairWind Offshore Windfarm: Windfarm Development Area Scoping Report

8.6 BENTHIC ECOLOGY STUDY AREA

17. This section describes the Benthic Ecology Study Area and how it has been defined. The purpose of a Study Area is to set the geographical boundary within which the existing environment is described (**Section 8.8**) and the EIA will be conducted.

18. The Benthic Ecology Study Area (**Figure 8.1**) is defined by a tidal excursion that extends from the WDA in a southerly direction by approximately 7-11 km (i.e. the average distance travelled by tidal flow between low-water slack tide and high-water slack tide before the current direction reverses). The tidal excursion traverses only a short distance in all other directions (including approximately 4-7 km in the North and centre of the WDA). This encompasses the area over which suspended sediment could be transported following disturbance from the seabed. The tidal excursion extent has been estimated based on publicly available data including Admiralty charts. The Study Area for benthic ecology provides regional context and ensures coverage of the Zone of Influence (ZoI) of potential impacts.



Windfarm Development Area (WDA)

Benthic Ecology Study Area

Marine Habitat Classification (EUNIS, 2025)

- Circalittoral Coarse Sediment (MC32)
- Circalittoral Rock and Biogenic Reef (MC12)
- Circalittoral Sand (MC52)
- Infralittoral Coarse Sediment (MB32)
- Infralittoral Rock and Biogenic Reef (MB12)
- Infralittoral Sand (MB52)
- Offshore Circalittoral Coarse Sediment (MD32)
- Offshore Circalittoral Sand (MD52)

N

0 5 10 Kilometres

2	09/02/2026	AB	GC	RF	PB
REV	REV DATE	GIS CREATOR	GIS REVIEWER	TECHNICAL CHECKER	TECHNICAL APPROVER

DRAWING NUMBER	MCW-DWF-ENV-MAP-RHS-000154		
DATUM	ETRS89	PROJECTION	UTM Zone 29N
SCALE	1:200,000	PAGE SIZE	A3
PROJECT TITLE	MachairWind		

Figure 8.1: Benthic Ecology Study Area

Service Layer Credits: World Ocean Reference: Sources: Esri, TomTom, Garmin, GEBCO, National Geographic, NOAA, and the GIS User Community
World_Hillshade: Esri, Intermap, NASA, NGA, USGS
World Topographic Map: Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community
World Ocean Base: Esri, GEBCO, Garmin, NaturalVue

NOT TO BE USED FOR NAVIGATION

Haskoning
Enhancing Society Together

ScottishPower Renewables

Project: C:\Users\305050\OneDrive - Royal HaskoningDHV\P-PC3479-MachairWind-EIA-and-Consenting - 03 GIS\A02_Figures\03_EIA\01_WDA\Chap_08_BenthicEcol\MCW_EIA_WDA_BenthicEcol.aprx
Name: MCW-DWF-ENV-MAP-RHS-000154_BenthicEcolStudyArea

8.7 REALISTIC WORST-CASE SCENARIOS

19. The final design of the WDA will be confirmed by detailed engineering studies post-consent. To undertake a robust and precautionary impact assessment, the realistic worst-case design scenarios (i.e., those that would cause the greatest impact) are defined from the Project Design Envelope (PDE); ensuring that all other design scenarios would have equal or less impact. Please see **Chapter 5 EIA Methodology** for further details on the design envelope approach.

20. The realistic worst-case scenarios for benthic ecology assessment are summarised in **Table 8.5** below. These are based on the Project design as described in **Chapter 3 Project Description**.

Table 8.5 Realistic worst-case scenarios for impacts on benthic ecology

Impact	Realistic Worst-Case Scenario	Rationale
Construction		
Impact 1: Impacts on Suspended Sediment Concentrations (SSCs) and sediment re-deposition	**Seabed preparation disturbance volume prior to foundation and scour protection installation (WTGs and OSPs) = 5,961,073.28 m^3** • Worst-case WTG foundation type = suction bucket jacket; • Worst-case OSP foundation type = gravity base structure (GBS); • Maximum number of WTGs = 144; • Maximum number of OSPs = 2; • Maximum WTG suction bucket foundation diameter = 15 m; • Maximum OSP GBS foundation dimensions = 125 m x 120 m (length and width respectively); • Maximum proportion of foundations with scour protection = 100%; • Maximum volume of dredging per WTG foundation = 39,870.37 m3; • Maximum volume of dredging per OSP foundation = 109,870 m3; • Maximum volume of dredging for all WTGs = 5,741,333.28 m3; • Maximum volume of dredging for all OSPs = 219,740 m3; and • Maximum volume of dredging for all foundations = 5,961,073.28 m^3. **WTG foundation installation (with drilling) total volume of disturbance = 501,728.16 m^3** • Worst-case foundation type with drilling for total volume = monopile; • Worst-case drilling volumes are associated with the larger number of smaller WTGs; • Maximum number of foundations = 144; • Maximum foundation diameter associated with the smallest WTG = 13 m; • Maximum drill penetration depth: 45 m; • Maximum volume of drill arisings per WTG (for the smallest WTG) = 10,452.67 m^3; and • Total volume of sediment disturbed due to foundation arisings assuming up to a third of foundation locations require drilling (48 of 144) = 501,728.16 m^3. **OSP foundation installation (with drilling) total volume of disturbance = 49,480 m^3**	Disturbance of seabed sediment resulting in changes to SSCs in the water column could occur due to the following construction activities: **Seabed preparation prior to foundation and scour protection installation** Seabed preparation works, including sandwave clearance/levelling, could be required prior to installation of foundations and associated scour protection. The realistic worst-case scenario is the foundations that have the greatest seabed footprint which are suction bucket foundations for WTGs and gravity-base structure foundations for OSPs. **Foundation installation** The installation of foundations will likely result in the release of disturbed sediments. The greatest sediment release is anticipated to be from the installation of monopile foundations for WTGs and pin-pile foundations for OSPs, if drilling is required. Drilling would result in the release of seabed and subseabed sediments, which will be deposited adjacent to each drilled foundation location, if required. **Seabed preparation prior to cable installation** Seabed preparation works, including sandwave clearance/levelling, could be required prior to installation of IACs. Based on preliminary layouts of OSPs (see **Appendix 7.1 Marine Physical Environment Numerical Modelling Technical**

Impact	Realistic Worst-Case Scenario	Rationale
	• Worst-case foundation type with drilling for total volume = pin-pile; • Maximum number of piles per OSP = 16 (2 OSPs = 32 pin-piles total;) • Maximum pin-pile diameter = 4.5 m; • Maximum volume of drill arisings per pile = 1,546.25 m3; and • Total volume of sediment disturbed due to foundation arisings assuming all foundation locations require drilling = 49,480 m3. **Sandwave levelling / dredging disturbance volume prior to IAC installation = 4,011,700 m^3**. **IAC installation total volume of displaced sediment = 6,694,850 m^3** • Worst-case IAC sediment displacement volume calculated assuming a cable plough creating a 'v'-shaped trench; • Maximum length of IACs = 572,000 m; • Maximum seabed route length of IACs = 521,000 m • Maximum disturbance width = 20 m; • Maximum disturbance depth = 3 m; • Volume of sediment displaced per metre of IAC installation = 12.85 m^3; and • Total volume of sediment disturbed due to IAC installation = 6,694,850 m^3. **OSP link cable installation total volume of displaced sediment = 1,747,600 m^3** • Worst-case OSP link cable sediment displacement volume calculated assuming a cable plough creating a 'v'-shaped trench; • Maximum length of OSP link trenches = 136,000 m; • Maximum disturbance width = 20 m; • Maximum disturbance depth = 3 m; • Volume of sediment displaced per metre of cable installation = 12.85 m^3; and • Total volume of sediment disturbed due to OSP link cable installation = 1,747,600 m^3. **Offshore export cable (within the WDA) installation total volume of displaced sediment = 1,285,000 m^3** • Worst-case offshore export cable sediment displacement volume calculated assuming a cable plough creating a 'v'-shaped trench;	**Report**), seabed preparation for export cable and OSP link cables is not anticipated. If, following detailed design post-consent, there is a requirement for sandwave levelling for OSP link or export cable(s) within the WDA, the IAC levelling budget is anticipated to be sufficiently conservative to cover any additional requirement for other cable types. **Cable installation** Offshore cable sediment displacement volume has been calculated assuming a cable plough creating a 'v'-shaped trench at 35 degree stability however cable installation may require a combination of jetting and or ploughing installation techniques. Maximum seabed route length of IACs does not account for additional IAC length for assumed length between seabed and WTGs / OSPs however this additional length would not manifest an increase in sediment arisings. For OSP link cables and offshore export cable(s), up to two of these would be bundled in the same trench and therefore instead of the total length of these (272 km and 200 km respectively) being used to calculate the sediment displacement volume, it is the maximum trench length.

Impact	Realistic Worst-Case Scenario	Rationale
	• Maximum length of offshore export cable trench within the WDA = 100,000 m; • Maximum disturbance width = 20 m; • Maximum disturbance depth = 3 m; • Volume of sediment displaced per metre of cable installation = 12.85 m^3; and • Total volume of sediment disturbed due to offshore export cable (within the WDA) installation = 1,285,000 m^3. **Worst-case scenario for total temporary increases in SSCs = <u>20,251,431 m^3</u>**	
Impact 2: Temporary Physical Disturbance / Habitat Loss	**Seabed preparation disturbance area prior to foundation installation (WTGs and OSPs) = 1,590,956 m^2** Worst-case WTG foundation type for total area = suction bucket jacket Worst-case OSP foundation type for total area = GBS Maximum number of WTGs = 144 Maximum number of OSPs = 2 Maximum area of seabed preparation per WTG = 10,677.78 m^2 Maximum area of seabed preparation for total WTG foundations = 1,537,600.32 m^2 Maximum area of seabed preparation per OSP = 26,678 m^2 Maximum area of seabed preparation for total OSP foundations = 53,356 m^2 Maximum footprint area of preparation for all foundations = 1,590,956 m^2 **Offshore cables temporary disturbance = 15,140,000 m^2** Maximum seabed route length of IAC trenches = 521 km Maximum length of OSP link cable trenches = 136 km Maximum length of offshore export cable route trenches (within the WDA) = 100 km Maximum total length of all offshore cable trenches = 757 km Maximum width of seabed affected during cable installation (including spoil heaps) = 20 m Maximum total footprint of temporary seabed disturbance from installation of all offshore cables within the WDA = 15,140,000 m^2 **Construction vessel footprints = 630,720 m^2** Jack-up vessel footprint – WTG and OSP installation: 3,600 m^2 footprint per WTG (x 144) and OSP installation (x 2) = 525,600 m^2	For seabed preparation disturbance for WTGs, the largest area is associated with the higher number of smaller turbines. Suction bucket jacket WTG foundations have a maximum bucket diameter of 15 m with four suction buckets per foundation and hence represent the worst-case scenario for temporary physical disturbance / habitat loss. For IACs, the maximum length is 572 km based on worst-case WTG / OSP layouts used for other assessments (e.g. **Chapter 13 Shipping and Navigation**). However, the maximum seabed route length is 521 km which is the total length of cable that will interact with the seabed and which is therefore relevant to benthic ecology. The 572 km length accounts for the length of the cable between the seabed and WTG / OSP. For OSP link cables and export cable(s), as a worst-case scenario, it is assumed that the total length is also the seabed route length. For sandwave levelling, based on the indicative layouts, it is assumed that sandwave levelling would only be required for IACs. If, following detailed design post-consent, there is a requirement for sandwave levelling for OSP link or export cable(s) within the

Impact	Realistic Worst-Case Scenario	Rationale
	Anchoring footprint – WTG and OSP installation: 360 m^2 footprint per WTG (x 144) and OSP (x 2) installation x 2 for maximum number of operations per foundation installation = 105,120 m^2 **Sandwave levelling** Total area disturbed during sandwave levelling / dredging (m2) for IACs = 8,023,400 m^2 **Total temporary seabed disturbance/loss footprint from seabed preparation for WTG/OSP foundations, offshore cable installation and sandwave levelling = <u>25,385,076 m^2</u>**	WDA, the IAC levelling budget is anticipated to be sufficiently conservative to cover any additional requirement for other cable types. Seabed disturbance from boulder clearance during foundation installation would be encompassed by that assumed for seabed preparation for WTG and OSP foundation installation and therefore is not counted separately. It should be noted that since boulders that are not able to be micro-sited around during cable installation would be relocated to an adjacent area of seabed within 20 m, the temporary seabed disturbance footprint would be encompassed by the assumed 20 m wide temporary disturbance footprint from cable installation (see **Chapter 3 Project Description**). Similarly, boulders required to be relocated for WTG or OSP foundations would be placed within the maximum temporary seabed disturbance footprints of foundations. For OSP link cables and offshore export cable(s), up to two of these would be bundled in the same trench and therefore instead of the total length of these (272 km and 200 km respectively) being used to calculate the temporary physical disturbance / habitat loss area, it is the maximum trench length.
Impact 3: Introduction of marine Invasive Non-Native Species	Preconstruction vessel trips (round trips to and from port) (total): 140 Vessel trips across entire construction period (round trips to and from port) (total): 5699 Max. no. of all types of vessels operating on site simultaneously during construction: 117	The maximum number of vessel round trips and number of vessels operating on site simultaneously determines the risk for the potential spread of INNS.

Impact	Realistic Worst-Case Scenario	Rationale
Operation and Maintenance		
Impact 1: Impacts on SSCs and sediment re-deposition	**Cable repair and reburial total volume of sediment disturbed per year = 63,600 m^3** • **IAC repair / replacement:** Assuming 10 repair / replacement events over the project lifetime with 10,000 m of cable replaced per event = total IAC repair / replacement footprint of 500,000 m^2 • **OSP Link Cables repair / replacement:** Assuming 4 repair / replacement events over the project lifetime with 1,000 m of cable replaced per event = total OSP Link Cables repair / replacement footprint of 20,000 m^2 • **Offshore export cables (within the WDA) repair / replacement:** Assuming 2 repair / replacement events over the project lifetime with up to 2,000 m of cable replaced per event = total offshore export cables (within the WDA) repair / replacement footprint of 20,000 m^2 • **IAC reburial:** Assuming 28,600 m of cable reburied over the project lifetime = total IAC reburial footprint of 143,000 m^2 • **OSP link cables reburial:** Assuming 6,800 m of cable trench reburied over the project lifetime = total OSP link cables reburial footprint of 34,000 m^2 • **Offshore export cables (within the WDA) reburial:** Assuming 5,000 m of cable trench reburied over the project lifetime = total offshore export cables (within the WDA) reburial footprint of 25,000 m^2 • Maximum disturbance depth of cable repair and reburial = 3 m (assumed to be the equal to maximum cable burial depth) • Area of sediment disturbed due to all cable repair or replacement events = 540,000 m^2 • Area of sediment disturbed due to all cable remedial reburial events = 202,000 m^2 • Total area of sediment disturbed due to cable repair and reburial during operational life of 35 years = 742,000 m^2 • Total volume of sediment disturbed due to cable repair and reburial during operational life of 35 years = 2,226,000 m^3 (742,000 m^2 x 3 m) • Total volume of sediment disturbed per year due to cable repair / replacement and reburial = 63,600 m^3 (2,226,000 m^3 / 35 years)	Disturbance of seabed sediment resulting in changes to SSCs in the water column could occur due to the following O&M activities: **Cable repair and reburial** Temporary increases in SSCs would result from cable repair, replacement and reburial activities. The total disturbance footprint and volume over the 35-year operational period is based on yearly averages and thus assumes, for example, that there may be no cable repair in one year and then longer lengths of cable repair/replacement and/or reburial in other years. The worst-case assumes a maximum 5 m jetting disturbance width and 3 m disturbance depth for all repair / replacement and reburial events, and a maximum 5% of the length of each cable could require reburial over the Project's operational life. Further detail on maximum temporary O&M footprints in the WDA are provided in Table 3.5 of **Chapter 3 Project Description**.
Impact 2: Temporary Physical Disturbance / Habitat Loss	**Maintenance: seabed footprint disturbed per year on average = 36,217 m²** Cable Repair / Replacement • Assuming a maximum 5 m jetting disturbance width for all repair / replacement and reburial events.	Temporary physical disturbance / habitat loss could occur due to the following O&M activities: **Cable repair/replacement and reburial** Temporary physical disturbance would result from cable repair, replacement and reburial activities. The

Impact	Realistic Worst-Case Scenario	Rationale
	• IAC repair / replacement: Assuming 10 repair / replacement events over 35-year operational life with 10,000 m of cable replaced per event = total IAC repair / replacement footprint of 500,000 m² • OSP Link Cables repair / replacement: Assuming 4 repair / replacement events over 35-year operational life with 1,000 m of cable replaced per event = total OSP Link Cables repair / replacement footprint of 20,000 m² • Offshore export cable(s) (within the WDA) repair / replacement: Assuming 2 repair / replacement events over 35-year operational life with 2,000 m of cable replaced per event = total offshore export cable(s) (within the WDA) repair / replacement footprint of 20,000 m² Cable Reburial • Assuming a maximum 5% of the length of each cable could require reburial over the 35-year operational life. • Assuming a maximum 5 m jetting disturbance width for all repair / replacement and reburial events. • IAC reburial: Assuming 28,600 m of cable reburied over 35-year operational life = total IAC reburial footprint of 143,000 m² • OSP link cables reburial: Assuming 13,600 m of cable trench reburied over 35-year operational life = total OSP link cables reburial footprint of 34,000 m² • Offshore export cable(s) (within the WDA) reburial: Assuming 5,000 m of cable trench reburied over 35-year operational life = total offshore export cable(s) (within the WDA) reburial footprint of 25,000 m² Jack-up Vessel Footprints • Anticipated number of jack-up events over 35-year operational life = 292. • Jack-up vessel footprint = 1,800 m^2. • One jack-up event per maintenance activity. • Total footprint = 525,600 m^2 Totals • Cable repair or replacement = 540,000 m² • Cable remedial reburial = 227,000 m² • Jack-up vessel footprint = 525,600 m^2 • Overall, assuming a maximum of 1,267,600 m² of cable repaired/replaced and reburied and jack-up vessel footprints over the 35-year operational life • Maximum 36,217 m² disturbed per year	total disturbance footprint and volume over the 35-year operational period is based on yearly averages and thus assumes, for example, that there may be no cable repair in one year and then longer lengths of cable repair/replacement and/or reburial in other years. The worst-case assumes a maximum 5 m jetting disturbance width and 3 m disturbance depth for all repair / replacement and reburial events, and a maximum 5% of the length of each cable could require reburial over the Project's operational life. Further detail on maximum temporary O&M footprints in the WDA are provided in **Chapter 3 Project Description**.

<table>
<tr><th>Impact</th><th>Realistic Worst-Case Scenario</th><th>Rationale</th></tr>
<tr><td>Impact 3: Introduction of marine Invasive Non-Native Species</td><td>Annual no. of vessel round trips required for routine operation and planned maintenance activities: 423</td><td>As above for construction.</td></tr>
<tr><td>Impact 4: Permanent habitat loss

Impact 5: Colonisation of introduced hard substrate</td><td>Total worst-case area subject to permanent habitat loss / colonisation of hard substrate = 6,788,230.51 m^2

Maximum footprint of suction bucket jacket WTG foundations including scour protection = 5,496,530.51 m^2 (38,170.35 m^2 x 144 WTGs)

Maximum footprint area for two OSP GBS foundations including scour protection = 270,000 m^2

Maximum cable trench lengths:
IAC = 521 km (based on seabed route length)
OSP link trenches = 136 km
Offshore export cable trench lengths in the WDA = 100 km
Offshore cable protection width for all offshore cables where cables are unable to be buried due to ground conditions or for IACs on approach to WTGs = 13 m

Maximum IAC protection area (ground conditions) = 677,300 m^2

Maximum IAC protection (unburied cable on approach to WTG) = 93,600 m^2

Maximum IAC protection (combined ground conditions and unburied cable on approach to WTG) = 770,900 m^2

Maximum offshore export cable protection area within the WDA due to ground conditions = 65,000 m^2

Maximum OSP link cable protection area (unburied cable) = 176,800 m^2

Maximum OSP link cable protection area (crossings):
Maximum width of cable protection at crossings = 18 m
Maximum length of cable protection at crossings = 250 m per crossing
Maximum number of OSP link cable crossings required = 2
Maximum area of OSP link cable crossing protection = 9,000 m^2
Maximum area cable protection material (all sources) for OSP Link cables = 185,800 m^2</td><td>As a worst-case scenario, it is assumed that all foundations would require scour protection.

For OSP link cables and offshore export cable(s), up to two of these would be bundled in the same trench and therefore instead of the total length of these (272 km and 200 km respectively) being used to calculate the maximum cable protection requirement, it is the maximum trench length.

Calculations of the length of each cable type for which cable protection is required due to ground conditions being unsuitable for cable burial are based on:
10% of 521 km of IACs;
10% of 136 km of OSP link cable trenches; and
5% of 100 km of offshore export cable trenches.
For IAC, additional allowance for cable protection along 50 m of cable at each WTG is provided where IACs are unable to be buried on approach to WTGs (maximum width of protection is the same as for ground conditions i.e. 13 m).

Based on publicly available data there are no third-party cables or pipelines and therefore the only crossings assumed to be required are for OSP link cables crossing IACs.</td></tr>
</table>

Impact	Realistic Worst-Case Scenario	Rationale
	Total area of cable protection within WDA for all offshore cables = 1,021,700 m^2	
Impact 6: Interactions with Electromagnetic Fields Impact 7: Heat exposure from subsea electrical cables	Maximum length of IAC = 572 km Maximum length of OSP link cables = 272 km Maximum length of offshore export cable within the WDA: 200 km Max voltage: • IAC = 132 kV • OSP link and offshore export cable(s) = 525 kV Cable burial minimum target DoL: • IAC = 0.3 m • OSP link and offshore export cable = 1m	The worst-case for EMF is associated with the maximum length of cables. The minimum target cable burial DoL and external cable protection is also important as EMF and cable heat rapidly attenuates with distance from the cable. DoLs of 0.3 m may be used for IACs in challenging ground conditions such as shallow outcropping rock, due to the inherent protection it provides the cable at a shallower DoL.
Decommissioning		
Impact 1: Impacts on SSCs and sediment re-deposition; and Impact 2: Temporary Physical Disturbance / Habitat Loss	The worst-case scenarios for decommissioning would be similar to those defined in the construction phase.	The area at risk of disturbance from decommissioning will likely be lower than that presented in construction. Decommissioning will not involve seabed preparation and cable burial, and therefore impacts on the seabed are likely to be similar in nature but reduced in magnitude compared to construction.
Impact 3: Introduction of marine Invasive Non-Native Species	The number of vessels required for decommissioning is not yet known however it is assumed that impacts would be similar to those defined in the construction phase.	The greatest risk of introduction of INNS is through ballast water and biofouling from various vessels required during decommissioning however the same mitigation measures (**Section 8.9**) applied during construction would be applied during decommissioning.

8.8 EXISTING ENVIRONMENT

8.8.1 Existing Baseline

21. A benthic ecology survey was carried out within the original W1 option area in 2021 by a third-party. This included sediment samples and drop-down video. From this data, a baseline characterisation report (Briggs, 2024[1]) was completed.

22. Another site investigation survey was undertaken in 2023 by the Project across the OAA (**Appendix 8.2 Benthic Characterisation Report** and **Appendix 8.3 Geophysical and Habitat Interpretative Report**). A comprehensive habitat assessment was conducted using geophysical interpretation, video and photographic analysis, in conjunction with the physical and biological characteristics identified from grab sampling.

23. Reports from both of these surveys were submitted at the Scoping phase of the Project (Fugro, 2023b and Briggs, 2024) with **Appendix 8.3 Geophysical and Habitat Interpretative Report** being submitted with this WDA application. An updated version of Fugro 2023b is submitted with this WDA application as **Appendix 8.2 Benthic Characterisation Report** (see I.D. 5 of **Table 8.2**).

24. A further survey was conducted in 2025, and although environmental drop-down camera work was planned, this was not completed due to weather and time limitations. Geophysical data was used in conjunction with the 2023 grab and drop-down camera data to complete a habitat assessment report (**Appendix 8.1 2025 Habitat Assessment Report**).

8.8.1.1 Sediment Characterisation

25. The analysis of survey data collected in 2023 (**Appendix 8.2 Benthic Characterisation Report** and **Appendix 8.3 Geophysical and Habitat Interpretative Report**) and 2025 (**Appendix 8.1 2025 Habitat Assessment Report**) indicates that the seabed within the Benthic Ecology Study Area is predominantly characterised by sand with shell fragments, which forms the principal surface sediment across most of the site. Localised depressions and several bathymetric highs contain coarser material, including gravelly sands, cobbles, and boulders. These features are particularly evident in the northern, southwestern, and southern parts of the area, where boulders are notably abundant. Subsequently, the sediment characteristics identified have been used to classify habitat types (see **Section 8.8.1.2**).

8.8.1.2 Habitat and Biotope Classification

26. **Appendix 8.1 2025 Habitat Assessment Report** provides a review of the acquired geophysical data and benthic ecology (Briggs (2024); Fugro (2023b)) across the survey area to identify the faunal communities and characterise the habitats present within the WDA. Habitats were classified using the JNCC marine habitat classification (JNCC, 2023).

27. Broad-scale habitat predictions from EUSeaMap (European Marine Observation and Data Network (EMODnet), 2023) were used to provide initial modelling of seabed habitats across the WDA. These predictions were checked against both the third-party benthic survey and the Project's site investigation data to ensure consistency. The European Nature Information System (EUNIS) (EMODnet, 2023) habitat map indicated that most of the WDA is likely to comprise circalittoral fine sand or circalittoral muddy sand.

28. Across both the third-party benthic survey (Briggs, 2024) and Project's site investigation (**Appendix 8.2 Benthic Characterisation Report**), similar habitat patterns were identified, specifically, a predominance of circalittoral sands with areas of coarse sediment.

29. In summary, three JNCC level 4 biotope complexes were identified across the survey area:

- Offshore circalittoral sand (SS.SSa.OSa);
- Offshore circalittoral coarse sediment (SS.SCS.OCS); and
- Echinoderms and crustose communities (CR.MCR.EcCr).

30. During the Project's site investigation survey, the most commonly assigned habitat (based on photographic evidence, macrofaunal samples and PSD data) was 'Offshore circalittoral sand' (SS.SSa.OSa). This is consistent with the wider EMODnet habitat map for the area.

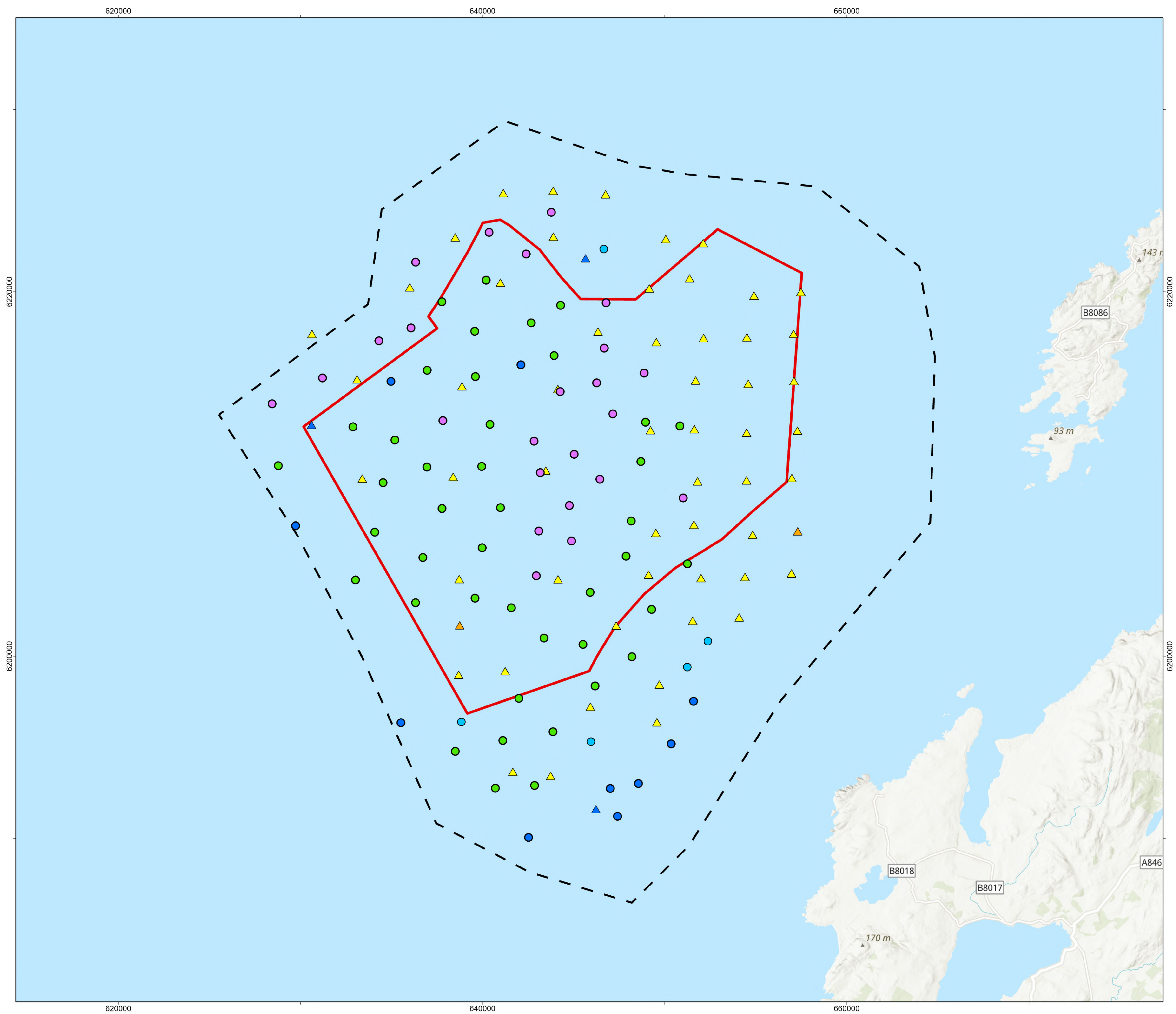
31. Areas containing gravelly sand, shell fragments, pebbles and scattered cobbles were classified as 'Offshore circalittoral coarse sediment' (SS.SCS.OCS). Two stations with numerous cobbles and large boulders were assigned to the 'Echinoderms and crustose communities' (CR.MCR.EcCr) biotope. The station to the east of the WDA was identified as a mosaic of SS.SCS.OCS and CR.MCR.EcCr (**Figure 8.2**).

32. For example:

- *Abra prismatica, Bathyporeia elegans* and polychaetes in circalittoral fine sand (SS.SSa.CFiSa.ApriBatPo) included the elongated furrow shell *(Abra prismatica)*, the sand digger shrimp *(Bathyporeia elegans)* and polychaetes (*Polychaeta. Sp.*).
- *Echinocyamus pusillus, Ophelia borealis* and *Abra prismatica* in circalittoral fine sand (SS.SSa.CFiSa.EpusOborApri) characterised by the pea urchin (*Echinocyamus pusillus)*, the polychaete *Ophelia borealis* and the bivalve *Abra prismatica.*
- *Abra alba* and *Nucula nitidosa* in circalittoral muddy sand or slightly mixed sediment (SS.SSa.CmuSa.AalbNuc) supported the white furrow shell *(Abra alba)* and bivalve mollusc (*Nucula nitidosa)*.

33. Although these finer-sediment biotopes were recorded, the broader survey area was predominantly classified as SS.SCS.OCS.

34. Across the third-party benthic survey, a number of DDV stations, particularly near the southern boundary of the survey area, were described as having substrate of cobble, boulders, and / or bedrock. These were classified as being within the 'Echinoderms and crustose communities on Atlantic circalittoral rock (CR.MCR.EcCr) JNCC level 4 biotope complex, and could indicate the presence of an Annex I reef (see **Section 8.8.1.3.2**).



Windfarm Development Area (WDA)

Benthic Ecology Study Area

Briggs (2024) Biotope Classification (JNCC, 2022)

- SS.SCS.OCS
- SS.SSa.CFiSa.ApriBatPo
- SS.SSa.CFiSa.EpusOborApri
- SS.SSa.CMuSa.AalbNuc

Fugro (2023) Biotope Classification (JNCC, 2022)

- CR.MCR.EcCr
- SS.SCS.OCS
- SS.SSa.Osa

N

0 5 10 Kilometres

3	14/04/2026	AB	GC	RF	PM
REV	REV DATE	GIS CREATOR	GIS REVIEWER	TECHNICAL CHECKER	TECHNICAL APPROVER

DRAWING NUMBER	MCW-DWF-ENV-MAP-RHS-000140		
DATUM	ETRS89	PROJECTION	UTM Zone 29N
SCALE	1:200,000	PAGE SIZE	A3
PROJECT TITLE	MachairWind		

Figure 8.2: Biotope Classifications

NOT TO BE USED FOR NAVIGATION

Haskoning Enhancing Society Together

ScottishPower Renewables

Project: C:\Users\304634\OneDrive - Royal HaskoningDHV\WIP\03 GIS\A02_Figures\03_EIA\01_WDA\Chap_08_BenthicEcol\MCW_EIA_WDA_BenthicEcol.aprx
Name: MCW-DWF-ENV-MAP-RHS-000140_BiotopeClassifications

8.8.1.3 Important Ecological Features

35. Important ecological features (IEFs) are important benthic habitats, species, or biotopes, that may be affected by the Project's infrastructure. Importance is determined based on quality or extent of habitats, species or habitat rarity, and/or the extent to which they are threatened (CIEEM, 2022).

8.8.1.3.1 Priority Marine Features

36. Scotland's NMP has identified a list of 81 PMFs (Tyler-Walters *et al.,* 2016). These PMFs are species and habitats considered to be of greatest marine nature conservation importance in Scottish territorial waters and are considered under threat.

37. Areas assigned as the biotope complexes 'Offshore circalittoral sand' (SS.SSa.OSa) and 'Offshore circalittoral coarse sediment' (SS.SCS.OCS) were present within the WDA and therefore the PMF 'Offshore subtidal sands and gravels' may be present (**Table 8.6**) (see **Appendix 8.1 2025 Habitat Assessment Report**).

38. It should also be noted that MarESA sensitivity information was not available for the JNCC biotope complexes identified within **Section 8.8.1.2** due to the high-level classification. Therefore:

- Throughout this assessment, 'Offshore circalittoral sand' is represented by the component biotope *Abra prismatica, Bathyporeia elegans* and polychaetes in circalittoral fine sand (SS.SSa.CFiSa.ApriBatPo) and *Echinocyamus pusillus, Ophelia borealis* and *Abra prismatica* in circalittoral fine sand (SS.SSa.CFiSa.EpusOborApri), both of which were identified in the third-party survey, with SS.SSa.CFiSa.ApriBatPo determined to be widespread across the WDA (Briggs, 2024).
- As neither of the site-specific surveys identified a biotope representative of the biotope complex 'SS.SCS.OCS', a proxy was identified based upon expert judgement and as a precautionary worst-case scenario. The biotope *Glycera lapidum, Thyasira* spp. and *Amythasides macroglossus* in offshore gravelly sand (SS.SCS.OCS.GlapThyAmy) was used for this purpose. *G.lapidum* was recorded during the surveys (Briggs, 2024 and **Appendix 8.2 Benthic Characterisation Report**), however, the remaining characteristic species were not identified. This resulted in a low level of confidence in assigning a JNCC level 5 biotope, and therefore a biotope complex was assigned.

39. During the third-party benthic survey (Briggs, 2024), thirteen single individuals of Ocean quahog (*Artica islandica*), a long-lived, slow growing bivalve, were recorded in grab samples at 13 stations (Briggs, 2024). Most occurrences were located within the central area of the WDA. In addition to being a PMF, this species is listed by OSPAR as threatened and/or declining.

40. Therefore, two PMFs are potentially present within the WDA. Their importance, characteristics, and location are shown in **Table 8.6** and **Figure 8.3**.

Table 8.6 Priority marine features located within the WDA

Priority Marine Features (PMF)	Component biotopes[7] identified in the WDA	Characteristics (Tyler-Walters *et al.,* 2016)
Offshore Subtidal Sand and Gravels	*Glycera lapidum, Thyasira* spp. and *Amythasides macroglossus* in offshore	Sand and gravel sediments are the most common subtidal habitat around the coast of the British Isles. Offshore sands and gravels are more stable than their shallower equivalents with diverse infaunal communities dominated by polychaetes, hatchet

[7] https://www.nature.scot/priority-marine-features-scotlands-seas-habitats-faqs

Priority Marine Features (PMF)	Component biotopes[7] identified in the WDA	Characteristics (Tyler-Walters *et al.,* 2016)
	gravelly sand (SS.SCS.OCS.GlapThyAmy) *Abra prismatica, Bathyporeia elegans* and polychaetes in circalittoral fine sand (SS.SSa.CFiSa.ApriBatPo) *Echinocyamus pusillus, Ophelia borealis* and *Abra prismatica* in circalittoral fine sand (SS.SSa.CFiSa.EpusOborApri)	shells (Thyasiridae family) (OCS.GlapThyAmy), and small bivalves (Bivalvia. Sp.); e.g. the little tellin (*Tellina tenuis*) (OCS.HeloPkef). Offshore fine to muddy sands support a diversity of tube building polychaetes, burrowing brittlestars (*Amphiura Urtica*) and bivalves (Osa.OfusAfil and Osa.MalEdaf), while the pea urchin (*Echinocyamus pusillus*), occurs in medium sands (CfiSaEpusOborApri) and amphipods and hooded shrimp in fine sands (CfiSa.ApriBatPo). Mobile predators include flatfish, starfish and crabs (including hermit crabs). This habitat also includes the Atlantic and Arctic bathyal and abyssal sediments which occur off the continental slope in Scotland.
Ocean quahog (*Arctica Islandica*)	N/A	The ocean quahog is considered to be the longest living mollusc with one individual reported to have lived for 507 years. It is a large, slow growing clam, reaching 11-13 cm in length. The shell is thick, round and oval or circular shaped. The outer layer of the shell is thick, glossy and brown, greenish brown or black. Parts of the outer layer may be worn away to reveal a white, pale brown to yellow shell. Found in the subtidal, burrowing 6 cm down into sandy and muddy sediment. It is most often found between depths of 10-280 m, although may be found as deep as 480 m. Found around all Scottish coasts. Mainly offshore in the east of Scotland and the northern North Sea but closer inshore along the west coast.

8.8.1.3.2 Annex I Geogenic Reef

41. Site-specific surveys undertaken for the WDA (Briggs, 2024 and **Appendix 8.2 Benthic Characterisation Report**) found areas resembling low to medium stony reef with epifauna relating to this habitat. One such area was identified within the WDA, with the remaining areas being located outside the WDA within the Benthic Ecology Study Area (**Figure 8.3**). These potential habitats are represented in the assessment (**Section 8.11**) by the biotopes presented in **Section 8.8.1.2**.

42. **Appendix 8.2 Benthic Characterisation Report** found areas of cobbles and boulders along three transects (MCW-D-ST73, MCW-D-ST82, MCW-C-ST83) which were assessed for potential resemblance to Annex I Stony Reef.

43. Along transects MCW-D-ST73, MCW-D-ST82 and MCW-C-ST83, cobble and boulder cover was in the range of medium (40–95%) at five stations, with elevations also classified as medium (64 mm to 5 m). Observed patches of 'medium reef' were generally less than 25 m² for transects MCW-D-ST73 and MCW-D-ST82 and therefore do not meet the criteria for Annex I stony reef, requiring a minimum extent of more than 25 m². Combined areas of 'medium reef' within transect MCW-C-ST83 were observed to be more than 25 m², therefore meeting the criteria for Annex I stony reef.

44. Several additional areas displayed medium elevation (64 mm to 5 m), though with low cobble and boulder cover (10–40%). Notably, one patch on transect MCW-D-ST73 (45 m²) and one on transect MCW-D-ST82 (27 m²) exceeded the 25 m² threshold and were therefore classified as 'low reef'.

When potential stony reef extents were delineated from geophysical data, these areas ranged from 5,566 m² in the vicinity of MCW-D-ST82, 20,799 m² in the vicinity of MCW-D-ST73 and 26,361 m² in the vicinity of MCW-C-ST83 (**Appendix 8.2 Benthic Characterisation Report**).

45. Numerous large boulders, cobbles, and pebbles were observed along sections classified as 'medium reef', interspersed with mixed sediments and 'low reef' areas. Epifaunal communities typical of stony reefs ranged from rare (e.g., *Alcyonium digitatum* and Pectinidae) to superabundant (Ophiuroidea, including *Ophiothrix fragilis*).

46. A reef assessment was also carried out for transects MCW-A-ST08A and MCW-C-ST91 however these exhibited low levels of cobble and boulder cover (<10%) and low elevation and so were classified as 'Not a reef' (**Appendix 8.2 Benthic Characterisation Report**).

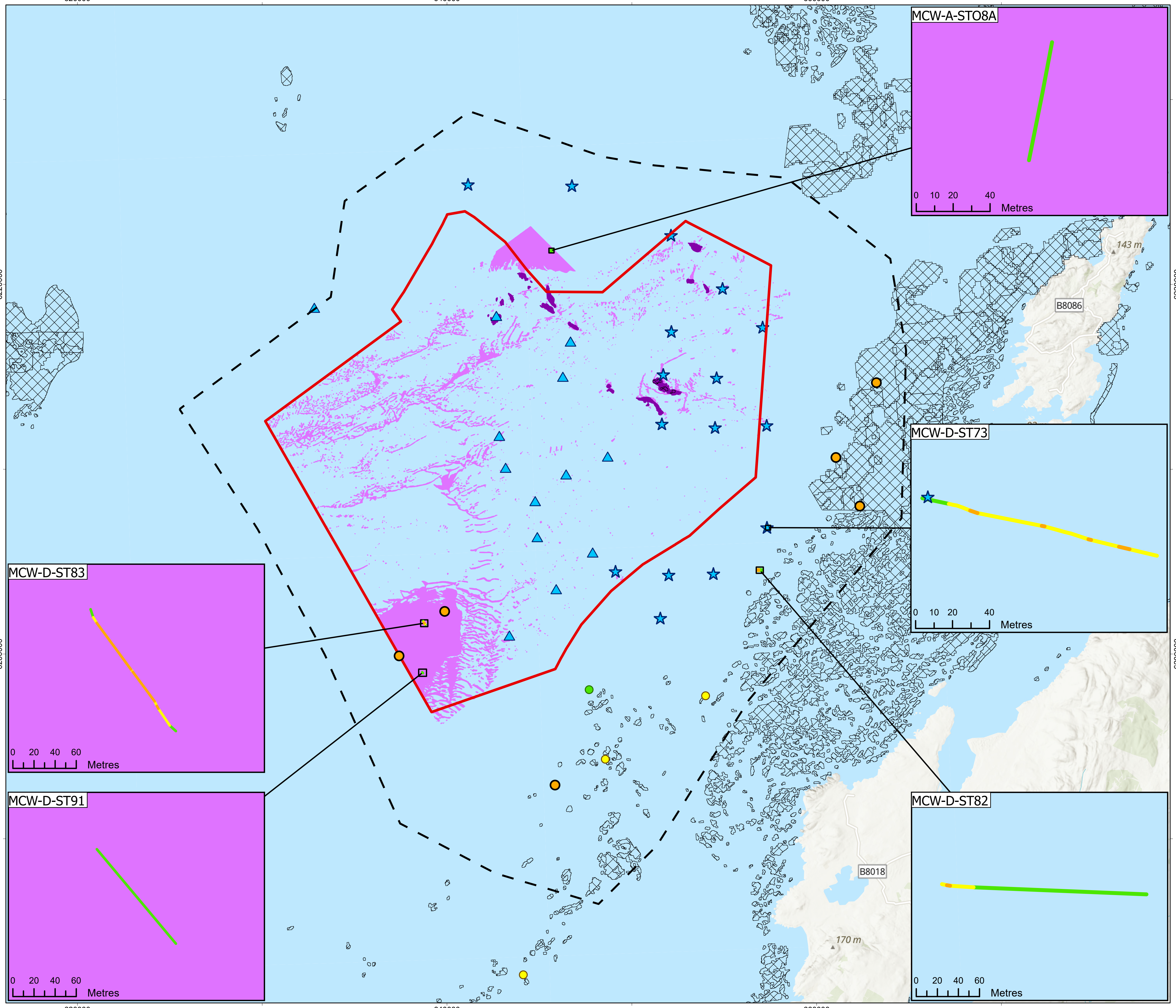
47. A review of the more recent geophysical survey data (**Appendix 8.1 2025 Habitat Assessment Report** identified bedrock outcrops in the northern region of the WDA, characterised by distinct SSS signatures and elevated seabed relief relative to the surrounding seabed. These features could also represent potential Annex I geogenic reef (stony or rocky reef).

48. For the assessment within **Section 8.11**, MarESA sensitivity information is not available for Echinoderms and crustose communities (CR.MCR.EcCr) which may represent Annex I geogenic reef. Therefore, throughout this assessment, Annex I geogenic reef is represented by the following biotopes which were identified in the third-party survey (Briggs, 2024):

- *Flustra foliacea* on slightly scoured silty circalittoral rock (CR.MCR.EcCr.FaAlCr.Flu); and
- Faunal and algal crusts with *Spirobranchus triqueter* and sparse *Alcyonium digitatum* on exposed to moderately wave-exposed circalittoral rock (CR.MCR.EcCr.FaAlCr).

49. **Figure 8.3** presents the areas showing potential Annex I geogenic reef features.

50. No other Annex I habitats or Annex II species, OSPAR threatened and/or declining species and habitats, or UK Priority Habitats and Species, or Scottish biodiversity list species and habitats were observed within the survey area.



Windfarm Development Area (WDA)

Benthic Ecology Study Area

Annex I Reef

GeMS - Scottish Priority Marine Features

Reef

Site Specific Data

Ocean Quahog (Fugro 2023)

Ocean Quahog (Briggs, 2024)

Potential Reef Areas (Sulmara, 2025)

Potential Geogenic Reef

Potential Stony Reef

Stoney Reef Assessment (Briggs, 2024)

Low Reef

Not a Reef

Stoney Reef Assessment (Fugro, 2023)

Medium Reef

Low Reef

Not a Reef

N

0 5 10 Kilometres

6	05/06/2026	AB	GC	RF	PM
REV	REV DATE	GIS CREATOR	GIS REVIEWER	TECHNICAL CHECKER	TECHNICAL APPROVER

DRAWING NUMBER	MCW-DWF-ENV-MAP-RHS-000141		
DATUM	ETRS89	PROJECTION	UTM Zone 29N
SCALE	1:200,000	PAGE SIZE	A3
PROJECT TITLE	MachairWind		

Figure 8.3: Annex I and Priority Marine Feature Habitats

NOT TO BE USED FOR NAVIGATION

Haskoning Enhancing Society Together

ScottishPower Renewables

Project: C:\Users\305050\OneDrive - Royal HaskoningDHV\P-PC3479-MachairWind-EIA-and-Consenting - 03 GIS\A02_Figures\03_EIA\01_WDA\Chap_08_BenthicEcol\MCW_EIA_WDA_BenthicEcol.aprx
Name: MCW-DWF-ENV-MAP-RHS-000141_AnnexI_PriorityMarineFeatures

8.8.2 Designated Sites

51. The closest designated site of relevance to benthic ecology is the Firth of Lorne Special Area of Conservation (SAC). The Firth of Lorne SAC, designated for its reef features, is located approximately 35 km to the northeast of the WDA. This site was screened out of assessment during the WDA EIA Scoping Report (Royal HaskoningDHV, 2024) due to the distance from the Project.

8.8.3 Predicted Future Baseline

52. The following section provides a summary of how benthic ecology is likely to evolve in absence of the Project.

53. The baseline conditions for benthic ecology are considered to be relatively stable within the WDA, and the wider area, with multiple datasets covering several years exhibiting similar patterns.

54. The existing environment within the WDA is influenced by variability and long-term changes in physical processes which exist on the west coast of Scotland, including waves and tidal currents driving changes in sediment transport and then seabed morphology (see **Chapter 7 Marine Physical Environment**) which may cause direct and indirect effects to benthic habitats and communities in the mid to long term future (Department of Energy and Climate Change (DECC), 2016). The best evidence indicates that long term changes to benthic ecology may be related to long term changes in the climate or in nutrients (DECC, 2016), with shifts in abundances and species composition being driven by climatic processes. These broadscale environmental changes will occur regardless of the presence or absence of the Project infrastructure.

55. Benthic communities are also influenced by anthropogenic pressures that currently exist across the Study Area such as commercial fishing, which have the potential to influence future change in the existing benthic environment (**Chapter 12 Commercial Fisheries**).

56. The UK Climate Change Risk Assessment (HM Government, 2022) highlights several climate-related risks to ecosystem services. These include:

- The potential for INNS to adversely affect native communities and ecosystems;
- Increased susceptibility of species to emerging pathogens as distributions shift; and
- Heightened pressures on high-biodiversity coastal areas resulting from more frequent storms and coastal erosion.

57. Overall, localised changes in benthic community composition may arise from pollution, contamination, and anthropogenic seabed disturbance or erosion (DECC, 2016; HM Government, 2022). The risk assessment also notes that risks associated with INNS, ocean acidification, and higher water temperatures are intrinsically linked to broader climatic changes, with the potential to influence benthic subtidal ecology at a wider scale. However, these pressures are unlikely to drive substantial alterations in sediment type, one of the primary determinants of benthic species assemblages and biotope classification. Despite this, there remains inherent uncertainty regarding how the baseline environment may evolve over time, particularly at the species level.

8.8.4 Data Limitations and Assumptions

58. Site-specific surveys, including grab sampling and DDV, were carried out to characterise the benthic ecology within the WDA (see **Table 8.4**). These surveys reflect the state of the seafloor sediments, habitats and communities at a point in time only. Seasonal, or longer-term temporal variations in hydrodynamic processes, or extreme events such as storms, can result in significant changes to seafloor sediments, especially in nearshore areas; these changes can, in turn, affect biological

assemblages. Seasonality may also be observed in larval recruitment to seafloor communities and seasonal die back may occur in certain shorter-lived species.

59. The potential Annex 1 Reefs identified from the SSS data presented in **Appendix 8.1** have not been ground truthed but have been assessed as potential reefs for impact assessment purposes based on those identified in the previous surveys (Fugro, 2023b and Briggs, 2024).

60. However, pre-construction surveys will be undertaken to reflect up to date ecological conditions and inform the final Project design, as well as identify the presence of protected habitats and species.

61. During the analysis of benthic habitat maps, the JNCC marine habitat classification (JNCC, 2023) was used. Classifying benthic communities, biotopes or JNCC levels may be subject to recorder bias due to the potential for confusion between biotopes which occupy similar habitats e.g. offshore circalittoral sand (SS.SSa.OSa) mapped as infralittoral fine sand (SS.SSa.IFiSa) or where the characteristic species could allow classification of multiple biotopes. However, this is a known characteristic of the habitat mapping process and is not considered to materially affect the overall confidence in it for the purpose of informing the assessment.

62. The impact assessments in **Section 8.11** describe the level of confidence in each assessment. There is high confidence in the understanding of the magnitude of impact based on the worst-case scenarios provided in **Section 8.7**, and therefore confidence in the conclusions of effect significance is primarily driven by the level of confidence in the sensitivity of receptors. MarLIN provides information on the confidence associated with sensitivity classifications based on the following definitions:

- High confidence - "based on peer reviewed papers (observational or experimental) or grey literature reports by established agencies on the feature, assessment based on the same pressures acting on the same type of feature in the UK, and studies agree on the direction and magnitude of impact or recovery".
- Medium confidence - "based on some peer reviewed papers but relies heavily on grey literature or expert judgement on feature or similar features, assessment based on similar pressures on the feature in other areas, and studies agree on the direction but not the magnitude of impact or recovery".
- Low confidence - "based on expert judgement, assessment based on proxies for pressures e.g. natural disturbance events, studies do not agree on concordance or magnitude of impact or recovery".

63. Information from MarLIN, and specifically the MarESA method, provides a robust resource for the fundamentals of the significance of effect assessment. As taken from their online database "*MarLIN provides information to support marine conservation, management and planning. Our resources are based on available scientific evidence and designed for all stakeholders, from government agencies and industry to naturalists and the public. MarLIN hosts the largest review of the effects of human activities and natural events on marine species and habitats yet undertaken*." It is supported by a number of organisations including Defra, JNCC and NatureScot.

64. However, the third-party survey (Briggs, 2024) and the Project's site investigation survey (Fugro, 2023) identified SS.SCS.OCS to JNNC biotope level 4. Due to the broad nature of this classification, MarLIN does not provide sensitivity assessments at this biotope level. Consequently, a precautionary proxy biotope has been applied to inform the assessment, namely *Glycera lapidum, Thyasira* spp. and *Amythasides macroglossus* in offshore gravelly sand (SS.SCS.OCS.GlapThyAmy). This biotope is considered representative of the PMF 'Offshore subtidal sands and gravels' and has therefore been adopted as a realistic worst-case proxy for sensitivity assessment purposes.

8.9 EMBEDDED MITIGATION MEASURES

65. This section outlines the embedded mitigation relevant to the benthic ecology assessment (as shown in **Table 8.7** below). Where additional mitigation measures are required to mitigate potentially significant effects (in EIA terms), these are detailed in the impact assessment (**Section 8.11**).

Table 8.7 Embedded mitigation measures for Benthic Ecology

ID	Mitigation Measure	Description	Securing Mechanism
M-3	Pollution from Ships	Compliance with the International Convention for the Prevention of Pollution from Ships (MARPOL) 73/78 and adherence to the "OSPAR Convention for the Protection of the Marine Environment of the North-East Atlantic".	Implemented as part of the standard operating procedures of contractors.
M-4	Environmental Management Plan	Development of, and adherence to, an Environmental Management Plan (EMP) which will be in accordance with an Outline EMP to be submitted with the Section 36 Application. They will include measures for preventing wastewater discharges from vessels and procedures for informing Project personnel on good practice guidance to reducing the potential for water discharges during offshore construction and operation and maintenance (O&M).	Secured via Section 36 consent and Marine Licence requirement for an Environmental Management Plan (EMP), in accordance with **Appendix 6 Outline Environmental Management Plan** (EMP) submitted to Scottish Ministers prior to construction.
M-5	Invasive Non-Native Species Mitigation Plan	Development of, and adherence to, an Invasive Non-Native Species Mitigation Plan (INNSMP). This plan will detail mitigation measures to reduce the introduction and transfer of invasive non-native species.	**Appendix 8 Invasive Non-Native Species Mitigation Plan** which has been submitted alongside the Section 36 and Marine Licence Application.
M-7	Marine Pollution Contingency Plan	Development of, and adherence to, a Marine Pollution Contingency Plan (MPCP). The MPCP will provide guidance to the Project personnel, contractors and subcontractors on the actions and reporting requirements in the event of spills and collision incidents. The MPCP will also contain emergency plans and mitigation procedures for a range of potential marine pollution incidents.	**Appendix 7 Marine Pollution Contingency Plan** which has been submitted alongside the Section 36 and Marine Licence Application.
M-8	Cable Plan	Development of, and adherence to, a Cable Plan (incorporating a Cable Burial Risk Assessment (CBRA)). The Cable Plan will confirm planned cable routeing, burial, and any additional external cable protection, and will set out methods for post-installation cable monitoring. Furthermore, this plan will detail environmental sensitivities and design considerations to mitigate, as far as	Secured in the Section 36 consent and Marine Licence, via the requirement for a Cable Plan developed and submitted to the Scottish Ministers for approval before commencement of construction.

ID	Mitigation Measure	Description	Securing Mechanism
		practicable, the effects of offshore cable laying and associated protection during installation and operation of the WDA infrastructure. The amount of cable protection utilised will be minimised where practicable; protection will be used only where design burial depths are not achievable or where crossings require it. Benthic ecology receptors will be considered in the drafting of the Cable Plan.	
M-9	Invasive Non-Native Species	Adherence to the International Convention for the Control and Management of Ships' Ballast Water and Sediments (BWM) Convention (2004) which provides global regulations to control the transfer of potentially invasive species.	Secured in the Section 36 consent and Marine Licence, via the requirement for an INNSMP, which has been submitted alongside the Section 36 and Marine Licence Application.
M-14	Micro-siting	Micro-siting of infrastructure, where practicable, around any identified sensitive habitats and identified anomalies of archaeological interest. Micro-siting mitigation would be agreed through consultation with MD-LOT and NatureScot on the identified sensitive benthic features (e.g. Annex I geogenic reef), and MD-LOT and historic environment advisors on anomalies of archaeological interest, which are required to be avoided. Final agreement will be through the Development Specification and Layout Plan.	Secured in the Section 36 consent and Marine Licence, via the requirement for a Development Specification and Layout Plan developed and submitted to the Scottish Ministers for approval before commencement of construction.
M-46	Decommissioning Programme	Development and adherence to a Decommissioning Programme. This programme will identify all the items of equipment, infrastructure and materials that have been installed or drilled and describes the decommissioning solution for each whilst considering the potential environmental effects of each method alongside appropriate mitigation techniques that can be implemented.	Decommissioning Programme
M-52	Removal of GBS foundations for WTGs from Project design envelope	Since scoping, and following site-specific engineering development and design refinement, GBS foundations for WTGs have been removed from the design envelope which results in a large reduction in the worst-case seabed preparation requirements and seabed footprint of the WDA infrastructure. This	Secured through Project design specifications in the generation marine licence.

ID	Mitigation Measure	Description	Securing Mechanism
		reduces the magnitude of temporary physical disturbance / habitat loss, increased SSCs and permanent habitat loss impacts.	

8.10 APPROACH TO ASSESSMENT

66. As noted above, this topic chapter considers the WDA Study Area and existing environment only. A combined assessment of the construction, O&M and decommissioning of the WDA, Offshore ECC and OnTDA infrastructure / activities (commensurate with the level of detail that is available at the time of carrying out that assessment) is also provided and the methodology for this is described in **Section 8.10.2**. This approach will ensure a holistic view is undertaken of the entire Project.

8.10.1 Windfarm Development Area-Alone

8.10.1.1 Methodology

67. **Chapter 5 EIA Methodology** provides a summary of the general impact assessment methodology applied in this WDA EIAR. The assessment uses the conceptual 'source-pathway-receptor' model. The model identifies potential impacts resulting from the proposed activities on the environment and sensitive receptors within it.

8.10.1.2 Sensitivity

68. The characterisation of the existing environment helps to determine the receptor sensitivity to assess the potential impacts upon it.

69. The definitions of sensitivity are based on The Marine Life Information Network's (MarLIN) Marine Evidence based Sensitivity Assessment (MarESA), (MarLIN, 2021) which determines sensitivity based on resistance (tolerance) and resilience (recoverability) (see **Table 8.8**). MarESA considers the likelihood for damage (i.e tolerance) due to defined pressures and the rate of recovery (i.e. recoverability) once said pressure is removed.

70. Tolerance is defined as the level at which a receptor can absorb disturbance or stress without changing character. Recoverability is defined as the ability of the habitat or species to return to the state that it existed in prior to the impact which caused the change. However, full recovery does not necessarily mean that every species component of a habitat or population has recovered to its prior condition, abundance, and/or extent. Instead, full recovery is reached if the relevant functional components are present, and the habitat and/or population is structurally and functionally recognisable as it was prior to the change.

Table 8.8 Tolerance and recoverability scale definitions (Tyler-Walters et al., 2023)

Level	Description
Tolerance (Resistance)	
None	Key functional, structural, characterising species severely decline and/or physicochemical parameters are also affected e.g. removal of habitats causing a change in habitats type. A severe decline/reduction relates to the loss of 75% of the extent, density or abundance of the selected species or habitat component e.g. loss of 75% substratum (where this can be sensibly applied).

Level	Description
Low	Significant mortality of key and characterising species with some effects on the physicochemical character of habitat. A significant decline/reduction relates to the loss of 25-75% of the extent, density, or abundance of the selected species or habitat component e.g. loss of 25-75% of the substratum.
Medium	Some mortality of species (can be significant where these are not keystone structural/functional and characterising species) without change to habitats relates to the loss <25% of the species or habitat component.
High	No significant effects on the physicochemical character of habitat and no effect on population viability of key/characterising species but may affect feeding, respiration and reproduction rates.
Recoverability (Resilience)	
Very Low	Negligible or prolonged recovery possible; at least 25 years to recover structure and function.
Low	Full recovery within 10-25 years.
Medium	Full recovery within 2-10 years.
High	Full recovery within 2 years.

71. The MarESA assessment of sensitivity is guided by the presence of key structural or functional species/assemblages and/or those that characterise the biotope groups. Physical and chemical characteristics are also considered where they structure the community. MarESA has been used to determine sensitivity of specific biotopes and dominant macrofauna recorded during the site-specific surveys.

72. The MarESA sensitivity assessment uses a matrix (**Table 8.9**) approach to determine the sensitivity of benthic receptors. This has been used to determine the sensitivity of specific biotopes and dominant macrofauna recorded during the site-specific surveys. Where MarESA uses 'not sensitive', this has been interpreted as negligible in terms of this assessment.

Table 8.9 Sensitivity matrix

	Tolerance (Resistance)				
Recoverability (Resilience)		**None**	**Low**	**Medium**	**High**
	Very Low	High	High	Medium	Low
	Low	High	High	Medium	Low
	Medium	Medium	Medium	Medium	Low
	High	Medium	Low	Low	Negligible

8.10.1.3 Value

73. In addition, the 'value' of the receptor forms an important element within the assessment, for instance if the receptor is a protected species or habitat. It is important to understand that high value and high sensitivity are not necessarily linked within a particular effect. A receptor could be of high value (e.g. Annex I habitat) but have a low or negligible physical/ecological sensitivity to an effect. Similarly, low value does not equate to low sensitivity and is judged on a receptor-by-receptor basis. The value will

be considered, where relevant, as a modifier for the sensitivity assigned to the receptor, based on expert judgement. **Table 8.10** states the definitions of value levels for benthic ecology.

Table 8.10 Definition of value for benthic ecology receptors

Value	Definition
High	Habitats (and species) protected under international law (e.g., all Annex I habitats, regardless of location).
Medium	Habitats protected under national law (e.g. Priority Marine Features). Species/habitat that may be rare or threatened in the UK.
Low	Habitats or species that provide prey items for other species of conservation value.
Negligible	Habitats and species which are not protected under conservation legislation and are not considered to be particularly important or rare.

8.10.1.4 Magnitude

74. The criteria for defining magnitude in this chapter are outlined in **Table 8.11**. Each assessment considered the spatial extent, duration, frequency and reversibility of impact when determining magnitude, which are outlined within the magnitude section of each impact assessment (e.g. a duration of hours or days would be considered for most receptors to be of short-term or temporary in duration, which is likely to result in a low magnitude of impact).

Table 8.11 Definition of terms relating to magnitude of an impact

Magnitude	Definition
High	Fundamental, permanent / irreversible changes, over the whole receptor, and / or fundamental alteration to key characteristics or features of the particular receptor’s character or distinctiveness.
Medium	Considerable, permanent / irreversible changes, over the majority of the receptor, and / or discernible alteration to key characteristics or features of the particular receptor’s character or distinctiveness.
Low	Discernible, temporary (throughout project duration) change, over a minority of the receptor, and / or limited but discernible alteration to key characteristics or features of the particular receptor’s character or distinctiveness.
Negligible	Discernible, temporary (for part of the Offshore Project duration) change, or barely discernible change for any length of time, over a small area of the receptor, and/or slight alteration to key characteristics or features of the particular receptor’s character or distinctiveness.

8.10.1.5 Significance of Effect

75. The potential significance of effect for a given impact is a function of the overall sensitivity and the magnitude of the impact (see **Chapter 5 EIA Methodology** for further details). A matrix is used (**Table 8.12**) as a framework to determine the significance of an effect. Definitions of each level of significance are provided in **Table 8.13**. For the purposes of this assessment, any effect that is of major or moderate significance is considered to be significant in EIA terms, whether this be adverse or beneficial. Any effect that has a significance of minor or negligible is not significant in EIA terms.

76. In applying this methodology, professional judgement contributes to concluding significance of effects. This judgement draws on the assessor’s technical expertise, knowledge of the receiving environment, and understanding of how similar developments have influenced comparable receptors. Judgement also considers the quality and confidence of the available data (**Section 8.8.4**),

the level of uncertainty associated with predicted impacts, and any relevant guidance or industry standards. Professional judgement ensures that the matrix outputs are interpreted in context, allowing the assessor to account for site-specific conditions, receptor sensitivities that may cut across criteria, and the nature of the predicted changes. This approach ensures that the determination of significance is robust, transparent and proportionate.

Table 8.12 Significance of effect matrix

Sensitivity	Adverse Magnitude				Beneficial Magnitude			
	High	**Medium**	**Low**	**Negligible**	**Negligible**	**Low**	**Medium**	**High**
High	Major	Major	Moderate	Minor	Minor	Moderate	Major	Major
Medium	Major	Moderate	Minor	Negligible	Negligible	Minor	Moderate	Major
Low	Moderate	Minor	Minor	Negligible	Negligible	Minor	Minor	Moderate
Negligible	Minor	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Minor

Table 8.13 Definition of significance of effect

Significance of Effect	Definition
Major	Very large or large change in receptor condition, both adverse or beneficial, which are likely to be important considerations at a regional or district level because they contribute to achieving national, regional or local objectives, or could result in exceedance of statutory objectives and / or breaches of legislation.
Moderate	Intermediate change in receptor condition, which are likely to be important considerations at a local level.
Minor	Small change in receptor condition, which may be raised as local issues but are unlikely to be important in the decision-making process.
Negligible	No discernible change in receptor condition.
No Change	No effect, therefore, no change in receptor condition.

8.10.2 Combined Assessment: Windfarm Development Area, Offshore Export Cable Corridor and Onshore Transmission Development Area Methodology

77. This section presents how the Applicant will assess interactions between the WDA, Offshore ECC and OnTDA (i.e. considering impact interactions and additive effects to determine if any effects would be materially elevated from those assessed for the WDA-alone assessment). The approach enables potential interactions between each Development Area to be identified and assessed, ensuring a whole Project assessment is undertaken in a manner that is meaningful and proportionate. This is referred to as the combined assessment.

78. In this context, interactions are considered where there may be spatial overlap of effects and additive effects are considered where there may be incremental effects on the same receptor, including increased temporal effects.

79. Worst-case scenarios for all WDA infrastructure (which includes OSPs, OSP link cables and up to 200 km of offshore export cable(s) which could be located within the WDA) has been incorporated into the worst-case scenario for the WDA-alone assessment **(Table 8.5** and **Section 8.11.1**).

80. To inform the combined assessment, a set of assumptions were developed which includes a preliminary boundary for the Offshore ECC and OnTDA (connect point new Girvan, South Ayrshire), anticipated project components and associated construction methods and timelines. These are set out in **Chapter 3 Project Description**, Sections 3.7 and 3.8. Offshore and onshore engineering and environmental surveys enabling Offshore ECC and OnTDA corridor refinement are anticipated to take place after the WDA EIAR has been submitted to the consenting authorities.

81. Within the upcoming Offshore ECC and OnTDA consent applications, their respective scoping and EIARs will take account of all likely effects predicted within the WDA EIA and present updated combined assessments using the latest available information covering all aspects of the Project.

82. **Section 8.11.2** includes a qualitative discussion where potential interactions and additive effects between the WDA and the Offshore ECC and OnTDA have been identified, with the aim of determining whether effects could result in those of greater significance than assessed for the WDA-alone assessment. To accompany the description, a combined assessment summary table is provided. Only residual effects from the WDA-alone assessment are taken forward for consideration in the combined assessment.

8.10.3 Cumulative Effects Assessment Methodology

83. The CEA considers the impacts arising from the activities and infrastructure associated with the whole-Project (i.e. the WDA, Offshore ECC and OnTDA) as well as cumulatively with other relevant plans, projects and activities. The general approach to the CEA for benthic ecology includes identifying potential cumulative effects, identifying a short list of plans and projects for consideration and evaluating the significance of cumulative effects. **Chapter 5 EIA Methodology** provides further details on the general approach to the CEA.

84. In line with the methodology set out in **Chapter 5 EIA Methodology**, the CEA is considered in two main stages with stage 1 split into two steps:

- **Stage 1a**: Screening of Potential Cumulative Impacts;
- **Stage 1b**: Screening of other plans, projects and activities; and
- **Stage 2:** CEA.

85. Stage 1a involves the screening / identification of which whole-Project impacts could have a cumulative effect with other plans, projects and activities (described as ‘impact screening’). Stage 1b is the screening of other plans, projects and activities. In accordance with guidance documents discussed in **Chapter 5 EIA Methodology**, other plans or projects that are deemed likely to go ahead or are going ahead, and for which sufficient information is available to conduct a meaningful assessment, have been taken forward for consideration in **Appendix 5.1 Cumulative Projects Long and Short Lists**. If sufficient detail is not available, it is not possible to conduct a meaningful assessment of potential cumulative effects and therefore, these developments are not considered further. For the purposes of the CEA Long-List, the criteria of other plans or projects that are proposed for consideration include those which are ‘reasonably foreseeable’ such as those:

- Which have become operational since baseline data was collected;
- Under construction;
- Permitted application(s), but not yet implemented;
- Submitted application(s) not yet determined; and
- Plans and projects with design information in the public domain, including those that requested a Scoping Opinion up to six months prior to submission of the WDA application date as follows:
    - Projects in Scottish waters;

  - Projects in English, Welsh and Northern Irish waters, or other non-UK waters if considered to be relevant, have connectivity, or the potential for a cumulative effect;
  - Offshore wind projects granted an Option Agreement or Agreement for Lease; and
  - Non-wind projects.

86. The CEA Long-List has been developed based on the above criteria, and has been screened for each potential impact-receptor pathway using the following process:

- **Conceptual overlap**: an impact-receptor pathway describes an impact which has the potential to directly or indirectly affect the receptor(s) in question;
- **Physical overlap**: ability for impacts arising from the WDA, Offshore ECC and OnTDA to overlap with those from other plans or projects on a receptor basis. An overlap of the ZoIs arising from the two (or more) projects/plans must be established for a cumulative effect to arise. There are exceptions to this for certain mobile receptors that are potentially subject to impacts from multiple plans or projects; and
- **Temporal overlap**: for a cumulative effect to arise from two or more plans or projects, a temporal overlap of impacts arising from each must be established. Some impacts are active only during certain phases of the WDA (e.g. piling noise during construction). However, the absence of a strict overlap may not necessarily mean there is no potential for cumulative effect, as receptors may become further affected by additional, non-temporally overlapping projects.

87. Stage 2 is the assessment of cumulative effects. A tiered approach is used to provide a framework for placing relative weight on the potential for each plan or project to be included in the CEA, based on the plan's or project's current stage of maturity, certainty in the design or effects and overall availability of detail on which to carry out an assessment. Projects or plans that will be assessed in Stage 2 will use the following tiers:

- Tier 1 assessment: projects which are operational (but not part of the baseline), under construction, those with consent and those projects where an application has been submitted but not yet determined;
- Tier 2 assessment: all plans/projects assessed under Tier 1, plus those projects with a Scoping Report and/or Scoping Opinion; and
- Tier 3 assessment: all plans/projects assessed under Tier 1 and Tier 2, plus those projects likely to come forward where a Crown Estate Scotland Option to Lease Agreement or equivalent has been granted (i.e., ScotWind and Innovation and Targeted Oil & Gas (INTOG) projects).

8.11 ASSESSMENT OF SIGNIFICANCE

8.11.1 Windfarm Development Area-Alone Assessment of Significance

88. The potential effects on benthic ecology receptors that may occur during construction, operation and decommissioning of the WDA are assessed in the following sections. The assessment follows the methodology set out in **Section 8.10.1** and is based on the realistic worst-case scenarios defined in **Section 8.7**, with consideration of embedded mitigation measures identified in **Section 8.9.**

89. This assessment has been undertaken on the basis of all embedded mitigation measures outlined in **Table 8.7**. The embedded mitigation measures relevant for each impact are listed in the summary **Table 8.26**.

8.11.1.1 Impact 1: Increased Suspended Sediment Concentrations (SSCs) and sediment re-deposition

90. Increases in SSC and subsequent deposition onto the seabed may occur as a result of seabed preparation and installation of WDA infrastructure. Other activities, such as seabed disturbance from offshore support vessels and placement of cable protection are not expected to increase SSCs to the extent which there would be a significant effect on benthic ecology receptors. Increased suspended sediments have the potential to affect benthic ecology receptors by blocking feeding apparatus as well as by smothering sessile species upon re-deposition. **Chapter 7 Marine Physical Environment** provides details of changes to SSCs and subsequent sediment deposition.

8.11.1.1.1 Sensitivity

91. The sensitivity of the IEFs identified in the Benthic Ecology Study Area have been assessed in relation to MarESA pressures relevant to increased SSC and re-deposition. The relevant pressures are:

- Changes in suspended solids (water clarity);
- Smothering and siltation rate changes (light); and
- Smothering and siltation rate changes (heavy).

92. The pressure ‘smothering and siltation rate changes (light)’ and ‘smothering and siltation rate changes’ (heavy) have been used to assess the significance of effect as the MarESA justification for light smothering and siltation is ‘up to 5 cm’ whilst heavy smothering and siltation is ‘up to 30 cm’. In **Chapter 7 Marine Physical Environment** the worst-case level sediment smothering and re-deposition is less than 5 cm for drilling, seabed preparation and sandwave levelling. During ploughing for cable installation in the WDA, smothering and re-deposition is predicted to be between 10 - 20 cm on average. The sensitivities of identified receptors to increased suspended sediment pressures are summarised in **Table 8.14**. Note that the sensitivity definitions presented in **Table 8.14** (and the following tables referring to the sensitivity of receptors to potential impacts) have been taken directly from the assessments presented on the MarLIN website.[8]

[8] Home - MarLIN - The Marine Life Information Network

Table 8.14 Sensitivity of the IEFs to increased SSC and sediment re-deposition

Receptor (IEF)	Representative Biotope	Tolerance	Recoverability	Sensitivity	Confidence Assessment
Changes in suspended solids (water clarity)					
Offshore circalittoral sand (SS.SSa.OSa)	*Abra prismatica, Bathyporeia elegans* and polychaetes in circalittoral fine sand (SS.SSa.CFiSa.ApriBatPo)	Medium	High	Low	Medium
	Echinocyamus pusillus, Ophelia borealis and *Abra prismatica* in circalittoral fine sand (SS.SSa.CFiSa.EpusOborApri)	Medium	High	Low	Low
Offshore circalittoral coarse sediment (SS.SCS.OCS)	*Glycera lapidum, Thyasira* spp. and *Amythasides macroglossus* in offshore gravelly sand (SS.SCS.OCS.GlapThyAmy)	High	High	Negligible (Not Sensitive)	Low
Echinoderms and crustose communities (CR.MCR.EcCr)	*Flustra foliacea* on slightly scoured silty circalittoral rock (CR.MCR.EcCr.FaAlCr.Flu)	High	High	Negligible (Not Sensitive)	Medium
	Faunal and algal crusts with *Spirobranchus triqueter* and sparse *Alcyonium digitatum* on exposed to moderately wave-exposed circalittoral rock (CR.MCR.EcCr.FaAlCr)	High	High	Negligible (Not Sensitive)	High
Ocean quahog	N/A	High	High	Negligible (Not Sensitive)	Low
Smothering and siltation rate changes (light): up to 5cm					
Offshore circalittoral sand (SS.SSa.OSa)	*Abra prismatica, Bathyporeia elegans* and polychaetes in circalittoral fine sand (SS.SSa.CFiSa.ApriBatPo)	Medium	High	Low	Medium
	Echinocyamus pusillus, Ophelia borealis and *Abra prismatica* in circalittoral fine sand (SS.SSa.CFiSa.EpusOborApri)	Medium	High	Low	Medium
Offshore circalittoral coarse sediment (SS.SCS.OCS)	*Glycera lapidum, Thyasira* spp. and *Amythasides macroglossus* in offshore gravelly sand (SS.SCS.OCS.GlapThyAmy)	Medium	High	Low	Medium

Receptor (IEF)	Representative Biotope	Tolerance	Recoverability	Sensitivity	Confidence Assessment
Echinoderms and crustose communities (CR.MCR.EcCr)	*Flustra foliacea* on slightly scoured silty circalittoral rock (CR.MCR.EcCr.FaAlCr.Flu)	Medium	High	Low	Low
	Faunal and algal crusts with *Spirobranchus triqueter* and sparse *Alcyonium digitatum* on exposed to moderately wave-exposed circalittoral rock (CR.MCR.EcCr.FaAlCr)	High	High	Negligible (Not Sensitive)	High
Ocean quahog	N/A	High	High	Negligible (Not Sensitive)	Medium
Smothering and siltation rate changes (heavy): up to 30cm					
Offshore circalittoral sand (SS.SSa.OSa)	*Abra prismatica, Bathyporeia elegans* and polychaetes in circalittoral fine sand (SS.SSa.CFiSa.ApriBatPo)	Low	Medium	Medium	Low
	Echinocyamus pusillus, Ophelia borealis and *Abra prismatica* in circalittoral fine sand (SS.SSa.CFiSa.EpusOborApri)	Low	Medium	Medium	Low
Offshore circalittoral coarse sediment (SS.SCS.OCS)	*Glycera lapidum, Thyasira* spp. and *Amythasides macroglossus* in offshore gravelly sand (SS.SCS.OCS.GlapThyAmy)	Medium	Medium	Medium	Low
Echinoderms and crustose communities (CR.MCR.EcCr)	*Flustra foliacea* on slightly scoured silty circalittoral rock (CR.MCR.EcCr.FaAlCr.Flu)	Low	Medium	Medium	Low
	Faunal and algal crusts with *Spirobranchus triqueter* and sparse *Alcyonium digitatum* on exposed to moderately wave-exposed circalittoral rock (CR.MCR.EcCr.FaAlCr)	Medium	High	Low	Low
Ocean quahog	N/A	High	High	Negligible (Not Sensitive)	Medium

93. All IEFs identified have a negligible to low sensitivity to changes in SSC, and light smothering and siltation rates, Therefore, these biotopes will not be affected by or will recover rapidly from an increase in SSC and subsequent re-deposition. This is because the characteristic species, such as bivalves, are expected to be regularly exposed to, and tolerant of, short-term increases in SSCs (Tillin, 2016; Tyler-Walters & Watson, 2024; Readman *et al.*, 2023; Stamp *et al.*, 2023; Tyler-Waters & Sabatini, 2017).

94. For heavy siltation (up to 30cm), IEFs have a negligible to medium sensitivity. However, as they also have a medium to high recoverability, they are expected to recover rapidly from short-term increases in SSCs and subsequent re-deposition.

95. As detailed in **Section 8.8.1.3**, SS.SSa.CFiSa.ApriBatPo, SS.SSa.CFiSa.EpusOborApri, SS.SCS.OCS.GlapThyAmy, and ocean quahog are PMF's, while MCR.EcCr.FaAlCr.Flu and CR.MCR.EcCr.FaAlCr represent Annex I habitats. These receptors are considered to be of high value. However, as described in **Section 8.10.1.3**, value is used, where relevant, as a modifier when determining sensitivity, based on expert judgement. Because these biotopes are not restricted to the WDA and are likely to occur more widely in the surrounding area, value has not been applied as a sensitivity modifier within this assessment. Accordingly, the overall sensitivities of the receptors are considered to be **medium** at worst.

8.11.1.1.2 Magnitude of Impact

8.11.1.1.2.1 Construction

96. Potential effects on benthic ecology may arise by the resuspension of up to 20,251,431 m^3 of sediment under the realistic worst-case design scenario (**Table 8.5**). The magnitude of construction-related pressures is assessed separately for each relevant MarESA pressure to reflect variability in the nature and extent of potential impacts.

97. As described in **Chapter 7 Marine Physical Environment** (Section 7.11.2), the maximum SSCs generated during drilling occur close to the seabed, typically within 300 m of WTG and OSP foundation locations, where concentrations range from 1-5 mg/l. Only in the southern part of the WDA do these elevated SSC levels extend up to 4 km beyond the WDA boundary. SSCs from seabed preparation activities similarly peak near the seabed and usually occur within 4 km of the disturbance footprint, with concentrations of 1-4 mg/l. Resulting plumes are short-lived, with baseline conditions re-establishing rapidly within hours of disturbance, meaning plumes disperse fully before subsequent activities take place, thereby limiting any potential overlap.

98. SSC increases associated with sandwave levelling for the cable installation also remain concentrated near the seabed, with maximum levels of 25–40 mg/l within approximately 140 m of the disturbance area. SSCs between 5–25 mg/l typically extend to around 250 m from the activity, while concentrations of 1–5 mg/l may occur up to 5 km away.

99. Given the short-term and temporary nature of these increases in suspended sediments and associated light smothering and siltation, the magnitude for both pressures is considered to be **low**.

100. During ploughing for cable installation, SSCs are again greatest near the seabed and attenuate with height in the water column. Increases of ≤5 mg/l may occur across the WDA and extend up to 8 km southwards and 3 km northwards beyond the WDA boundary; however, these effects will not occur concurrently, as each plume will dissipate before the next phase of disturbance. SSCs immediately adjacent to the cable route typically average 1,500-2,500 mg/l and may extend up to 150 m either side of the trench.

101. Cable installation (ploughing) activities are also predicted to generate localised sediment deposition exceeding the 5 cm threshold associated with light smothering. Deposition of 10-20 cm may occur up to 200 m from the trench, with deposition of 20-30 cm occurring within 100 m. These deposits will be redistributed by natural bedload transport processes prior to installation of adjacent cables and following the completion of construction, due to the dynamic nature of the seabed.

102. Given the short-term, localised and temporary nature of these heavier smothering and siltation effects, the magnitude is considered to be **negligible**.

8.11.1.1.2.2 Operation and Maintenance

103. There is the potential for increases in SSCs and subsequent re-deposition associated with O&M activities. However, effects will be less than those experienced during the construction phase. Whilst activities such as cable repair and reburial will occur over the full duration of the operational lifetime, they will be infrequent and the changes will be short-lived. Additionally, the total volume of sediment that could be disturbed is relatively low (**Table 8.5**). Although this effect will persist throughout the O&M phase, the effect of SSCs and subsequent re-deposition will be localised and temporary in nature. The magnitude of the effect is considered to be **negligible**.

8.11.1.1.2.3 Decommissioning

104. Decommissioning of WDA infrastructure may lead to increases in SSCs and associated deposition. It should be noted that the decommissioning strategy is not defined. While the assumption is that all WDA infrastructure above the surface of the seabed will be removed, offshore cables, cable protection, and scour protection may be left *in situ*. SSCs and subsequent re-deposition would increase but be localised around the area of removal activity and remain in suspension for similar times as described above for construction. In reality, if some WDA infrastructure remains *in situ*, the increase in SSCs will be significantly lower than during construction. Therefore, the magnitude of impact is considered to be **low**.

8.11.1.1.3 Significance of Effect

105. The sensitivity of IEFs to increases in SSC and sediment re-deposition are considered to be medium at worst and the magnitude of the impact is deemed to be low at worst. Based on expert judgement and adopting a precautionary approach, the significance of effect has been assessed as **minor adverse** across all phases of the Project's development, which is **not significant** in EIA terms.

8.11.1.2 Impact 2: Temporary Physical Disturbance / Habitat Loss

106. During construction there will be disturbance in the WDA due to seabed preparation for and installation of WTG and OSP foundations and offshore cables. There will also be disturbance to habitats due to construction vessel anchors and jack-up vessel legs which can cause temporary habitat loss and physical disturbance to the seabed.

107. Where disturbed sediments are subsequently covered with infrastructure i.e. by the foundations and associated scour protection, habitat loss becomes long-term or permanent and is assessed in **Section 8.11.1.4**.

8.11.1.2.1 Sensitivity

108. The sensitivity of the receptors identified in the Benthic Ecology Study Area have been assessed in relation to MarESA pressures relevant to temporary habitat loss / physical disturbance. The relevant pressures are:

- Habitat structure changes – removal of substratum (extraction);
- Abrasion/disturbance at the surface of the substratum or seabed; and
- Penetration and/or disturbance of the substratum subsurface.

109. The sensitivity of identified receptors to the above pressures are summarised in **Table 8.15**.

Table 8.15 Sensitivity of receptors to temporary physical disturbance/habitat loss

Receptor (IEF)	Representative Biotope	Tolerance	Recoverability	Sensitivity	Confidence Assessment
Habitat structure changes – removal of substratum (extraction)					
Offshore circalittoral sand (SS.SSa.OSa)	*Abra prismatica, Bathyporeia elegans* and polychaetes in circalittoral fine sand (SS.SSa.CFiSa.ApriBatPo)	None	Medium	Medium	High
	Echinocyamus pusillus, Ophelia borealis and *Abra prismatica* in circalittoral fine sand (SS.SSa.CFiSa.EpusOborApri)	None	Medium	Medium	High
Offshore circalittoral coarse sediment (SS.SCS.OCS)	*Glycera lapidum, Thyasira* spp. and *Amythasides macroglossus* in offshore gravelly sand (SS.SCS.OCS.GlapThyAmy)	None	Medium	Medium	Medium
Echinoderms and crustose communities (CR.MCR.EcCr)	*Flustra foliacea* on slightly scoured silty circalittoral rock (CR.MCR.EcCr.FaAlCr.Flu)	Not Relevant	Not Relevant	Not Relevant	Not Relevant
	Faunal and algal crusts with *Spirobranchus triqueter* and sparse *Alcyonium digitatum* on exposed to moderately wave-exposed circalittoral rock (CR.MCR.EcCr.FaAlCr)	Not Relevant	Not Relevant	Not Relevant	Not Relevant
Ocean quahog	N/A	None	Very Low	High	Medium
Abrasion/disturbance at the surface of the substratum or seabed					
Offshore circalittoral sand (SS.SSa.OSa)	*Abra prismatica, Bathyporeia elegans* and polychaetes in circalittoral fine sand (SS.SSa.CFiSa.ApriBatPo)	Medium	High	Low	Medium
	Echinocyamus pusillus, Ophelia borealis and *Abra prismatica* in circalittoral fine sand (SS.SSa.CFiSa.EpusOborApri)	Medium	High	Low	Low
Offshore circalittoral coarse sediment (SS.SCS.OCS)	*Glycera lapidum, Thyasira* spp. and *Amythasides macroglossus* in offshore gravelly sand (SS.SCS.OCS.GlapThyAmy)	Medium	High	Low	Low

Receptor (IEF)	Representative Biotope	Tolerance	Recoverability	Sensitivity	Confidence Assessment
Echinoderms and crustose communities (CR.MCR.EcCr)	*Flustra foliacea* on slightly scoured silty circalittoral rock (CR.MCR.EcCr.FaAlCr.Flu)	Medium	High	Low	Medium
	Faunal and algal crusts with *Spirobranchus triqueter* and sparse *Alcyonium digitatum* on exposed to moderately wave-exposed circalittoral rock (CR.MCR.EcCr.FaAlCr)	Medium	High	Low	High
Ocean quahog	N/A	Low	Very Low	High	Medium
Penetration and/or disturbance of the substratum subsurface					
Offshore circalittoral sand (SS.SSa.OSa)	*Abra prismatica, Bathyporeia elegans* and polychaetes in circalittoral fine sand (SS.SSa.CFiSa.ApriBatPo)	Medium	High	Low	Medium
	Echinocyamus pusillus, Ophelia borealis and *Abra prismatica* in circalittoral fine sand (SS.SSa.CFiSa.EpusOborApri)	Medium	High	Low	Medium
Offshore circalittoral coarse sediment (SS.SCS.OCS)	*Glycera lapidum, Thyasira* spp. and *Amythasides macroglossus* in offshore gravelly sand (SS.SCS.OCS.GlapThyAmy)	Medium	High	Low	Medium
Echinoderms and crustose communities (CR.MCR.EcCr)	*Flustra foliacea* on slightly scoured silty circalittoral rock (CR.MCR.EcCr.FaAlCr.Flu)	Not Relevant	Not Relevant	Not Relevant	Not Relevant
	Faunal and algal crusts with *Spirobranchus triqueter* and sparse *Alcyonium digitatum* on exposed to moderately wave-exposed circalittoral rock (CR.MCR.EcCr.FaAlCr)	Not Relevant	Not Relevant	Not Relevant	Not Relevant
Ocean quahog	N/A	Low	Very Low	High	Medium

110. The majority of IEF's within the Benthic Ecology Study Area are characteristic of highly disturbed environments, and typically have medium to high recoverability and will therefore recover rapidly from disturbance as a result of construction impacts.

111. The biotopes are concluded to be of low to medium sensitivity to this impact based on the three MarESA pressures (**Table 8.15**) (Tillin, 2016; Tyler-Walters & Watson, 2024; Readman *et al.*, 2023; Stamp *et al.*, 2023). They have medium to high recoverability to the pressure 'Habitat structure changes – removal of substratum (extraction)' as the benthic species associated with these biotopes are shallowly buried and extraction will remove them. However, these biotopes have medium tolerance as they are characterised by opportunistic species that can rapidly colonise disturbed habitats or species that are larger and longer living and may present in established and mature assemblages (**Table 8.15**) (Tillin, 2016). The biotopes have a low sensitivity to the pressures 'Abrasion/disturbance of the surface of the substratum or seabed' and 'Penetration or disturbance of the substratum subsurface'. While abrasion and penetration of the subsurface are likely to damage a proportion of the characteristic species at the surface of the substratum, resilience and recovery is high due to their opportunistic nature, resulting in a low sensitivity (Tillin, 2016).

112. However, the ocean quahog, is more sensitive to physical disturbance, being classed as highly sensitive to all three MarESA pressures (Tyler-Waters & Sabatini, 2017). The ocean quahog is a long-lived, slow growing bivalve that takes 5-15 years to reach sexual maturity, depending on locality. They reside in the top few centimetres (Taylor, 1976; Morton, 2011) of the sediment and would be disturbed or removed as a result of substratum disturbance or removal. The species therefore has no or low resistance to the pressures associated with physical disturbance and temporary habitat loss.

113. However, this conclusion is derived primarily from evidence relating to dredging activities, which represent far more severe, widespread, and continuous impacts than those of the construction of the Project. Installation of the foundations, offshore cables, scour and cable protection, and any associated site preparation works, are of a much more localised and transient nature. Therefore, they are expected to result in considerably lower levels of seabed disturbance than the pressures underpinning the MarESA.

114. The sensitivities of the receptors are, therefore, considered to be **low** to **high**.

8.11.1.2.2 Magnitude of Impact

8.11.1.2.2.1 Construction

115. Together, installation of the WTG/OSP foundations, offshore cable installation and sandwave levelling will result in a worst-case temporary disturbance of 25,385,076 m^2 within the WDA (**Table 8.5**). It is worth noting that this disturbance would be episodic, associated with particular locations across the WDA at any one time and occur over the five-year duration of construction, not as a single event.

116. Due to the temporary, episodic and relatively localised nature of the impact and resilience of the majority of receptors which are common across the wider region, the magnitude of impact is therefore considered to be **negligible**.

8.11.1.2.2.2 Operation and Maintenance

117. There is the potential for temporary habitat loss and physical disturbance across an area of 36,931m^2 associated with O&M activities. However, effects will be less than those experienced during the

construction phase. Whilst activities such as cable repair and reburial will occur over the full duration of the operational lifetime, they will be infrequent, and the changes will be short-lived.

118. Due to the episodic, temporary and localised nature of the impact and common distribution of the receptors across the wider region, the magnitude of impact of temporary physical disturbance and habitat loss is considered to be **negligible**.

8.11.1.2.2.3 Decommissioning

119. Potential impacts from decommissioning would be equal to or less than the worst-case impacts for construction, as no seabed preparation or sandwave levelling will be required. The impacts from decommissioning will relate to the assemblage of habitats present in the future baseline, and how the benthic community has altered. Accordingly, given that the magnitude of impact was assessed to be **negligible** for the identified benthic ecology receptors during the construction phase, it is anticipated that the same would be true for the decommissioning phase.

8.11.1.2.3 Significance of Effect

120. Overall, it is predicted that sensitivity of the identified receptors is high at worst, and the magnitude of impact is negligible. The effect is therefore of **minor adverse** significance, which is **not significant** in EIA terms.

8.11.1.3 Impact 3: Introduction of Marine Invasive Non-Native Species (INNS)

121. Artificial hard substrates introduced via infrastructure such as foundations, scour and cable protection could act as potential 'stepping stones' or vectors for INNS. The primary pathway for the potential introduction of INNS is from the use of vessels and infrastructure that has originated from an ecologically different location. Therefore, vessels used during the construction, O&M, and decommissioning phases of the Project could inadvertently transport INNS.

8.11.1.3.1 Sensitivity

122. The sensitivity of the IEFs identified in the Benthic Ecology Study Area have been assessed in relation to the MarESA pressure (**Table 8.16**):

- Introduction or spread of invasive non-indigenous species.

123. This impact is related to the impact of 'Colonisation of hard substrates', which may lead to an increased risk of potential habitat that could be colonised by INNS (see **Section 8.11.1.4**).

124. No MarESA sensitivity assessment was available for ocean quahog or the Annex I Reef representative biotopes in response to the spread of INNS, this is because no evidence was found to suggest that ocean quahog populations or circalittoral rock biotopes are adversely affected by INNS. Ocean quahog typically inhabit soft, muddy sediments that experience frequent natural disturbance (Tyler-Walters & Sabatini, 2017), meaning these habitats are generally at low risk of invasion by most UK INNS (Macleod et al., 2016; Mustow, 2021). Slipper limpet (*Crepidula fornicata* and carpet sea squirt (*Didemnum vexillum*) are potential exceptions, as both can settle on bivalves, small stones and shell fragments, smothering the existing habitat (NatureScot, 2023; Begg & Matejusova, 2020). Nevertheless, the strong burrowing behaviour of ocean quahog suggests they may be able to avoid overgrowth or attachment by slipper limpets.

125. The biotopes representing SS.SSa.Osa have a negligible sensitivity to the spread of INNS. This is because the characterising sediments are likely to be too mobile or otherwise unsuitable for colonisation by most of the INNS species currently recorded in the UK.

126. In contrast, SS.SCS.OCS.GlapThyAmy, which represents SS.SCS.OCS, has a high sensitivity to the spread of INNS. Evidence suggests that the slipper limpet could colonise coarse sediment habitats in the subtidal, typical of this biotope (Bohn et al. 2015). However, this assessment was based on a worst-case of the potential colonisation of maerl gravels, which would result in the loss of the biotope. Maerl is not recorded in the WDA, and therefore, no pathway exists to this specific biotope.

127. The sensitivity of the receptor is therefore considered to be negligible to high, based on value of the receptors (**Table 8.16**).

128. It should be noted that there is no existing evidence for the spread of these species being facilitated by offshore wind developments, with *D. vexillum*, for example, typically being spread via shipping and aquaculture activities (Marine Directorate Communications, 2021).

Table 8.16 Sensitivity of the IEFs to INNS

Receptor (IEF)	Representative Biotope	Tolerance	Recoverability	Sensitivity	Confidence Assessment
Offshore circalittoral sand (SS.SSa.OSa)	*Abra prismatica, Bathyporeia elegans* and polychaetes in circalittoral fine sand (SS.SSa.CFiSa.ApriBatPo)	High	High	Negligible (Not Sensitive)	Not Relevant
	Echinocyamus pusillus, Ophelia borealis and *Abra prismatica* in circalittoral fine sand (SS.SSa.CFiSa.EpusOborApri)	High	High	Negligible (Not Sensitive)	Not Relevant
Offshore circalittoral coarse sediment (SS.SCS.OCS)	*Glycera lapidum, Thyasira* spp. and *Amythasides macroglossus* in offshore gravelly sand (SS.SCS.OCS.GlapThyAmy)	Low	Very Low	High	Not Relevant
Echinoderms and crustose communities (CR.MCR.EcCr)	*Flustra foliacea* on slightly scoured silty circalittoral rock (CR.MCR.EcCr.FaAlCr.Flu)	Insufficient Evidence	Insufficient Evidence	Medium*	Not Relevant
	Faunal and algal crusts with *Spirobranchus triqueter* and sparse *Alcyonium digitatum* on exposed to moderately wave-exposed circalittoral rock (CR.MCR.EcCr.FaAlCr)	Insufficient Evidence	Insufficient Evidence	Medium*	Not Relevant
Ocean quahog	N/A	Insufficient Evidence	Insufficient Evidence	Medium*	Not Relevant

** In the absence of a MarESA sensitivity assessment, sensitivity of the IEF has been based on value (**Section 8.10.1.3**).*

8.11.1.3.2 Magnitude of Impact

8.11.1.3.2.1 Construction

129. Throughout the site preparation and construction phase, the Project accounts for up to 5,699 vessel round trips, with a maximum of 117 vessels on site at any one time.

130. These provide vectors, via ballast water discharge and/or biofouling of vessels, for the potential introduction of INNS into the habitats within the WDA. In addition, the installation of artificial hard substrate on the seabed and in the water column throughout the construction phase could provide new habitat for INNS to colonise into the O&M phase. However, all vessels are required to comply with the IMO's guidance on ballast water management (IMO, 2023), the Merchant Shipping (Control and Management of Ships' Ballast Water and Sediments) Regulations (2022), and the Maritime and Coastguard Agency's Marine Guidance Note 675, which will reduce the risk of introducing and spreading INNS. This is detailed in **Table 8.7** (M-5) as embedded mitigation.

131. In addition, an INNSMP will be implemented, which aims to manage and reduce the potential risk of introduction and spread of INNS as far as reasonably practicable (see **Table 8.7**).

132. Overall, taking account of the embedded mitigation measures, the magnitude of introduction of INNS during the construction phase is assessed as **negligible**.

8.11.1.3.2.2 Operation and Maintenance

133. During O&M, up to 423 vessel round trips per annum are predicted over the operational lifetime. As for the construction phase, these vessels provide vectors for the potential introduction of INNS into the habitats within the Benthic Ecology Study Area. In addition, the installation of artificial hard substrate on the seabed and in the water column in the construction phase could provide new habitat for INNS to colonise throughout the lifetime of the Project.

134. Similarly to the construction phase, the implementation of an INNSMP is an embedded mitigation measure which aims to manage and reduce the potential risk of introduction and spread of INNS as far as reasonably practicable. All vessels will be required to comply with the IMO ballast water management guidelines, which will help reduce the risk of potential introduction and spread of INNS as far as practicable. Therefore, the magnitude is considered to be **negligible**.

8.11.1.3.2.3 Decommissioning

135. As with the construction phase, the risk of introduction of INNS during decommissioning would originate from vessel ballast water and biofouling. The number of vessels required for decommissioning is not known at this stage, but it is considered that for construction, the magnitude of impact is negligible and it is anticipated that the same would be true for the decommissioning phase.

136. Adherence to the embedded mitigation measures (**Table 8.7**) during decommissioning will minimise the risk of INNS being introduced into the environment and therefore the magnitude is considered to be **negligible**.

8.11.1.3.3 Significance of Effect

137. The magnitude of the impact is deemed to be negligible, and the sensitivities of the receptors are considered to be negligible to high. Given the localised nature of the impact, and the embedded mitigation measure (**Table 8.7**), the significance of effect is assessed as **minor adverse**, which is **not significant** in EIA terms.

8.11.1.4 Impact 4: Permanent Habitat Loss

138. Permanent habitat loss will occur as a result of the presence of the Project's foundations, scour and external cable protection installed on the seabed leading to a change in habitat type during the lifetime of the Project.

139. The impact of permanent habitat loss does not represent a complete removal of habitat, but rather a physical change from a predominantly sandy / coarse sedimentary habitat to a hard, artificial substratum.

8.11.1.4.1 Sensitivity

140. The sensitivity of the IEFs identified in the Benthic Ecology Study Area have been assessed in relation to the MarESA pressure (**Table 8.17**):

- Physical change (to another seabed type).

141. Installed infrastructure/protection will be colonised by some species of the existing epibenthic community (such as more mobile species, hydroids and bryozoans). The new hard substrate will differ in character from the existing substrate. Hence, the replacement of natural surfaces with artificial hard substratum may lead to changes in the biotope through changes in species composition, richness and diversity.

142. The effects of permanent habitat loss are assessed here; however the potential for colonisation of the hard structures installed has been assessed in Impact 5 'Colonisation of hard structures' (**Section 8.11.1.5**).

Table 8.17 Sensitivity of the IEFs to permanent habitat loss

Receptor (IEF)	Representative Biotope	Tolerance	Recoverability	Sensitivity	Confidence Assessment
Offshore circalittoral sand (SS.SSa.OSa)	*Abra prismatica, Bathyporeia elegans* and polychaetes in circalittoral fine sand (SS.SSa.CFiSa.ApriBatPo)	None	Very Low	High	High
	Echinocyamus pusillus, Ophelia borealis and *Abra prismatica* in circalittoral fine sand (SS.SSa.CFiSa.EpusOborApri)	None	Very Low	High	High
Offshore circalittoral coarse sediment (SS.SCS.OCS)	*Glycera lapidum, Thyasira* spp. and *Amythasides macroglossus* in offshore gravelly sand (SS.SCS.OCS.GlapThyAmy)	None	Very Low	High	High
Echinoderms and crustose communities (CR.MCR.EcCr)	*Flustra foliacea* on slightly scoured silty circalittoral rock (CR.MCR.EcCr.FaAlCr.Flu)	None	Very Low	High	High
	Faunal and algal crusts with *Spirobranchus triqueter* and sparse *Alcyonium digitatum* on exposed to moderately wave-exposed circalittoral rock (CR.MCR.EcCr.FaAlCr)	None	Very Low	High	High
Ocean quahog	N/A	Low	Very Low	High	Low

143. All IEFs identified in the Benthic Ecology Study Area have a high sensitivity to permanent habitat loss. The two representative biotopes of the Offshore circalittoral sand and Offshore circalittoral

coarse sediment IEFs are characterised by their sedimentary habitats. A change to an artificial or rock substratum would alter the characteristics of the biotopes, and result in a loss of the characteristic species (such as *Abra prismatica, Bathyporeia elegans,* and bivalves, like the ocean quahog) that live buried within sandy sediments (Tillin, 2016). Therefore, these IEFs have none or low resistance to the impact of permanent habitat loss.

144. Echinoderms and crustose communities (representative of the 'medium Annex I Stony Reef' area identified within the WDA as detailed in **Section 8.8.1.3.2**) are typically associated with bedrock and boulder habitats. While the MarESA assessment assumes physical change arising from sediment replacing rock, this pathway is less relevant here, as these communities already inhabit hard substrate. Consequently, the anticipated impact represents a smaller deviation from existing habitat conditions than would be expected for sedimentary environments.

145. *Flustra foliacea* is a coarse, foliaceous bryozoan commonly found on stones and shells. It typically reaches heights of 6-10 cm and is capable of repairing physical damage (such as notches to its fronds) within 5–10 days. Provided the holdfast remains intact, *F. foliacea* can survive and regenerate (Tyler-Walters & Ballerstedt, 2007).

146. Fariñas-Franco & Roberts (2014) documented the rapid colonisation of an artificial reef deployed in Strangford Loch, with *F. foliacea* establishing on the structure within six months of installation. Because the species was already recorded in the vicinity prior to construction, it is likely that colonisation resulted from local recruitment. The tubeworm *Spirobranchus triqueter* has rapid recolonisation rate and is likely to colonise any introduced artificial substrate. The soft coral *Alcyonium digitatum* and sea urchin *Echinus esculentus* are also characteristic of echinoderms and crustose communities, However, these species are slower to grow or mature. Hiscock et al. (2010) recorded the succession of the biological community on an artificial reef. *A. digitatum* was first recorded a year after the artificial reef was sunk. Within the first year, colonies had reached close to full size; however, they did not become a visually prominent component of the community until approximately five years later.

147. *Echinus esculentus* is a mobile species and is therefore capable of migrating and recolonising disturbed areas relatively quickly. Lewis & Nichols (1981) reported that adults began to colonise an artificial reef within three months of installation, with population numbers increasing steadily over the following year.

148. Overall, the IEFs are deemed to be of **high** sensitivity at worst.

8.11.1.4.2 Magnitude of Impact

8.11.1.4.2.1 Operation and Maintenance

149. The total worst-case area subject to permanent habitat loss is 6,788,230.51 m^2 (**Table 8.5**) due to WDA infrastructure. The disturbance is expected to be located in discrete areas throughout the WDA (equating to 1.5% of the total footprint of the WDA) and is therefore considered to be highly localised.

150. The IEFs identified within the WDA are not solely dependent on the habitats within the WDA. The characterising species of the biotope '*Abra prismatica, Bathyporeia elegans* and polychaetes in circalittoral fine sand' are found widespread around the coasts of Britain. *Abra prismatica* inhabits mixed sandy sediments from low-water down to 280 m in depth (Lloyd, 2021), whilst *Bathyporeia elegans* is found in fine and muddy sand down to 40 m and may be locally abundant (Richards, 2008).

151. The representative biotope of circalittoral coarse sediment is characterised by *Spirobranchus triqueter* which is widespread on all coasts of northwest Europe to the Mediterranean. Additionally, the representative biotopes of echinoderms and crustose communities, *F. foliacea* and *A. digitatum,* are common on all rocky coasts of Britain and Ireland, in the shallow sublittoral (Readman *et al.,* 2023; Bud, 2008). Ocean quahog is found around all British and Irish coasts and offshore. They reside in the top few centimetres of sediment, at wide-ranging water depths of 4 to 482 m (Tyler-Walters & Sabatini, 2017).

152. Transect MCW-C-ST83 within the WDA where habitat meets the criteria for medium Annex I Stony Reef (as detailed in **Section 8.8.1.3.2**) was assigned the biotope 'Echinoderms and crustose communities (CR.MCR.EcCr)' for its entirety (**Appendix 8.2 Benthic Characterisation Report** and **Appendix 8.3 Geophysical and Habitat Interpretative Report**). As noted in the paragraph above, this biotope is common around the rocky coast of Britain and Ireland.

153. Due to the far-ranging and widespread distribution of IEFs; any permanent habitat loss caused by the WDA infrastructure is unlikely to result in adverse effects at the population level. Whilst the impact is long-term, and directly impactful to IEFs during the lifetime of the Project, it is highly localised within the WDA. Therefore, the magnitude of impact is considered to be low in relation to the site and wider region.

154. However, the Project has committed to micro-siting of infrastructure, where practicable, around any identified sensitive habitats (including Annex I Reef) and identified anomalies of archaeological interest (**Table 8.7** – M14). This will be undertaken following site-specific surveys and design reviews in accordance with **Appendix 6 Outline Environmental Management Plan**. The magnitude of impact is therefore reduced to **negligible**.

8.11.1.4.3 Significance of Effect

155. The magnitude of the impact is considered to be negligible, and the sensitivities of the IEFs are assessed as high. Given the small footprint of permanent habitat loss with respect to the WDA, the widespread availability of alternative suitable habitat, and the mitigation measure of micro-siting, the significance of effect is concluded to be **minor adverse**, which is **not significant** in EIA terms.

8.11.1.5 Impact 5: Colonisation of Introduced Hard Substrate

156. The subsea hard structures (foundations, scour, and cable protection) are expected to be colonised by a range of epifaunal species local to the Benthic Ecology Study Area. In areas where the infrastructure is installed, it may lead to a localised change in biodiversity and also cause the introduction of INNS. The impact of INNS on IEFs in the Benthic Ecology Study Area is assessed in **Section 8.11.1.3**. The presence of the structures may also provide habitat for mobile species, for example serving as a refuge for fish. This represents a change from the baseline ecology. Overall, the area available for colonisation would be low and to date there is no evidence of significant changes of the seabed beyond the vicinity of the foundation structures due to the installation of windfarms (Lindeboom *et al.,* 2011).

8.11.1.5.1 Sensitivity

157. Introduction of hard structures within the WDA will represent a shift in seabed type and species assemblage. In terms of the MarESA pressure, the sensitivities for this impact are as previously described for 'Physical change (to another seabed type)' in the assessment of permanent habitat loss (**Section 8.11.1.4**). The MarESA sensitivities were high for all IEFs (**Table 8.17**). Colonisation of hard structures has the potential to alter baseline benthic communities within the WDA by increasing local habitat complexity and creating additional ecological niches. The introduction of

artificial substrates replaces a predominantly two-dimensional sedimentary seabed with a three-dimensional structure that provides new surfaces for attachment and shelter, thereby enhancing habitat heterogeneity (Dannheim et al*.,* 2020). However, evidence suggests that such changes are dependent on the location of suitable substrates being introduced at appropriate scales and distances from source populations (Chase, 2015).

158. For the Offshore circalittoral sand, Offshore circalittoral coarse sediment and the ocean quahog IEFs, several studies indicate the colonisation of artificial structures typically causes an increase in organic carbon in the surrounding sediment (Fricke et al, 1986; Danovaro et al, 2002; Wilding, 2014). Conversely, other studies determined that the installation of artificial structures does not substantially alter the soft sediment communities surrounding them, as dominant infaunal species typically remain present (De Backer et al., 2020; Degraer *et al.,* 2020).

159. For example, a study assessing the long-term effects of a gas platform in the southern North Sea on the surrounding benthic community found that differences in species composition were more pronounced between transects rather than between distances from the platform and primarily due to changes in sedimentary organic matter content (Klunder et al, 2018). Lefaible et al. (2023) studied two Belgian offshore windfarms (Belwind: monopiles and C-Power: jackets), which found that effects from artificial structures were highly site- and foundation-specific, with monopile foundations showing little to no detectable effect on surrounding soft sediments. Soft-sediment infaunal patterns remained primarily driven by sediment characteristics and natural environmental factors, not by proximity to artificial structures.

160. Although increases in structural complexity may encourage fish aggregation (Birchenough & Degraer, 2020; Coolen et al*.,* 2020) around WDA infrastructure, leading to a theoretical increase in predation pressure, current evidence remains limited. Research into predator responses within benthic environments is sparse, and no studies to date have conclusively demonstrated significant increases in predation linked to offshore WTG structures (Dannheim et al., 2019). Some studies even suggest that artificial foundations can provide additional habitat and partially compensate for other habitat losses (Langhamer, 2012).Therefore, the sensitivities of ocean quahog, the Offshore circalittoral sand and Offshore circalittoral coarse sediment IEFs aligned with MarESA and are considered to be high.

161. In contrast, echinoderms and crustose communities are established on rocks and boulders within the Benthic Ecology Study Area, and the Project's infrastructure is therefore likely to be rapidly colonised with fauna characteristic of the surrounding environment. As a result, this impact does not constitute a shift from a preferred habitat to an unsuitable one for this IEF, unlike the case for other IEFs. Accordingly, the sensitivity of this receptor to this impact is modified by expert judgment and considered to be negligible (not sensitive).

8.11.1.5.2 Magnitude of Impact

8.11.1.5.2.1 Operation and Maintenance

162. The worst-case scenario for colonisation of introduced hard substrate assumes that all available hard infrastructure within the WDA is colonisable by epilithic benthic species and remains *in situ* throughout the lifetime of the Project. The magnitude of this impact is therefore broadly comparable to that of permanent habitat loss assessed in **Section 8.11.1.4**, which assumes that up to 6,788,230.51 m^2 (**Table 8.5**) of artificial hard substrate will be installed within the WDA (1.5% of the entire WDA).

163. It is expected that these artificial hard structures will be colonised by epifaunal species local to the Benthic Ecology Study Area which may lead to beneficial outcomes. For instance, a 12-year monitoring programme of the artificial foundations at the Lysekil research site in Sweden observed increases in biodiversity, reef-associated species abundance, and overall species richness over time (Bender et al., 2020). Colonisation of hard structures associated with the WDA is therefore likely to lead to a localised increase in biodiversity and a measurable shift from baseline conditions if no hard substrates were present (Lindeboom et al., 2011).

164. Although this impact could be considered potentially beneficial in terms of increasing biodiversity, the installation of hard structures has the potential to alter the surrounding habitats, such as the Offshore circalittoral sand and Offshore circalittoral coarse sediment IEFs (**Section 8.11.1.4**). However, given the wide availability of both of these habitats over the Benthic Ecology Study Area, and the localised nature of this impact, this impact is only expected to result in minor alteration to these IEFs as a whole.

165. The colonisation of introduced substrate is a long-term impact during the lifespan of the Project, but of local spatial extent (1.5% of the WDA). Therefore, the magnitude is considered to be **negligible** in relation to the surrounding habitat available and the highly localised nature of the impact.

166. To note, the amount of cable protection utilised (and therefore hard substrate available for colonisation on the seabed) will be minimised through cable burial where practicable; protection will be used only where design burial depths are not achieved or where crossings require it (see embedded mitigation measures in **Table 8.7** i.e. the requirement for a Cable Plan (M-8)).

167. In addition, the Project is also considering the use of nature inclusive design solutions to promote biodiversity (see **Nature Positive Plan**).

8.11.1.5.3 Significance of Effect

168. The magnitude of the impact may be considered beneficial for the Echinoderms and crustose IEF. The sand dominated IEFs may be adversely impacted however the impact magnitude is deemed to be negligible, and the sensitivities of the IEFs are considered to be not sensitive for the echinoderms and crustose communities IEFs, and high for others. Given the relatively small footprint of the WDA infrastructure with respect to both the WDA and the wider area, and the widespread availability of alternative suitable habitat, the significance of effect is concluded to be **minor adverse** at worst, which is **not significant** in EIA terms.

8.11.1.6 Impact 6: Interactions with Electromagnetic Fields

169. There is potential for the Project's subsea electrical cabling to produce EMFs that interfere with the behaviour of benthic species during the operational phase.

170. EMFs are comprised of electric fields (E-fields) and magnetic fields (B-fields) (Gill & Desender, 2020). The Earth creates its own geomagnetic field and has E- and B-fields associated with natural phenomena (e.g., lightning), while also being permeated by EMFs from outside the Earth's atmosphere (Gill et al., 2014). The global geo-magnetic field ranges from approximately 25 μT to 65 μT (Hutchinson et al., 2020). Within the eastern Atlantic, background levels of magnetic fields are approximately 50 μT and background electric fields are approximately 25 μV/m (Tasker et al., 2010).

171. Direct electrical fields (E-fields) are typically contained within the cable by shielding and grounding that allow the field to dissipate quickly, but a B-field is still emitted in the outside environment. This results in an electrical field (iE-field) generated when organisms or water current causes motion through a B-field) (Gill & Desender, 2020).

172. The strength of the EMFs produced by underwater cables is dependent on a variety of factors including distance from the cable, whether the cable is in sediment or sea water, speed and direction of water flow, and strength of the magnetic field. EMF strength dissipates rapidly with increasing distance from the source; for example, the average windfarm array cable buried 1 m below the seabed will decrease from 7.85 μT directly next to the cable (0 m) to 1.47 μT at 4 m distance (Normandeau et al., 2011).

173. The effects of EMF on benthic communities are not well understood, although studies (e.g. Sherwood et al., 2016) suggest that benthic communities growing along offshore export cable(s) routes are similar to those in nearby areas beyond the likely extent of EMF effects. It is important to note, any observed changes could be the result of the physical presence of the cable and surface properties, rather than an EMF effect (Gill & Desender, 2020).

174. Jakubowska et al (2019) studied the effect of EMF on the behaviour and bioenergetics of the polychaete, *Hediste diversicolor*. No avoidance or attraction behaviour to EMF was shown, but burrowing activity was enhanced in EMF treatment, indicating a potential stimulating effect on bioturbation potential.

175. In addition, relatively little is known about the effects of EMFs on marine benthic invertebrates, but some decapod crustaceans are known to be magnetosensitive. Research concerning invertebrates (e.g. Hutchinson *et al.,* 2018; 2020; Scot *et al.,* 2018; Taormina *et al.,* 2020) generally supports previous studies that demonstrated no or minor effects of encounters with EMFs, but some findings are equivocal (Albert *et al.*, 2020).

176. In general, the occurrence of apparently healthy and diverse communities on existing offshore windfarm structures provides evidence that EMF is unlikely to pose a significant threat to the colonising communities on foundation bases in the longer term (Gill *et al.,* 2009; Linley *et al.,* 2007). However, in the absence of more comprehensive evidence, uncertainty remains when predicting potential impacts of EMF on benthic invertebrate communities.

8.11.1.6.1 Sensitivity

177. The sensitivity of the IEFs identified in the Benthic Ecology Study Area have been assessed in relation to the MarESA pressure (**Table 8.16**):

- Electromagnetic changes.

178. No MarESA sensitivity assessments are available for the identified IEFs, reflecting a significant lack of empirical evidence regarding the effects of EMFs on benthic organisms. Existing studies investigating anthropogenically generated EMFs, typically at intensities between 2 nT and 40 mT, far exceeding in-situ levels associated with subsea power cables, have reported mixed outcomes. While some research has identified behavioural, physiological, reproductive, developmental, immunological, cytotoxic and orientation-related responses, other studies have observed no measurable effects (Albert et al., 2020; Hutchison et al., 2020). Overall, study findings vary depending on the species examined, as well as the intensity and duration of EMF exposure (Tillin & Watson, 2025).

179. While the evidence base concerning the effects of EMFs on fish species is steadily expanding, research on benthic invertebrates remains comparatively limited, with existing studies focusing predominantly on crustaceans (Hutchison et al., 2018; 2020; Scott et al., 2018).

180. Echinoderms, bivalves and polychaetes represent key components of the representative biotopes within the Offshore circalittoral sand, Offshore circalittoral coarse sediment, and Echinoderms and

crustose communities IEFs. However, reported EMF-related effects on these taxa are inconsistent across the literature.

181. Several studies have examined the responses of bivalves to EMF exposure (Albert et al., 2020; Jakubowska et al., 2019). Although some have identified cytotoxic, genotoxic and neurotoxic effects, these findings were typically associated with exposure intensities far exceeding those anticipated several metres from subsea power cables, for example, 300 μT (Albert et al., 2022) and 1 mT (Jakubowska et al., 2019). While such effects could theoretically be relevant to species such as ocean quahog due to taxonomic similarity, the exposure levels in these studies are not representative of those expected within the WDA.

182. On a precautionary basis, all IEFs are therefore considered to exhibit medium tolerance and medium recoverability. However, this is likely conservative, as much of the available evidence indicates minimal impacts at EMF intensities consistent with those likely to occur within the WDA. Furthermore, the majority of existing studies investigate EMF levels substantially higher than those expected within several metres of the Project's offshore cables.

183. The sensitivities of the receptors are, therefore, considered to be **medium**.

8.11.1.6.2 Magnitude of Impact

8.11.1.6.2.1 Operation and Maintenance

184. The total length of cabling within the WDA, comprising IAC, OSP link cables and offshore export cable, is approximately 1,044 km (**Table 8.5**).

185. Cable minimum Depth of Lowering (DoL) (i.e. the distance between mean seabed level and the top surface of the buried cable) will be between 0.3 m and 3 m but is typically between 1.0 m and 2.0 m in seabed substrates consisting of granular material or soft clay. Where practicable, the Applicant will seek to achieve DoLs of 1.0 m to 2.0 m for all offshore cable types. DoLs of up to 3.0 m may be used for areas experiencing significant seabed mobility or due to an increased external threat, such as crossing shipping lanes. DoLs of 0.3 m may be used for IACs in challenging ground conditions such as shallow outcropping rock, due to the inherent protection it provides the cable at a shallower DoL. OSP link cables and offshore export cables would, as far as practicable, have a minimum DoL of 1 m. Otherwise, external cable protection methods would be considered such as concrete mattresses, rock placement, rock bags and nature inclusive design solutions.

186. Final cable burial depths will be determined through a CBRA, to be developed as part of the Cable Plan (see embedded mitigation M-8 - **Table 8.7**). For the worst-case scenario, it is estimated that up to 25% of the total cable length may require external cable protection: 10% for IACs, 10% for OSP link cables and 5% of the offshore export cable(s). Up to 2 OSP link cable crossings could also require protection.

187. It is expected that the IACs will be buried to a minimum DoL of 0.3 m and 1.0 m for OSP link cables and the offshore export cables. However, where practicable, the Applicant will seek to achieve DoLs of 1.0 m to 2.0 m for all offshore cable types and depths of 0.3 m are only likely to be accepted along very discrete sections of IACs, if at all. Increased burial depth significantly reduces the strength of magnetic fields that may be detectable by benthic fauna, as EMF intensity decreases rapidly with distance from the cable (CSA, 2019). Surface-laid IACs, where required, will be covered with cable protection materials, further limiting the extent of EMF exposure to benthic epifauna.

188. In summary, although EMFs generated by offshore power cables may be detectable by some benthic species, any effects are expected to be highly localised due to the rapid attenuation of EMFs with distance, following an inverse-square decay pattern (Gill & Barlett, 2010).

189. While EMF emissions will persist for the duration of the operational phase, the impact is considered to be highly reversible, as cables are expected to be removed or cut and de-powered during decommissioning. Consequently, the magnitude of impact is assessed as **negligible**.

8.11.1.6.3 Significance of Effect

190. For all IEFs, the magnitude of the impact is considered to be negligible, and the sensitivities of the receptor are assessed as medium. The effect will, therefore, be of **negligible adverse** significance, which is **not significant** in EIA terms.

8.11.1.7 Impact 7: Heat Exposure from Subsea Electrical Cables

191. The transfer of electrical current through the Project's subsea electrical cabling has the potential to generate heat within surrounding sediments (OSPAR Commission, 2009), which could in turn, influence nearby benthic ecological receptors.

192. Recent evidence indicates that the temperature differences measured at the surface of operational power cables, when compared with inert sections, were negligible, recorded at a sensitivity threshold of approximately 0.06°C (Taormina *et al.,* 2021). Modelling of heat generation from high-voltage direct current (HVDC) cables with similar specifications comparable to high-capacity offshore windfarm export cable(s) (525kV) similarly suggests that, even under worst-case conditions involving bundled cables, temperature increases remain limited to a very narrow band above the cables, with negligible heat transfer into the wider seabed environment (Brakelmann & Stammen, 2017). It is noted, however, that empirical measurements of *in-situ* thermal change around subsea cables remain limited, with only one documented field study to date (Meiβner et al., 2007).

193. As part of regulatory approval processes for individual windfarm developments in the North Sea and Baltic Sea, several seabed temperature modelling studies have been undertaken (e.g. EOS Offshore AG, 2003; Worzyk & Böngeler, 2003; Offshore Wind Technology GmbH, 2004). These studies consistently concluded that seabed temperature increases may occur in close proximity to export cable(s), although such increases typically remain below 2 °C. Brakelmann (2006) noted that these outputs represent conservative, worst-case estimates, as they assume several consecutive days of full-load operation i.e. conditions that are infrequent in practice. At one monitored windfarm near Sylt, for example, only seven such full-load periods occurred per year, implying that actual thermal effects are likely to be lower than those predicted by the models.

194. Findings from Meißner et al. (2007) support this interpretation. The extent of thermal influence is strongly governed by local sediment characteristics and burial depth. Coarse sediments dissipate heat more rapidly than finer sediments, while relatively thin sediment cover (e.g. 65–80 cm) increases the influence of overlying water temperature on the seabed thermal regime. These factors collectively limit the potential for heat generated by subsea cables to affect benthic ecological receptors at ecologically meaningful scales.

8.11.1.7.1 Sensitivity

195. There are currently no MarESA sensitivity assessments available for the identified IEFs in relation to thermal emissions from subsea electrical cables, reflecting the relatively recent recognition of this impact pathway and the limited evidence base concerning physiological or behavioural responses of benthic organisms to seabed heating.

196. Given the scarcity of field data, the effects of artificially elevated seabed temperatures on benthic communities remain poorly understood. It is reasonable to assume that sustained increases in sediment temperature could influence the physiology, reproductive capacity, or mortality of certain benthic species, potentially leading to shifts in community composition through emigration or immigration. The extent of temperature change experienced within the upper sediment layers, where most benthic fauna occur, is influenced by several factors, including cable burial depth. Appropriate burial depths, therefore, play an important role in reducing the potential for localised thermal effects.

197. In addition to direct biological effects, increases in sediment temperature resulting from cable heat emissions may alter sediment physico-chemical conditions and stimulate bacterial activity (Meißner & Sordyl, 2006). Processes initiated within deeper sediment layers may ultimately influence conditions throughout the overlying seabed via pore-water exchange. Resultant changes to sediment chemistry may exert secondary effects on benthic flora and fauna. The magnitude of these processes is strongly influenced by the organic-matter content of the sediment.

198. On a precautionary basis, all IEFs are therefore considered to exhibit medium tolerance and medium recoverability. However, this is likely conservative, as much of the available evidence indicates minimal impacts to benthic ecology due to heat from subsea electrical cables.

199. The sensitivities of the receptors are, therefore, considered to be **medium**.

8.11.1.7.2 Magnitude of Impact

8.11.1.7.2.1 Operation and Maintenance

200. The footprint of any thermal effect is expected to be highly limited, typically confined to a narrow zone of less than 1 m surrounding the cable, although the precise extent cannot be defined with certainty. The Project's offshore cables will be buried to a minimum DoL of between 0.3 m and 1 m, depending on cable type, which will further reduce potential thermal influence on the surrounding sediments.

201. Modelling indicates that at a depth of 0.2 m below the seabed surface, temperature increases will remain below 2 °C when cables are buried at depths greater than 0.35–0.55 m. At burial depths exceeding 1.5 m, any temperature change at 0.2 m depth is predicted to be negligible (Brakelmann & Stammen, 2017).

202. In addition, where burial is not practicable and cables require external protection, the sheathing and any overlying sediment or cable protection material will act as an insulating barrier. This will further attenuate heat transfer to the water column and adjacent sediments. Available evidence indicates that temperature increases within the surrounding seabed are generally negligible, particularly when compared to natural seasonal variability (Hughes et al., 2015; Taormina et al., 2020). As with EMF interactions, any effects arising from cable-related heat emissions are therefore not anticipated to result in adverse impacts at the population level for benthic receptors.

203. Considering the above evidence regarding ecological risks of heat exposure from cables is negligible, the magnitude of impact is therefore considered to be **negligible**.

204. Furthermore, the Project would implement the embedded mitigation listed in **Table 8.7** regarding micro-siting of infrastructure (M-14), where practicable, around any identified sensitive habitats. Therefore, these habitats should not be directly impacted by heat exposure from subsea cables.

8.11.1.7.3 Significance of Effect

205. For all IEFs, the magnitude of the impact is deemed to be negligible, and the sensitivities of the receptors are considered to be medium. The significance of effect will, therefore, be **negligible adverse**, which is **not significant** in EIA terms.

8.11.2 Combined Assessment: Windfarm Development Area, Offshore ECC and Onshore Development Transmission Development Area

206. The impacts for the WDA presented in **Section 8.11.1** are likely to have interactions and additive effects with activities occurring in the Offshore ECC, including the intertidal area. However, there will be no interactions and additive effects between the WDA and the OnTDA, therefore this section will just focus on the combined effects of the WDA and the Offshore ECC. It is noted that the OSPs and part of the offshore export cable located within the Benthic Ecology Study Area have already been encompassed within the WDA-Alone Assessment.

8.11.2.1 Impact 1: Impacts on Suspended Sediment Concentrations (SSCs) and sediment re-deposition

207. Cable installation activities within the Offshore ECC, such as ploughing, jetting, or mechanical cutting, would temporarily increase the overall volume of sediment disturbed when considered in combination with activities in the WDA. This has the potential to enhance the effects described under Impact 1 (**Section 8.11.1.1**), resulting in additional SSCs and sediment redeposition. However, these effects are expected to remain highly localised and short-lived, with sediment concentrations dispersing rapidly under prevailing hydrodynamic conditions (**Chapter 7 Marine Physical Environment**).

208. As described in the WDA-alone assessment, ploughing for cable installation results in the highest SSCs near the seabed, with concentrations decreasing gradually towards the water surface. SSC changes of ≤5 mg/s may occur across the entire WDA and extend up to approximately 8 km south of the WDA boundary; however, these increases will not occur simultaneously, as each plume will dissipate before the next phase of disturbance begins. Close to the cable trench, SSC levels typically range from 1,500 to 2,500 mg/l and may extend up to 150 m laterally from the trench.

209. Overall, although the Offshore ECC contributes to the total volume of suspended sediment, the combined effects are constrained by spatial separation, short duration, and natural sediment dynamics. Consequently, the combined significance of effect is considered to be **minor adverse**, consistent with the WDA-alone assessment (**Section 8.11.1.1.3**).

8.11.2.2 Impact 2: Temporary Physical Disturbance / Habitat Loss

210. Cable installation activities within the Offshore ECC, such as ploughing, jetting and mechanical cutting, would temporarily increase the overall footprint of seabed disturbed when considered in combination with activities in the WDA. However, even when combined, the total disturbance area remains very small in the context of the extensive sandy and gravelly sediment habitats present across the wider region. Evidence from comparable environments indicates that benthic communities typically recover rapidly following such installation activities (RPS, 2019; Newell et al., 1998).

211. Overall, although the Offshore ECC contributes to the total area of temporary habitat disturbance, interactional and additive effects are limited by the spatial separation of activities, their short duration, and the demonstrated capacity of benthic habitats to recover quickly. Consequently, the combined significance of effect is considered to be **minor adverse**, consistent with the WDA-alone assessment (**Section 8.11.1.2.3**).

8.11.2.3 Impact 3: Introduction of Marine Invasive Non-Native Species

212. The maximum number of vessels assumed for WDA infrastructure activities includes those required for offshore export cable installation and therefore there would be no overall increase in vessel traffic when combined with the WDA. Therefore, there would be no or very little potential for an elevated risk of introducing INNS through mechanisms such as hull fouling or ballast water discharge. The implementation of embedded biosecurity measures and adherence to relevant marine guidance will apply across all areas, substantially reducing this risk.

213. Overall, although the Offshore ECC will increase the geographical spread of vessel activity, these contributions are negligible relative to the level of vessel activity and port movements already anticipated for construction within the WDA. Furthermore, the WDA does not contain habitats that would inherently facilitate the establishment or proliferation of INNS, and the spatial footprint of new infrastructure remains limited in the context of the wider marine environment. Consequently, the combined significance of effect for INNS-related impacts is considered to be **negligible**, consistent with the WDA-alone assessment (**Section 8.11.1.3.3**).

8.11.2.4 Impact 4: Permanent Habitat Loss

214. Installation of additional cable protection or infrastructure within the Offshore ECC during the operational phase would marginally increase the footprint of permanent habitat loss relative to the WDA-alone scenario. However, the spatial extent of habitat loss within the Offshore ECC would remain very small in the context of the total seabed area and would primarily affect sandy substrates, which are widely distributed across the Benthic Ecology Study Area.

215. Overall, while the Offshore ECC introduces a minor additional footprint associated with cable protection and related infrastructure, these contributions are negligible when compared to foundations and scour protection within the WDA. Furthermore, the Project has committed to micro-siting infrastructure, where practicable, to avoid sensitive habitats and known archaeological anomalies. Consequently, the combined assessment of permanent habitat loss is considered to be **minor adverse**, consistent with the WDA-alone assessment (**Section 8.11.1.4.3**).

8.11.2.5 Impact 5: Colonisation of Introduced Hard Substrate

216. Installation of additional scour protection or cable protection within the Offshore ECC would slightly increase the overall footprint of hard substrate compared to the WDA-alone scenario. This could create new surfaces for colonisation by benthic invertebrates, altering habitat composition and potentially generating artificial reef effects (Birchenough & Degraer, 2020; Coolen et al., 2020). This may be considered beneficial for hard substrate biotopes such as those that represent the Echinoderms and crustose IEF. Conversely, sand dominated communities may be impacted by increased organic carbon, resulting in a change of biotope. However, the spatial extent of hard substrate introduction within the Offshore ECC will remain very small relative to the wider region, and any ecological changes will be highly localised.

217. Overall, while the Offshore ECC adds a minor additional footprint of rock protection, colonisation processes and associated ecological shifts will occur gradually and remain localised. Consequently, the combined assessment of hard substrate introduction is considered to be **minor adverse** at worst, consistent with the WDA-alone assessment (**Section 8.11.1.5.3**).

8.11.2.6 Impact 6: Interactions with Electromagnetic Fields

218. In a combined assessment, the export cable extending beyond the WDA into the Offshore ECC would increase the overall footprint of EMF sources compared to the WDA-alone scenario. However,

EMF emissions from subsea electrical cables are highly localised and attenuate rapidly with distance. Normandeau et al., (2011), reported that the magnetic field generated by a typical windfarm array cable buried 1 m below the seabed decreases from approximately 7.85 μT at the cable surface (0 m) to around 1.47 μT at a distance of 4 m from the cable. As the export cable will also be buried, where practicable, at a minimum of depth of 1 m, the extent of EMF exposure to benthic epifauna will be further reduced.

219. Overall, while the Offshore ECC introduces additional cable length along the export route, the resulting EMF emissions remain highly localised and diminish rapidly with distance from the cable. Consequently, the combined assessment of EMF-related impacts is considered to be **minor adverse**, consistent with the WDA-alone conclusion (**Section 8.11.1.6.3**).

8.11.2.7 Impact 7: Heat Exposure from Subsea Electrical Cables

220. As with interactions involving EMFs, the export cable extending beyond the WDA into the Offshore ECC would, in a combined assessment, increase the overall footprint of potential heat-emitting sources compared to the WDA-alone scenario. This could slightly increase the potential for heat transfer into surrounding sediments, which may, in turn, influence nearby benthic ecological receptors.

221. However, modelling indicates that at a depth of 0.2 m below the seabed surface and where cables are buried at depths greater than 0.35–0.55 m, temperature increases remain below 2 °C. At burial depths exceeding 1.5 m, any temperature change at 20 cm depth is predicted to be negligible (Brakelmann & Stammen, 2017).

222. Overall, although the Offshore ECC introduces additional cable length along the export route, any associated thermal effects remain highly localised and diminish rapidly with distance from the cable. Consequently, the combined assessment of cable heating-related impacts is considered to be **minor adverse**, consistent with the WDA-alone conclusion (**Section 8.11.1.7.3**).

8.11.2.8 Combined Assessment Summary

Table 8.18 Benthic ecology combined assessment summary

Receptor/Topic	WDA Residual Effect	Offshore ECC Assessment of Effects	OnTDA Assessment of Effects	Combined Assessment
C, O&M, D* Impact 1: Impacts on SSCs and sediment re-deposition.	Not Significant (Minor Adverse).	Not Significant (Minor Adverse).	N/A – no pathway to receptors.	No significant residual effects, a greater volume of sediment will be disturbed but it is highly unlikely to generate a combined effect as plumes will disperse rapidly after disturbance limiting the potential for overlapping plumes.
C, O&M, D* Impact 2: Temporary Physical Disturbance / Habitat Loss	Not Significant (Minor Adverse).	Not Significant (Minor Adverse).	N/A – no pathway to receptors.	No significant residual effects likely, a greater area of seabed will be disturbed but the total will remain small when

Receptor/Topic	WDA Residual Effect	Offshore ECC Assessment of Effects	OnTDA Assessment of Effects	Combined Assessment
				compared to the wider regional area.
C, O&M, D* Impact 3: Introduction of marine Invasive Non-Native Species	Not Significant (Minor Adverse).	Not Significant (Minor Adverse).	N/A – no pathway to receptors.	No significant residual effects likely, despite an increase in subsea infrastructure therefore some additive effects in the vicinity of the WDA.
O&M* Impact 4: Permanent habitat loss	Not Significant (Minor Adverse).	Not Significant (Minor Adverse).	N/A – no pathway to receptors.	No significant residual effects likely, despite some additive effects in the vicinity of the WDA.
O&M* Impact 5: Colonisation of introduced hard substrate	Not Significant (Minor Adverse).	Not Significant (Minor Adverse).	N/A – no pathway to receptors.	No significant residual effects likely, despite an increase in subsea infrastructure therefore some additive effects in the vicinity of the WDA.
O&M* Impact 6: Interactions with Electromagnetic Fields	Not Significant (Minor Adverse).	Not Significant (Minor Adverse).	N/A – no pathway to receptors.	No significant residual effects likely, despite some additive effects in the vicinity of the WDA.
O&M* Impact 7: Impacts to benthic ecology due to heat from subsea electrical cables	Not Significant (Minor Adverse).	Not Significant (Minor Adverse).	N/A – no pathway to receptors.	No significant residual effects likely, despite some additive effects in the vicinity of the WDA.
* C = Construction, O&M = Operation and Maintenance, D = Decommissioning				

8.12 CUMULATIVE EFFECTS

8.12.1 Screening of Potential Cumulative Impacts

223. The first step in the CEA is the screening / identification of which whole-Project impacts could have a cumulative effect with other plans, projects and activities (described as ‘impact screening’). This information is set out in **Table 8.19**, together with a consideration of the confidence in the data that is available to inform a detailed assessment and the associated rationale.

Table 8.19 Potential cumulative impacts (impact screening)

Impact	Potential for Cumulative Impact	Data Confidence	Rationale
Construction and Decommissioning			
Impact 1: Impacts on SSCs and sediment re-deposition	Yes	High	The increase in SSCs and subsequent sediment re-deposition are expected to be highly localised and short-lived. Although elevated SSCs may disperse over the distance of a single tidal ellipse (approximately 11km), there will be spatial and temporal overlap with other plans or projects with the potential to increase the overall impact from increased SSCs and sediment re-deposition. Consequently, the potential for cumulative effects from increased SSCs and sediment re-deposition has been included within the CEA (**Section 8.12.3.1**).
Impact 2: Temporary Physical Disturbance / Habitat Loss	Yes	High	The loss of habitat and associated disturbance will be highly localised and short-term in nature. However, there will be spatial and temporal overlap with other plans and projects. Although the duration and footprint of disturbance are limited, the overlap of activities may increase the overall impact from temporary physical disturbance/loss. Consequently, the potential for physical disturbance and temporary habitat loss affecting benthic ecology has been included within the CEA (**Section 8.12.3.2**).
Impact 3: Introduction of marine INNS	Yes	High	There is spatial and temporal overlap between project boundaries, and therefore the potential for a cumulative increase in vessels within the ZoI that would allow INNS to move or spread between developments. The potential for cumulative effects from the transfer of INNS has been included within the CEA (**Section 8.12.3.3**).
Operation and Maintenance			
Impact 1: Impacts on SSCs and sediment re-deposition	Yes	High	The increase in SSCs and subsequent sediment re-deposition are expected to be highly localised and short-lived. Although elevated SCCs may disperse over the distance of a single tidal ellipse (approximately 11km), there will be spatial and temporal overlap with other plans or projects with the potential to increase the overall impact from increased SSCs and sediment re-deposition. Consequently, the potential for cumulative effects from increased SSCs and sediment re-deposition has been included within the CEA (**Section 8.12.3.1**).
Impact 2: Temporary Physical Disturbance / Habitat Loss	Yes	High	The loss of habitat and associated disturbance will be highly localised and short-term in nature. However, there will be spatial and temporal overlap with other plans and projects. Although the duration and

Impact	Potential for Cumulative Impact	Data Confidence	Rationale
			footprint of disturbance are limited, the overlap of activities may increase the overall impact from temporary physical disturbance/loss. Consequently, the potential for physical disturbance and temporary habitat loss affecting benthic ecology has been included within the CEA (**Section 8.12.3.2**).
Impact 3: Introduction of marine INNS	Yes	High	There is spatial and temporal overlap between project boundaries, and therefore the potential for a cumulative increase in vessels within the ZoI that would allow INNS to move or spread between developments. The potential for cumulative effects from the transfer of INNS has been included within the CEA (**Section 8.12.3.3**).
Impact 4: Permanent habitat loss	Yes	High	Permanent habitat loss is considered to result in a minor adverse significance of effect due to the small spatial extent which would be lost. There would be spatial and temporal overlap between project boundaries that have the potential to result in cumulative long-term habitat loss. The potential for cumulative effects from permanent habitat loss has been included within the CEA (**Section 8.12.3.4**).
Impact 5: Colonisation of introduced hard substrate	Yes	High	Colonisation of hard structures is not considered to result in significant adverse effect for the Project alone. There would be spatial and temporal overlap between project boundaries that have the potential to contribute to cumulative impacts. The potential for cumulative effects from colonisation of introduced hard substrate has been included in the CEA (**Section 8.12.3.5**).
Impact 6: Interactions with EMFs	Yes	High	Interactions with EMFs is considered to result in negligible adverse effects. There is spatial and temporal overlap with other cables in the Offshore ECC and therefore a pathway to cumulative impacts exists. As a result, this potential impact has been included within the CEA (**Section 8.12.3.5.3**).
Impact 7: Heat Exposure from Subsea Electrical Cables	Yes	High	Interactions with heat from subsea electrical cables is considered to result in negligible adverse effects. In addition, there are spatial and temporal overlap with other cables in the Offshore ECC and therefore a pathway to cumulative impacts exists. As a result, this potential impact has been included within the CEA (**Section 8.12.3.7**).

8.12.2 Screening of Other Plans, Projects and Activities

224. The second screening step in the CEA is the identification of the other plans, projects and activities that may result in cumulative impacts for inclusion in the CEA (described as 'project screening'). This information is set out in **Table 8.20**, together with consideration of the relevant details of each, including current status (e.g. under construction), planned construction period, closest distance to the Project, status of available data and rationale for including or excluding from the assessment.

225. The project screening has been informed by the development of a CEA Long List which forms an exhaustive list of plans, projects and activities in a very large Study Area relevant to the Project. The list has been appraised, based on the confidence in being able to undertake an assessment from the information and data available, enabling individual plans, projects and activities to be screened in or out. As described in **Section 8.10.3**, this has been undertaken using a tiered approach to provide a framework for placing relative weight on the potential for each plan or project to be included in the CEA for this topic.

226. An appropriate 11 km ZoI to identify overlapping projects/plans has been determined based on the maximum tidal excursion that extends from the WDA in a southerly direction. However, as the ZoI is moderated by the direction and length of the tidal ellipse excursions across the Project, a precautionary larger ZoI has been considered in the CEA to account for the Combined Assessment of the WDA, Offshore ECC and Onshore Transmission Development Area. The Offshore ECC will potentially be located in an area of very rapid tidal current speeds to the south of the WDA where characterised tidal ellipses reach lengths up to 30 km, oriented north (northeast) to south (southwest). A ZoI of 30 km is therefore defined for this CEA.

Table 8.20 Planned projects within 11 km of the Project

Project / Plan	**Status**	**Closest Distance from the WDA (km)**	**Closest Distance from the Offshore ECC (km)**	**Description of Project / Plan**	**Construction Period**	**Operational Period**	**Data Confidence**	**Overlap with the WDA**	**Included in the CEA**	**Rationale**
Tier 1 projects / plans (projects which are operational (but not part of the baseline), under construction, those with consent and submitted but not yet determined)										
Dubh Artach Lighthouse Refurbishment	Operational	1.5	28	Refurbishment	2027-2032	5 years	High	Yes, temporal overlap	Yes	Potential overlap with the Project's construction activities
Tier 2 projects / plans (all plans/projects assessed under Tier 1, plus those projects with a Scoping Report and/or Scoping Opinion)										
LirIC interconnector	Development	125	Spatial overlap	Electricity Interconnector	2032	Unknown	High	Yes, temporal overlap	Yes	Potential overlap with the Project's construction and O&M activities
Tier 3 projects / plans (all plans/projects assessed under Tier 1 and Tier 2, plus those projects likely to come forward where a CES Option to Lease Agreement or equivalent has been granted (i.e., ScotWind and INTOG projects)										
Western Link 2	Early Planning	104	Spatial overlap	Electricity Transmission Cable	Unknown	Unknown	High	Yes, temporal overlap	Yes	Potential overlap with the Project's construction and O&M activities
Malin Sea Wind	Early Planning	48	14	Offshore Windfarm	2030-2031	25+ years	High	Yes, temporal overlap	Yes	Potential overlap with the Project's construction and O&M activities

8.12.3 Cumulative Effects Assessment

227. This CEA considers whether the Project could act in-combination with other relevant projects/plans (split across Tiers 1 to 3) to generate additional effects on benthic ecology receptors, beyond those identified for the Project alone.

228. There is little information available for Dubh Artach Lighthouse Refurbishment (Tier 1) only that it involves the structural erection of buildings, fabrication work, and the manufacture of a replacement entrance platform for the Lighthouse[9]. The Lighthouse Refurbishment has no spatial overlap with the Project, however as there is a temporal overlap it can be assumed that a small increase in the number of vessels supporting the refurbishment may be brought to the area. Therefore, this project is only discussed in **Section 8.12.3.3** in relation to the introduction of INNS.

229. The LirIC Interconnector (Tier 2) is a proposed subsea cable connecting the Belfast region in Northern Ireland and the Ayrshire region in Scotland. Construction of the Offshore ECC may overlap spatially and temporally with construction of the LirIC Interconnector, resulting in the potential for cumulative effects on benthic ecology receptors within areas of overlap.

230. The Western Link 2 (Tier 3) is a proposed subsea cable connecting Ayrshire in Scotland and Wales. As with the LirIC Interconnector, construction of Western Link 2 may overlap spatially and temporally with construction of the Offshore ECC, giving rise to the potential for cumulative effects on benthic ecology receptors within areas of overlap.

231. Malin Sea Wind (Tier 3) is a proposed floating offshore windfarm located 23 km southeast of Islay. The project is currently engaged in early planning so little information is known.

8.12.3.1 Cumulative Impact 1: Impacts on SSCs and sediment re-deposition

8.12.3.1.1 Sensitivity

232. Receptor sensitivity to increased SSCs and sediment re-deposition is negligible to medium, and aligns with the sensitivities outlined in **Section 8.11.1.1.1**.

8.12.3.1.2 Magnitude

8.12.3.1.2.1 Construction

233. The LirIC Interconnector, Western Link 2 and Malin Sea Wind may overlap spatially and temporally with the Project's construction programme, creating the potential for combined increases in SSCs. SSC increases arising from the Project will be highly localised and short-lived, with sediment plumes predicted to disperse within hours of disturbance (**Section 8.11.1.1.2**).

234. For these projects, activities comprise offshore cables installation involving seabed burial or placement. Any associated increases in SSCs are expected to be limited in spatial extent and duration. If temporal overlap occurs, sediment plumes would be small, short-lived and within natural turbidity variability. Furthermore, construction programmes are typically phased, such that the likelihood of multiple sediment plumes interacting at any single location is low. Any combined plumes would still occupy only a very small proportion of available water column habitat, and natural tidal dispersion would rapidly reduce SSC levels. Consequently, cumulative increases in SSCs are not anticipated to result in adverse ecological effects. Further detail will be provided within the Offshore ECC consent application.

[9] https://www.delta-esourcing.com/delta/respondToList.html?noticeId=944545871

235. On this basis, the magnitude of cumulative effects associated with increased SSCs and sediment re-deposition is considered to be **negligible** for all receptors.

8.12.3.1.2.2 Operation and Maintenance

236. For the LirIC Interconnector, Western Link 2 and Malin Sea Wind, O&M activities are not anticipated to generate significant increases in SSCs within the ZoI. The limited spatial extent and short duration of any SSC releases means that cumulative turbidity effects are unlikely to arise or meaningfully elevate SSCs above natural background variability. Given the patchy, localised and temporary nature of increased SSCs and sediment redeposition, cumulative effects on benthic ecology are not anticipated.

237. Accordingly, the magnitude of cumulative impacts associated with increased SSCs and sediment re-deposition for all receptors is considered to be **negligible**.

8.12.3.1.2.3 Decommissioning

238. At the time the Project enters decommissioning, the LirIC Interconnector, Western Link 2 and Malin Sea Wind are likely to involve limited activities which result in increased SSCs. The likelihood of meaningful temporal overlap with major sediment-disturbing activities is therefore very low. Any interactions with minor SSC releases from neighbouring sites would be short-lived and not significant.

239. As with the construction and O&M phases of the Project, cumulative impacts associated with increased SSCs and sediment redeposition are expected to be highly localised, short-lived, and temporary in nature. Therefore, the magnitude is considered to be **negligible**.

8.12.3.1.3 Significance of Effect

240. Overall, it is predicted that sensitivity for all receptors is negligible to medium (**Table 8.14**). The magnitude of cumulative impact is negligible for phases of the Project. The cumulative significance of effect is therefore **minor adverse** at worst, which is **not significant** in EIA terms.

8.12.3.2 Cumulative Impact 2: Temporary Physical Disturbance / Habitat Loss

8.12.3.2.1 Sensitivity

241. Receptor sensitivity to temporary physical disturbance/habitat loss is low to high, and aligns with the sensitivities outlined in **Section 8.11.1.2.1**.

8.12.3.2.2 Magnitude

8.12.3.2.2.1 Construction

242. Several projects overlap spatially and/or temporally with the Project's construction programme, creating the potential for cumulative temporary physical disturbance/habitat loss.

243. Disturbance from the Project will be highly localised, intermittent and short-term, with a maximum estimated footprint of 25,385,076 m² associated with the WDA infrastructure (**Section 8.11.1.2.2**). Although some temporal overlap may occur, the affected areas represent a very small proportion of available habitat, and recovery of sediments is expected to begin rapidly once activities cease.

244. For the LirIC Interconnector, Western Link 2 and Malin Sea Wind, activities comprise offshore cables installation involving seabed burial or placement. Seabed disturbance associated with this activity is expected to be similar to that associated with the Project's offshore export cable. It is unlikely that there would be a temporal overlap of activities in the areas where the cable installation works would

cross, although if this were to occur, temporary physical disturbance / habitat loss areas would be restricted to the crossing location and be highly localised. Given the wide availability of similar habitats throughout the region, cumulative effects on benthic ecology receptors are not anticipated. Further detail will be provided in the Offshore ECC consent application.

245. On this basis, the magnitude of cumulative effects associated with temporary physical disturbance/habitat loss is considered to be **negligible** for all receptors.

8.12.3.2.2.2 Operation and Maintenance

246. For the LirIC Interconnector, Western Link 2 and Malin Sea Wind, limited O&M activities have the potential to occur concurrently with the Project. However, these activities are generally low in frequency, spatially discrete, and typically occur at different times across individual sites. As a result, the likelihood of multiple maintenance events causing cumulative seabed disturbance at a single location is low. If there were to be a temporal overlap with the Project, it would result in only minor, highly localised seabed disturbance, with rapid recovery anticipated once works are completed. As such, cumulative effects on benthic ecology receptors are not expected.

247. The magnitude of cumulative effects associated with temporary physical disturbance/habitat loss is therefore considered to be **negligible** for all receptors.

8.12.3.2.2.3 Decommissioning

248. At the time the Project enters decommissioning, the LirIC Interconnector, Western Link 2 and Malin Sea Wind are likely to be fully operational. As a result, only limited and low-intensity seabed disturbance would occur at these sites, with no major seabed preparation or cable installation works anticipated. The likelihood of significant temporal overlap between the Project's decommissioning activities and other substantial seabed-disturbing works is therefore very low. Any interaction with ongoing operational activities would be highly localised and not expected to contribute to cumulative habitat loss due to the small scale and short duration of disturbance. Therefore, the magnitude is considered to be **negligible**.

8.12.3.2.3 Significance of Effect

249. Overall, it is predicted that sensitivity for all receptors is low to high (**Table 8.15**). The magnitude of impact is negligible for all phases of the Project. The cumulative significance of effect is therefore **minor adverse** at worst, which is **not significant** in EIA terms.

8.12.3.3 Cumulative Impact 3: Introduction of Marine Invasive Non-Native Species (INNS)

8.12.3.3.1 Sensitivity

250. Receptor sensitivity to the introduction of INNS is negligible to high, and aligns with the sensitivities outlined in **Section 8.11.1.3.1**.

8.12.3.3.2 Magnitude of Impact

8.12.3.3.2.1 Construction

251. During construction, up to 5,699 vessel round trips are predicted. These vessels provide vectors for the potential introduction of INNS into the habitats within the WDA Benthic Ecology Study Area through biofouling or ballast water discharge. In addition, the installation of artificial hard substrate on the seabed and in the water column in the construction phase could provide new habitat for INNS

to colonise throughout the lifetime of the Project, resulting in a potential ‘stepping-stone’ to the spread of INNS in the wider area.

252. There will be up to up to 117 vessels potentially carrying out construction activities within the WDA at any one time.

253. Vessels supporting the refurbishment of the Dubh Artach Lighthouse are expected to be small in number, significantly less than the number of vessels used during the construction phase of the Project.

254. For LirIC Interconnector, Western Link 2 and Malin Sea Wind, vessel activity will increase locally but will not materially contribute to cumulative vessel-density impacts regionally.

255. All vessels must adhere to the International Convention for the Control and Management of Ships’ BWM Convention (2004) which provides global regulations to control the transfer of potentially invasive species. In addition, the Project would implement an INNSMP (**Appendix 8 INNSMP**) as an embedded mitigation measure which aims to manage and reduce the potential risk of introduction and spread of INNS as far as reasonably practicable. Therefore, the magnitude is considered to be **negligible**.

8.12.3.3.2.2 Operation and Maintenance

256. As discussed above, the installation of artificial hard substrate to the benthic environment has the potential to provide a stepping-stone for the colonisation of INNS. However, as the surrounding region has natural hard substrate, such as rock outcrops and boulders, the construction of the Project, will not significantly increase the risk of INNS, as ‘stepping-stones’ have existed in the Benthic Ecology Study Area for a prolonged period of time.

257. The cumulative risk is also associated with the movement of vessels in and out of the region. However, as previously considered in **Section 8.12.3.3.2.1**, the introduction of INNS through vessels will be mitigated through adherence with the BWM Convention 2004 guidelines and an INNSMP. Therefore, the magnitude is considered to be **negligible**.

8.12.3.3.2.3 Decommissioning

258. As with the construction and O&M phases of the Project, the risk of spreading of INNS from vessels would be mitigated through the BWM Convention 2004 guidelines and an INNSMP.

259. Therefore, the magnitude is considered to be **negligible**.

8.12.3.3.3 Significance of Effect

260. Overall, it is predicted that sensitivity for all receptors is negligible to high (**Table 8.16**). The magnitude of impact is negligible for all phases of the Project. The cumulative significance of effect is therefore **minor adverse** at worst, which is **not significant** in EIA terms.

8.12.3.4 Cumulative Impact 4: Permanent habitat loss

8.12.3.4.1 Sensitivity

261. Receptor sensitivity to permanent habitat loss is high, and aligns with the sensitivities outlined in **Section 8.11.1.4.1**.

8.12.3.4.2 Magnitude

8.12.3.4.2.1 Operation and Maintenance

262. Permanent habitat loss during the O&M phase of the WDA arises from the long-term presence of WTG infrastructure that would remain in place throughout the project lifetime and potentially beyond. The worst-case assumes that areas of habitat loss associated with these structures could persist permanently.

263. These features represent a permanent physical alteration of the seabed environment. The cumulative assessment considers the additive contribution of the Project (including Offshore ECC infrastructure) in combination with other operational and proposed offshore developments identified in **Table 8.20**.

264. The estimated worst-case permanent habitat loss footprint within the WDA is approximately 6,788,230.51 m² (**Table 8.5**), accounting for 1.5% of its total area. When combined with the LirIC Interconnector and the Western Link 2 projects, the cumulative area of permanent seabed change represents a negligible proportion of the regional seabed. The footprint of Offshore ECC infrastructure is unknown at this time but would be significantly less than that associated with the WDA and so there is limited potential for significant cumulative permanent habitat loss effects associated with this. Each project introduces small, discrete footprints widely separated across the region, and given the limited number of projects, this is not anticipated to be significant.

265. The magnitude of impact for permanent habitat loss, for all receptors is therefore considered to be **negligible**.

8.12.3.4.3 Significance of Effect

266. Overall, it is predicted that sensitivity for all receptors is high. The magnitude of impact is negligible for O&M. The cumulative significance of effect is therefore **minor adverse**, which is **not significant** in EIA terms.

8.12.3.5 Cumulative Impact 5: Colonisation of introduced hard substrate

8.12.3.5.1 Sensitivity

267. Receptor sensitivity to the colonisation of introduced hard substrate is low to high, and aligns with the sensitivities outlined in **Section 8.11.1.5.1**.

8.12.3.5.2 Magnitude

8.12.3.5.2.1 Operation and Maintenance

268. For the Project, the worst-case scenario for colonisation of introduced hard substrate assumes that all available hard infrastructure within the WDA is colonisable by epilithic benthic species and remains *in situ* throughout the lifetime of the Project. The magnitude of this cumulative impact is therefore broadly comparable to that of cumulative permanent habitat loss assessed in **Section 8.12.3.4**.

269. When combined with the LirIC Interconnector, Western Link 2 and Malin Sea Wind, the cumulative area of colonisation of introduced hard substrate represents a negligible proportion of the regional seabed. The footprint of Offshore ECC infrastructure is unknown at this time but would be significantly less than that associated with the WDA and so there is limited potential for significant cumulative effects associated with the colonisation of introduced hard substrate to occur. Each project

introduces small, discrete footprints widely separated across the region, and given the limited number of projects, this is not anticipated to be significant.

270. The magnitude of impact for colonisation of introduced hard substrate, for all receptors is therefore considered to be **negligible**.

8.12.3.5.3 Significance of Effect

271. Overall, it is predicted that sensitivity for all receptors is high. The magnitude of impact is negligible for O&M. The cumulative significance of effect is therefore **minor adverse** significance, which is **not significant** in EIA term.

8.12.3.6 Cumulative Impact 6: Interactions with Electromagnetic Fields (EMFs)

8.12.3.6.1 Sensitivity

272. Receptor sensitivity to interactions with EMFs is medium, and aligns with the sensitivities outlined in **Section 8.11.1.6.1**.

8.12.3.6.2 Magnitude

8.12.3.6.2.1 Operation and Maintenance

273. During O&M, EMFs will be generated by the IACs, OSP link cables and offshore export cable(s). EMF emissions from all Project cables are highly localised, rapidly attenuate with distance, and are further reduced by cable burial depths of at least 0.3 m (for IACs only and this would only occur at very discrete sections) or 1 m for OSP link cables or offshore export cables (or by cable protection where burial is not practicable).

274. The LirIC interconnector will comprise two 320 kV HVDC subsea cables, which will be buried within the seabed or laid on the seabed surface. As a result, EMF emissions will be highly localised and will attenuate rapidly with increasing distance from the cables. Cable burial substantially limits the spatial extent of detectable EMFs. EMFs generated by the LirIC interconnector may spatially overlap with those associated with the Project’s offshore export cables. However, given that interconnector cables are typically buried to similar or greater depths, and that additional protective layers are installed above and below cables at crossing locations, EMF emissions are not expected to combine or accumulate in a manner that would result in effects of greater significance than those identified for the Project alone.

275. The type of cables to be used for Western Link 2 and Malin Sea Wind is currently unknown; however, the magnitude of impact is expected to be similar to that of the LirIC interconnector.

276. Given the highly localised nature of EMF emissions and rapid attenuation with distance, exposure is limited to areas in close proximity to the Project’s, LirIC Interconnector or Western Link 2’s cables. Therefore, the magnitude of impact for EMF for all receptors is considered to be **negligible.**

8.12.3.6.3 Significance of Effect

277. Overall, it is predicted that the sensitivity for all receptors is medium. The magnitude of impact is negligible for O&M. The cumulative significance of effect is therefore **negligible adverse**, which is **not significant** in EIA terms.

8.12.3.7 Cumulative Impact 7: Heat Exposure from Subsea Electrical Cables

8.12.3.7.1 Sensitivity

278. Receptor sensitivity to heat exposure from subsea electrical cables is medium, and aligns with the sensitivities outlined in **Section 8.11.1.7.1**.

8.12.3.7.2 Magnitude

8.12.3.7.2.1 Operation and Maintenance

279. The magnitude of this cumulative impact is therefore broadly comparable to that of cumulative interactions with EMFs assessed in **Section 8.12.3.6**.

280. The footprint of any thermal effect is expected to be highly limited, typically confined to a narrow zone of less than 1 m surrounding a subsea cable, although the precise extent cannot be defined with certainty.

281. The Project's offshore cables will be buried to a minimum DoL of between 0.3 m and 1 m, depending on cable type, which will further reduce potential thermal influence on the surrounding sediments. Cables from LirIC interconnector, Western Link 2 and Malin Sea Wind would also be buried where practicable, with cable protection used at crossings. Available evidence indicates that temperature increases within the surrounding seabed are generally negligible, particularly when compared to natural seasonal variability (Hughes et al., 2015; Taormina et al., 2020).

282. Considering the above evidence regarding ecological risks of heat exposure from cables is negligible, the magnitude of impact is therefore considered to be **negligible**.

8.12.3.7.3 Significance of Effect

283. Overall, it is predicted that sensitivity for all receptors is medium. The magnitude of impact is negligible for O&M. The cumulative significance of effect is therefore **negligible adverse**, which is **not significant** in EIA terms.

8.13 TRANSBOUNDARY EFFECTS

284. No potential for significant transboundary effects from the WDA on IEF within the EEZ of other EEA member states or other interests of EEA member states have been identified. Therefore, transboundary effects have been scoped out of the EIA, in line with the Scoping Opinion (I.D. 4 and I.D.18 of **Table 8.2**; MD-LOT, 2024).

8.14 INTER-RELATED AND INTERACTING IMPACTS

8.14.1 Inter-Relationships

285. **Table 8.21** below provides a summary of the key inter-relationships between benthic ecology and other technical chapters and indicates where those issues have been addressed in the relevant chapters.

Table 8.21 Benthic ecology inter-relationships

Topic and description	Related chapter(s)	Where addressed in this chapter	Rationale
Construction			
Increased Suspended sediment concentrations (SSCs) and sediment re-deposition	Chapter 7 Marine Physical Environment; Chapter 9 Fish (including Basking Shark) and Shellfish.	**Section 8.11.1.1**	Changes in SSCs and associated sediment re-deposition could have potential impacts, such as smothering, on benthic habitats and species. The effects outlined in this chapter demonstrate how suspended sediment influences benthic habitats and associated marine species, which is an important consideration when assessing potential impacts on wider marine ecosystems.
Temporary physical disturbance / habitat loss	Chapter 7 Marine Physical Environment; Chapter 9 Fish (including Basking Shark) and Shellfish; Chapter 12 Commercial Fisheries; and Chapter 10 Marine Mammals and Leatherback Turtle.	**Section 8.11.1.2**	Hydrodynamic changes could cause greater abrasion/scour of benthic sediments which could cause an indirect impact on benthic receptors. Fish nursery grounds and spawning locations that utilise the benthic habitats within the WDA may be indirectly impacted as a result of changes to benthic habitats. Changes to prey availability that may occur as a result of benthic habitat changes from the WDA infrastructure could have indirect impacts to marine mammals.
Invasive Non-Native Species (INNS)	Chapter 9 Fish (including Basking Shark) and Shellfish; and Chapter 12 Commercial Fisheries.	**Section 8.11.1.3**	INNS can alter seabed habitats by introducing new species that compete with or displace native benthic organisms. This affects community structure and habitat integrity, which are key considerations in benthic impact assessment. They may also impact fish and shellfish populations due to changes in dominant biotopes.
Operation and Maintenance			
Increased SSCs and sediment re-deposition	Chapter 7 Marine Physical Environment; Chapter 9 Fish (including Basking Shark) and Shellfish.	**Section 8.11.1.1**	As per construction.
Temporary physical disturbance / habitat loss	Chapter 7 Marine Physical Environment; Chapter 9 Fish (including Basking Shark) and Shellfish;	**Section 8.11.1.2**	As per construction.

Topic and description	Related chapter(s)	Where addressed in this chapter	Rationale
	Chapter 12 Commercial Fisheries; and Chapter 10 Marine Mammals and Leatherback Turtle.		
INNS	Chapter 9 Fish (including Basking Shark) and Shellfish; and Chapter 12 Commercial Fisheries.	**Section 8.11.1.3**	As per construction.
Permanent Habitat Loss	Chapter 9 Fish (including Basking Shark) and Shellfish; and Chapter 12 Commercial Fisheries.	**Section 8.11.1.4**	Permanent habitat loss resulting from infrastructure installation and long-term seabed occupation can alter benthic communities, with potential implications for more mobile species which occupy the habitats. This section considers the effect of habitat loss on the site and wider region.
Colonisation of introduced substrate	Chapter 9 Fish (including Basking Shark) and Shellfish; and Chapter 12 Commercial Fisheries.	**Section 8.11.1.5**	The installation of WTGs, scour protection, and associated cable protection introduces hard substrates to the seabed, creating permanent physical changes to local habitats. These structures can provide new surfaces for colonisation, supporting reef-like communities and altering species composition. This section examines how such artificial habitats may influence biodiversity and ecosystem dynamics within the WDA.
Electro-Magnetic Fields (EMF)	Chapter 9 Fish (including Basking Shark) and Shellfish; and Chapter 12 Commercial Fisheries.	**Section 8.11.1.6**	EMFs generated by subsea cables have the potential to influence the behaviour of marine species. This section evaluates the possible effects of EMFs on benthic ecology, ensuring these interactions are fully considered within the impact assessment process.
Heat exposure from subsea electrical cabling	N/A	**Section 8.11.1.7**	Heat generated by subsea cables have the potential to influence the behaviour of marine species. This section evaluates the possible effects of heat emissions on benthic ecology, ensuring these interactions are fully considered within the impact assessment process.

Topic and description	Related chapter(s)	Where addressed in this chapter	Rationale
Decommissioning			
Inter- relationships for impacts during the decommissioning phase will be the same as those outlined above for the Construction and Operation & Maintenance phases			

8.14.2 Interactions

286. The impacts identified and assessed in this chapter have the potential to interact with each other. Areas of potential interaction between impacts are presented in **Table 8.22**, **Table 8.23**, and **Table 8.24** below. The impacts are assessed relative to each development phase (i.e. construction, O&M or decommissioning) to see if (for example) multiple construction impacts affecting the same receptor could increase the magnitude of impact upon that receptor.

287. A subsequent lifetime assessment has been undertaken which considers the impact interactions identified and the potential for impacts to affect receptors relevant to this chapter across all development phases (**Table 8.25**).

Table 8.22 Potential interaction between impacts – construction

Potential Interactions Between Construction Impacts			
	Impact 1: Impacts on Suspended Sediment Concentrations (SSCs) and sediment re-deposition	Impact 2: Temporary Physical Disturbance / Habitat Loss	Impact 3: Introduction of marine Invasive Non-Native Species
Impact 1: Impacts on Suspended Sediment Concentrations (SSCs) and sediment re-deposition		Yes	No
Impact 2: Temporary Physical Disturbance / Habitat Loss	Yes		No
Impact 3: Introduction of Marine Invasive Non-Native Species	No	No	

Table 8.23 Potential interactions between impacts – operation and maintenance

Potential Interactions Between Operation and Maintenance Impacts							
	Impact 1: Impacts on Suspended Sediment Concentrations (SSCs) and sediment re-deposition	Impact 2: Temporary Physical Disturbance / Habitat Loss	Impact 3: Introduction of marine Invasive Non-Native Species	Impact 4: Permanent habitat loss	Impact 5: Colonisation of introduced hard substrate	Impact 6: Interactions with Electromagnetic Fields	Impact 7: Impacts to benthic ecology due to heat from subsea electrical cables
Impact 1: Impacts on Suspended Sediment Concentrations (SSCs) and sediment re-deposition		Yes	No	No	No	No	No
Impact 2: Temporary Physical Disturbance / Habitat Loss	Yes		No	Yes	No	No	No
Impact 3: Introduction of marine Invasive Non-Native Species	No	No		No	Yes	No	No
Impact 4: Permanent habitat loss	No	Yes	No		No	No	No
Impact 5: Colonisation of introduced hard substrate	No	No	Yes	No		No	No
Impact 6: Interactions with EMF	No	No	No	No	No		Yes
Impact 7: Impacts to benthic ecology due to heat from subsea electrical cables	No	No	No	No	No	Yes	

Table 8.24 Potential interaction between impacts – decommissioning

Potential Interactions Between Decommissioning Impacts			
	Impact 1: Impacts on Suspended Sediment Concentrations (SSCs) and sediment re-deposition	Impact 2: Temporary Physical Disturbance / Habitat Loss	Impact 3: Introduction of marine Invasive Non-Native Species
Impact 1: Impacts on Suspended Sediment Concentrations (SSCs) and sediment re-deposition		Yes	No
Impact 2: Temporary Physical Disturbance / Habitat Loss	Yes		No
Impact 3: Introduction of marine Invasive Non-Native Species	No	No	

Table 8.25 Potential interactions between impacts – phase and lifetime assessment

Potential Interactions Between Impacts					
Receptor	**Construction**	**Operation and Maintenance**	**Decommissioning**	**Phase Assessment**	**Lifetime Assessment**
Offshore circalittoral sand (SS.SSa.OSa)	Minor adverse	Minor adverse	Minor adverse	**No greater than individually assessed impact for each phase.** Across all phases of the Project, construction, O&M, and eventual decommissioning, the potential impacts on benthic ecology are expected to remain within the levels assessed for individual stressors and are not anticipated to interact in a way that increases overall significance. During construction, activities such as piling, and seabed preparation have the potential to disturb habitats, and temporarily increase SSCs. These effects are predicted to be short-term, localised, and intermittent, with limited spatial overlap. Furthermore, all benthic habitats are predicted to recover from temporary disturbance. O&M activities may introduce short-term disturbance, but these events are episodic and low in intensity, whilst long term habitat loss during operation increases the potential for interactions with other impacts assessed for that phase	**No greater than individually assessed impact.** As with the phase assessment, all potential impacts are non-significant and localised in nature, limiting the potential for different impacts to interact across the different phases. The potential impacts from habitat loss, EMF and heat exposure will occur throughout the O&M phase of the Project. However, these impacts have a limited spatial extent and are not anticipated to interact in such a way as to result in inter-related effects of greater significance than the assessments presented for each individual stressor. Decommissioning impacts are expected to resemble those of construction, excluding piling. Activities such as the removal of IACs and scour protection may cause temporary habitat disturbance, short-term increases in SSC, and vessel-related noise. These effects will be spatially limited and diminish quickly once
Offshore circalittoral coarse sediment (SS.SCS.OCS)	Minor adverse	Minor adverse	Minor adverse		
Echinoderms and crustose communities (CR.MCR.EcCr)	Minor adverse	Minor adverse	Minor adverse		
Ocean quahog	Minor adverse	Minor adverse	Minor adverse		

Potential Interactions Between Impacts					
				However, all potential effects are non-significant (minor adverse or less) and localised in nature, being restricted to the Project's ZoI. The majority of effects are also temporary in nature. Together, these factors limit the potential for different impacts to interact within each phase As a result, none of the potential interactions identified with respect to benthic ecology are expected to result in a synergistic or greater significance of effect than those already assessed.	decommissioning activities conclude. Overall, the combined pressures across all phases are not expected to interact in a way that increases the significance level beyond what has been assessed for individual stressors. The greatest effect will occur during construction, and once this phase is complete, the majority of impacts will remain small-scale, localised, and episodic.

8.15 POTENTIAL MONITORING REQUIREMENTS

288. No monitoring to test the predictions made within the assessment of likely significant effects on Benthic Ecology is considered necessary, as the assessment has found no significant effects. The embedded mitigation measures already in place (**Section 8.9**) provides additional confidence that impacts will remain not significant.

8.16 SUMMARY

289. **Table 8.26** presents a summary of the assessment of likely significant effects on benthic ecology during the construction, O&M and decommissioning phases of the Project.

290. The assessment has established that the WDA infrastructure, the combined assessment and cumulatively with other plans or projects would result in effects of **negligible** to **minor adverse** (**not significant** in EIA terms).

Table 8.26 Summary of potential effects for benthic ecology

Potential Impact	IEFs (Receptor)	Relevant Embedded Mitigation Measures	Sensitivity	Magnitude of Impact	Significance of Effect	Additional Mitigation	Residual Significance of Effect	Proposed Monitoring	Combined Assessment	Cumulative Residual Significance of Effect
Construction and Decommissioning										
Impact 1: Increased SSCs and sediment re-deposition	Offshore circalittoral sand (SS.SSa.OSa)	M-8; M-14; M-46	Low to Medium	Negligible to Low	Not significant (Negligible Adverse to Minor Adverse)	N/A	Not significant (Negligible Adverse to Minor Adverse)	N/A	Not significant	Not significant (Negligible Adverse)
	Offshore circalittoral coarse sediment (SS.SCS.OCS)		Negligible to Medium	Negligible to Low	Not significant (Negligible Adverse to Minor Adverse)	N/A	Not significant (Negligible Adverse to Minor Adverse)	N/A	Not significant	Not significant (Negligible Adverse)
	Echinoderms and crustose communities (CR.MCR.EcCr)		Negligible to Medium	Negligible to Low	Not significant (Negligible Adverse to Minor Adverse)	N/A	Not significant (Negligible Adverse to Minor Adverse)	N/A	Not significant	Not significant (Negligible Adverse)
	Ocean quahog		Negligible	Negligible to Low	Not significant (Negligible Adverse)	N/A	Not significant (Negligible Adverse)	N/A	Not significant	Not significant (Negligible Adverse)
Impact 2: Temporary Physical Disturbance / Habitat Loss	Offshore circalittoral sand (SS.SSa.OSa)	M-8; M-14; M-46	Low to Medium	Negligible	Not significant (Negligible Adverse)	N/A	Not significant (Negligible Adverse)	N/A	Not significant	Not significant (Negligible Adverse)
	Offshore circalittoral coarse sediment (SS.SCS.OCS)		Low to Medium	Negligible	Not significant (Negligible Adverse)	N/A	Not significant (Negligible Adverse)	N/A	Not significant	Not significant (Negligible Adverse)
	Echinoderms and crustose communities (CR.MCR.EcCr)		Low	Negligible	Not significant (Negligible Adverse)	N/A	Not significant (Negligible Adverse)	N/A	Not significant	Not significant (Negligible Adverse)
	Ocean quahog		High	Negligible	Not significant (Minor Adverse)	N/A	Not significant (Minor Adverse)	N/A	Not significant	Not significant (Minor Adverse)
Impact 3: Introduction of marine INNS	Offshore circalittoral sand (SS.SSa.OSa)	M-5; M-9; M-46	Negligible	Negligible	Not significant (Negligible Adverse)	N/A	Not significant (Negligible Adverse)	N/A	Not significant	Not significant (Negligible Adverse)
	Offshore circalittoral coarse sediment (SS.SCS.OCS)		High	Negligible	Not significant (Minor Adverse)	N/A	Not significant (Minor Adverse)	N/A	Not significant	Not significant (Minor Adverse)
	Echinoderms and crustose communities (CR.MCR.EcCr)		Medium	Negligible	Not significant (Negligible Adverse)	N/A	Not significant (Negligible Adverse)	N/A	Not significant	Not significant (Negligible Adverse)
	Ocean quahog		Medium	Negligible	Not significant (Negligible Adverse)	N/A	Not significant (Negligible Adverse)	N/A	Not significant	Not significant (Negligible Adverse)
Operation and Maintenance										
Impact 1: Increased SSCs and sediment re-deposition	Offshore circalittoral sand (SS.SSa.OSa)	M-8; M-14	Low to Medium	Negligible	Not significant (Negligible Adverse)	N/A	Not significant (Negligible Adverse)	N/A	Not significant	Not significant (Negligible Adverse)
	Offshore circalittoral coarse sediment (SS.SCS.OCS)		Negligible to Medium	Negligible	Not significant (Negligible Adverse)	N/A	Not significant (Negligible Adverse)	N/A	Not significant	Not significant (Negligible Adverse)

Potential Impact	IEFs (Receptor)	Relevant Embedded Mitigation Measures	Sensitivity	Magnitude of Impact	Significance of Effect	Additional Mitigation	Residual Significance of Effect	Proposed Monitoring	Combined Assessment	Cumulative Residual Significance of Effect
	Echinoderms and crustose communities (CR.MCR.EcCr)		Negligible to Medium	Negligible	Not significant (Negligible Adverse)	N/A	Not significant (Negligible Adverse)	N/A	Not significant	Not significant (Negligible Adverse)
	Ocean quahog		Negligible	Negligible	Not significant (Negligible Adverse)	N/A	Not significant (Negligible Adverse)	N/A	Not significant	Not significant (Negligible Adverse)
Impact 2: Temporary Physical Disturbance / Habitat Loss	Offshore circalittoral sand (SS.SSa.OSa)	M-8; M-14	Low to Medium	Negligible	Not significant (Negligible Adverse)	N/A	Not significant (Negligible Adverse)	N/A	Not significant	Not significant (Negligible Adverse)
	Offshore circalittoral coarse sediment (SS.SCS.OCS)		Low to Medium	Negligible	Not significant (Negligible Adverse)	N/A	Not significant (Negligible Adverse)	N/A	Not significant	Not significant (Negligible Adverse)
	Echinoderms and crustose communities (CR.MCR.EcCr)		Low	Negligible	Not significant (Negligible Adverse)	N/A	Not significant (Negligible Adverse)	N/A	Not significant	Not significant (Negligible Adverse)
	Ocean quahog		High	Negligible	Not significant (Minor Adverse)	N/A	Not significant (Minor Adverse)	N/A	Not significant	Not significant (Minor Adverse)
Impact 3: Introduction of marine INNS	Offshore circalittoral sand (SS.SSa.OSa)	M-5; M-9;	Negligible	Negligible	Not significant (Negligible Adverse)	N/A	Not significant (Negligible Adverse)	N/A	Not significant	Not significant (Negligible Adverse)
	Offshore circalittoral coarse sediment (SS.SCS.OCS)		High	Negligible	Not significant (Minor Adverse)	N/A	Not significant (Minor Adverse)	N/A	Not significant	Not significant (Minor Adverse)
	Echinoderms and crustose communities (CR.MCR.EcCr)		Medium	Negligible	Not significant (Negligible Adverse)	N/A	Not significant (Negligible Adverse)	N/A	Not significant	Not significant (Negligible Adverse)
	Ocean quahog		Medium	Negligible	Not significant (Negligible Adverse)	N/A	Not significant (Negligible Adverse)	N/A	Not significant	Not significant (Negligible Adverse)
Impact 4: Permanent Habitat Loss	Offshore circalittoral sand (SS.SSa.OSa)	M-8; M-14	High	Negligible	Not significant (Minor Adverse)	N/A	Not significant (Minor Adverse)	N/A	Not significant	Not significant (Minor Adverse)
	Offshore circalittoral coarse sediment (SS.SCS.OCS)		High	Negligible	Not significant (Minor Adverse)	N/A	Not significant (Minor Adverse)	N/A	Not significant	Not significant (Minor Adverse)
	Echinoderms and crustose communities (CR.MCR.EcCr)		High	Negligible	Not significant (Minor Adverse)	N/A	Not significant (Minor Adverse)	N/A	Not significant	Not significant (Minor Adverse)
	Ocean quahog		High	Negligible	Not significant (Minor Adverse)	N/A	Not significant (Minor Adverse)	N/A	Not significant	Not significant (Minor Adverse)

Potential Impact	IEFs (Receptor)	Relevant Embedded Mitigation Measures	Sensitivity	Magnitude of Impact	Significance of Effect	Additional Mitigation	Residual Significance of Effect	Proposed Monitoring	Combined Assessment	Cumulative Residual Significance of Effect
Impact 5: Colonisation of introduced hard substrate	Offshore circalittoral sand (SS.SSa.OSa	M-8	High	Negligible	Not significant (Minor Adverse)	N/A	Not significant (Minor Adverse)	N/A	Not significant	Not significant (Minor Adverse)
	Offshore circalittoral coarse sediment (SS.SCS.OCS)		High	Negligible	Not significant (Minor Adverse)	N/A	Not significant (Minor Adverse)	N/A	Not significant	Not significant (Minor Adverse)
	Echinoderms and crustose communities (CR.MCR.EcCr)		Negligible	Negligible	Not significant (Negligible Adverse)	N/A	Not significant (Negligible Adverse)	N/A	Not significant	Not significant (Negligible Adverse)
	Ocean quahog		High	Negligible	Not significant (Minor Adverse)	N/A	Not significant (Minor Adverse)	N/A	Not significant	Not significant (Minor Adverse)
Impact 6: Interactions with Electromagnetic Fields	Offshore circalittoral sand (SS.SSa.OSa)	M-8; M-14	Medium	Negligible	Not significant (Negligible Adverse)	N/A	Not significant (Negligible Adverse)	N/A	Not significant	Not significant (Negligible Adverse)
	Offshore circalittoral coarse sediment (SS.SCS.OCS)		Medium	Negligible	Not significant (Negligible Adverse)	N/A	Not significant (Negligible Adverse)	N/A	Not significant	Not significant (Negligible Adverse)
	Echinoderms and crustose communities (CR.MCR.EcCr)		Medium	Negligible	Not significant (Negligible Adverse)	N/A	Not significant (Negligible Adverse)	N/A	Not significant	Not significant (Negligible Adverse)
	Ocean quahog		Medium	Negligible	Not significant (Negligible Adverse)	N/A	Not significant (Negligible Adverse)	N/A	Not significant	Not significant (Negligible Adverse)
Impact 7: Heat exposure from subsea electrical cables	Offshore circalittoral sand (SS.SSa.OSa)	M-8; M-14	Medium	Negligible	Not significant (Negligible Adverse)	N/A	Not significant (Negligible Adverse)	N/A	Not significant	Not significant (Negligible Adverse)
	Offshore circalittoral coarse sediment (SS.SCS.OCS)		Medium	Negligible	Not significant (Negligible Adverse)	N/A	Not significant (Negligible Adverse)	N/A	Not significant	Not significant (Negligible Adverse)
	Echinoderms and crustose communities (CR.MCR.EcCr)		Medium	Negligible	Not significant (Negligible Adverse)	N/A	Not significant (Negligible Adverse)	N/A	Not significant	Not significant (Negligible Adverse)
	Ocean quahog		Medium	Negligible	Not significant (Negligible Adverse)	N/A	Not significant (Negligible Adverse)	N/A	Not significant	Not significant (Negligible Adverse)

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