9. BENTHIC ECOLOGY

9.1 Introduction

This chapter of the Environmental Impact Assessment (EIA) Report (EIAR) shows the presence and distribution of benthic ecology receptors in vicinity of the Offshore Site and assesses the potential effects from construction, operation and maintenance, and decommissioning of the Offshore Site on these receptors. Mitigation is proposed where required, and the residual effects and their significance are assessed. Potential cumulative effects are also considered.

Table 9-1 below lists all the supporting studies which relate to, and should be read in conjunction with, the benthic ecology impact assessment.

Table 9-1 Supporting studies relevant to the benthic ecology impact assessment

Details of Study	Document Reference
Benthic Characterisation Survey 2023: Survey Report	Ocean Ecology Limited, 2023a
Benthic Characterisation Survey 2023: Habitat Assessment	Ocean Ecology Limited, 2023b
Benthic Characterisation Survey 2023: Technical Report	Ocean Ecology Limited, 2024
Geophysical Survey 2022 Interpretive Report RSA & ESA.	EGS (International) Limited, 2023a
Geophysical Survey 2022 Interpretive Report: Export Cable Route.	EGS (International) Limited, 2023b

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

- Chapter 7: Marine Physical and Coastal Processes which assesses the potential effects on marine physical processes which can influence the presence and distribution of benthic habitats and species;
- Chapter 8: Water and Sediment Quality which assess potential effects on water and sediment quality which can influence benthic species and habitats;
- Chapter 10: Fish and Shellfish Ecology which assesses the potential effects on fish and shellfish species which are directly influenced by availability of benthic prey species; and the commercial importance of benthic ecology receptors; and
- Chapter 12: Marine Mammals and Other Megafauna which assesses the potential effects on marine mammals and other megafauna which are directly influenced by availability of benthic prey species.

9.1.1 Statement of Authority

This Chapter of the EIAR has been prepared by John Spence (Chapter lead); Ashley Hecklinger (Lead Author), Christina McIntyre (Secondary Author) of Xodus Group Limited (Xodus).

John Spence is a Principal Environmental Consultant with 15 years' experience. John holds a BSc (Hons) in Applied Marine Biology. John has worked on numerous EIAs for marine energy developments and is a technical lead on benthic ecological effects assessment chapters. John also provides technical advice and support in the area of environmental survey and benthic ecology including survey design, developing scopes of work, assisting with survey video interpretation. Prior to joining Xodus he worked in an environmental benthic lab as a Marine Biologist before working in a consultancy role which included the participation in benthic environmental surveys in Shetland and the North Sea using sediment grabs and ROV /drop down video and water sampling equipment. In his subsequent role in the Shell UK environmental team, John undertook technical reviews of environmental baseline and habitat assessment survey reports across the North Sea and also supporting the development of Scope of Work packages for offshore monitoring and decommissioning surveys.

Ashley Hecklinger is an Environmental Consultant with 2 years' experience. Ashley holds an MSc in Marine Conservation (*with commendation*) and a Bachelor of Science in Biology. During her time at Xodus, Ashley has provided the baseline characterisation for benthic ecology across EIA and technical reports for oil and gas, offshore wind and subsea cable projects.

Christina McIntyre is a Lead Environment Consultant with 5 years' experience. Christina holds an MSc in Marine Environmental Management (*with distinction*) and a BSc (Hons) in Biology and Geography. Christina has authored a number of EIAR chapters and supporting technical documents for offshore wind in the UK on the topic of marine physical and coastal processes and benthic ecology. Prior to joining Xodus, Christina worked in a marine benthic ecology laboratory.

Additionally, the following specialists have contributed to this assessment:

EGS International Limited – Geophysical survey campaign 2022: EGS International Limited conducted a geophysical survey of the Offshore Site using high resolution Multibeam Echosounder (MBES) and Side Scan Sonar (SSS) to provide characterisation of seabed bathymetry, seabed features (i.e. sandwaves, obstructions) and seabed sediments; magnetometer to detect ferrous objects (e.g. wrecks, cables, pipelines and other anthropogenic debris); single-channel Ultra High Resolution Seismic System (S-UHRS) to provide seabed profiles to assess geology; and a Sub-Bottom Profiler (SBP) to obtain high resolution profiles of shallow sediments. The geophysical survey reporting was undertaken by a team of technical leads (geoscience and hydrography), senior geophysicists, geophysicist, junior geophysicist, senior and junior hydro surveyors and associated Geographic Information System (GIS) analysists and geo data processors.

Ocean Ecology Limited – Benthic characterisation survey 2023: Ocean Ecology Limited conducted ground-truthing of geophysical survey data using Drop-Down Camera (DDC), sediment grab sampling and water sampling to provide baseline information on the benthic environment (including habitats and associated biological infaunal and epifaunal communities) (see section 9.4.1.2.2). Ocean Ecology Limited has a team of qualified field scientists with degrees in Marine Biology or a related discipline as a minimum, with specialist qualifications gained through commercially endorsed power boat and Unmanned Aerial Vehicle (UAV) pilot training.

9.2 Legislation, Policy and Guidance

In addition to the legislation, policy and guidance listed in Chapter 2: Legislative Context and Regulatory Requirements, the legislation and policy relevant to the assessment of potential effects from the Offshore Site on benthic ecology receptors are outlined in Table 9-2.

The EIAR is prepared in accordance with the requirements of the European Commission (2017) guidance on the preparation of the EIAR (Directive 2011/92/EU as amended by 2014/52/EU). The requirements of the following legislation are complied with:

- Planning and Development Acts 2000 to 2023;
- Planning and Development Regulations 2001 (as amended); and

- Directive 2011/92/EU as amended by Directive 2014/52/EU on the assessment of the effects of certain public and private projects on the environment.

Table 9-2 Policy and guidance relevant to benthic ecology

Policy / Guidance	Reference
Policy	
Offshore Renewable Energy Development Plan (OREDP): A Framework for the Sustainable Development of Ireland's Offshore Renewable Energy Resource (Ireland)	Department of Communications, Energy and Natural Resources (now Department of the Environment, Climate and Communications (DECC)), 2014
Marine Planning Policy Statement (Ireland)	Department of Housing, Local Government and Heritage (DHLGH), 2019
National Marine Planning Framework (Ireland)	DHLGH, 2021
Ireland's 4th National Biodiversity Action Plan 2023 – 2030	National Parks and Wildlife Service (NPWS), 2024
Guidance	
Guidance on EIA and Natura Impact Statement (NIS) Preparation for Offshore Renewable Energy Projects (Ireland)	DECC, 2017
Guidance on Marine Baseline Ecological Assessment and Monitoring Activities for Offshore Renewable Energy Projects (Parts 1 and 2) (Ireland)	DECC, 2018a; 2018b
Guidance on Environmental Considerations for Offshore Wind Farm Development (United Kingdom (UK) and Ireland)	OSPAR, 2008
Guidelines for EIA in Britain and Ireland, Marine and Coastal (UK and Ireland)	Chartered Institute of Ecology and Environmental Management (CIEEM), 2018
Guidelines for Data Acquisition to Support Marine Environmental Assessments of Offshore Renewable Energy Projects (UK)	Centre for Environment, Fisheries and Aquaculture Science (Cefas), 2012
Guidance on Survey and Monitoring in Relation to Marine Renewables Development in Scotland. Volume: Benthic Habitats (UK)	Scottish Natural Heritage (SNH), 2011
Decommissioning of Offshore Renewable Energy Installations: Guidance Notes for Industry (UK)	Department of Business, Energy and Industrial Strategy (BEIS), 2019

9.3 Consultation

Stakeholder consultation has been ongoing throughout the EIA and has played an important part in ensuring the scope of the baseline characterisation and effects assessment are appropriate with respect to the Offshore Site and the requirements of the regulators and their advisors and all stakeholders.

The Scoping Report was distributed to key stakeholders in August 2023. Following receipt of scoping responses, no specific issues or comments were raised regarding benthic ecology receptors.

9.4 Assessment Methodology

9.4.1 Data and Information Sources

9.4.1.1 Desktop Study

The existing data sets and literature used to inform the baseline characterisation for this EIAR chapter are outlined in Table 9-3.

Table 9-3 Available data and information sources for benthic ecology

Title	Description	Author	Date
Ireland's Marine Atlas: Marine Strategy Framework Directive (MSFD) Predominant Habitat Type	These predominant seabed habitat types have been defined by the MSFD commission and broadly correspond to level 2 habitat types of the European Nature Information System (EUNIS) habitat classification.	Marine Institute	2021
EMODnet EUSeaMap	European broad-scale seabed habitat map.	EMODnet	2023
INFOMAR Seabed and Sediment Data	Irish seabed mapping programme providing a range of habitat data for shelf and coastal waters. The database geophysical data measurements including Multibeam Echosounder (MBES) bathymetry and backscatter, shallow seismic profiles, gravity, magnetics, Side-Scan Sonar (SSS) and oceanographic water column profiles. It also hosts data on physical ground-truthing samples and over shipwreck records.	INFOMAR	2023
NPWS: Habitats and Species Data	Designated sites and habitats maps, including rocky habitats data.	NPWS	2023b
OSPAR List of Threatened and/or Declining Species and Habitats	The list aims at providing guidance for setting priorities for the conservation and protection of marine biodiversity in implementing Annex V to the Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR Convention).	OSPAR	2010
Inishmore Island Special Area of Conservation (SAC)	A description of the site as well as the qualifying interests, conservation objectives document and conservation objectives supporting documents for marine habitats and lagoon habitats.	NPWS	2015a
Carrowmore Point to Spanish Point and Islands SAC	A description of the site as well as the qualifying interests, conservation objectives document and conservation objectives supporting documents for marine habitats and lagoon habitats.	NPWS	2014a

Title	Description	Author	Date
Carrowmore Dunes SAC	A description of the site as well as the qualifying interests, conservation objectives document and conservation objectives supporting document for marine habitats.	NPWS	2014b
Kilkieran Bay and Islands SAC	A description of the site as well as the qualifying interests, conservation objectives document and conservation objectives supporting documents for marine habitats and lagoon habitats.	NPWS	2014d
Kilkee Reefs SAC	A description of the site as well as the qualifying interests, conservation objectives document and conservation objectives supporting document for marine habitats.	NPWS	2014c
Inishmaan Island SAC	A description of the site as well as the qualifying interests, conservation objectives document and conservation objectives supporting document for marine habitats.	NPWS	2014e
Connemara Bog Complex SAC	A description of the site as well as the qualifying interests, conservation objectives document and conservation objectives supporting documents for marine habitats and lagoon habitats.	NPWS	2015b
Slyne Head Peninsula SAC	A description of the site as well as the qualifying interests, conservation objectives document and conservation objectives supporting documents for marine habitats and lagoon habitats.	NPWS	2015c
Inisheer Island SAC	A description of the site as well as the qualifying interests, conservation objectives document and conservation objectives supporting documents for marine habitats and lagoon habitats.	NPWS	2014f
Slyne Head to Admore Point Islands SAC	A description of the site as well as the qualifying interests, conservation objectives document and conservation objectives supporting document for marine habitats.	NPWS	2012
Kilkieran Bay Aquaculture EIAR and Benthic Drop-down Video Survey, Kilkieran Bay, Galway	EIAR (Part 2: Impact Assessment) Section 4: Benthic Ecology	Bradan Beo Teoranta	2024

9.4.1.2 Site Surveys

9.4.1.2.1 *Geophysical Surveys*

EGS International Limited were contracted to undertake geophysical surveys within the Sceirde Rocks Offshore Array Area (OAA) and the Offshore Export Cable Corridor (OECC). The surveys of the OECC took place 9-16 June 2022 and 1st September 2022 and the OAA surveys commenced on 16th July 2022 and the survey was completed 1st September 2022. The geophysical survey utilised high resolution MBES and SSS to provide characterisation of seabed bathymetry, seabed features (i.e. sandwaves, obstructions) and seabed sediments; magnetometer to detect ferrous objects (e.g. wrecks, cables, pipelines and other anthropogenic debris); single-channel S-UHRS to provide seabed profiles to assess geology; and a SBP to obtain high resolution profiles of shallow sediments.

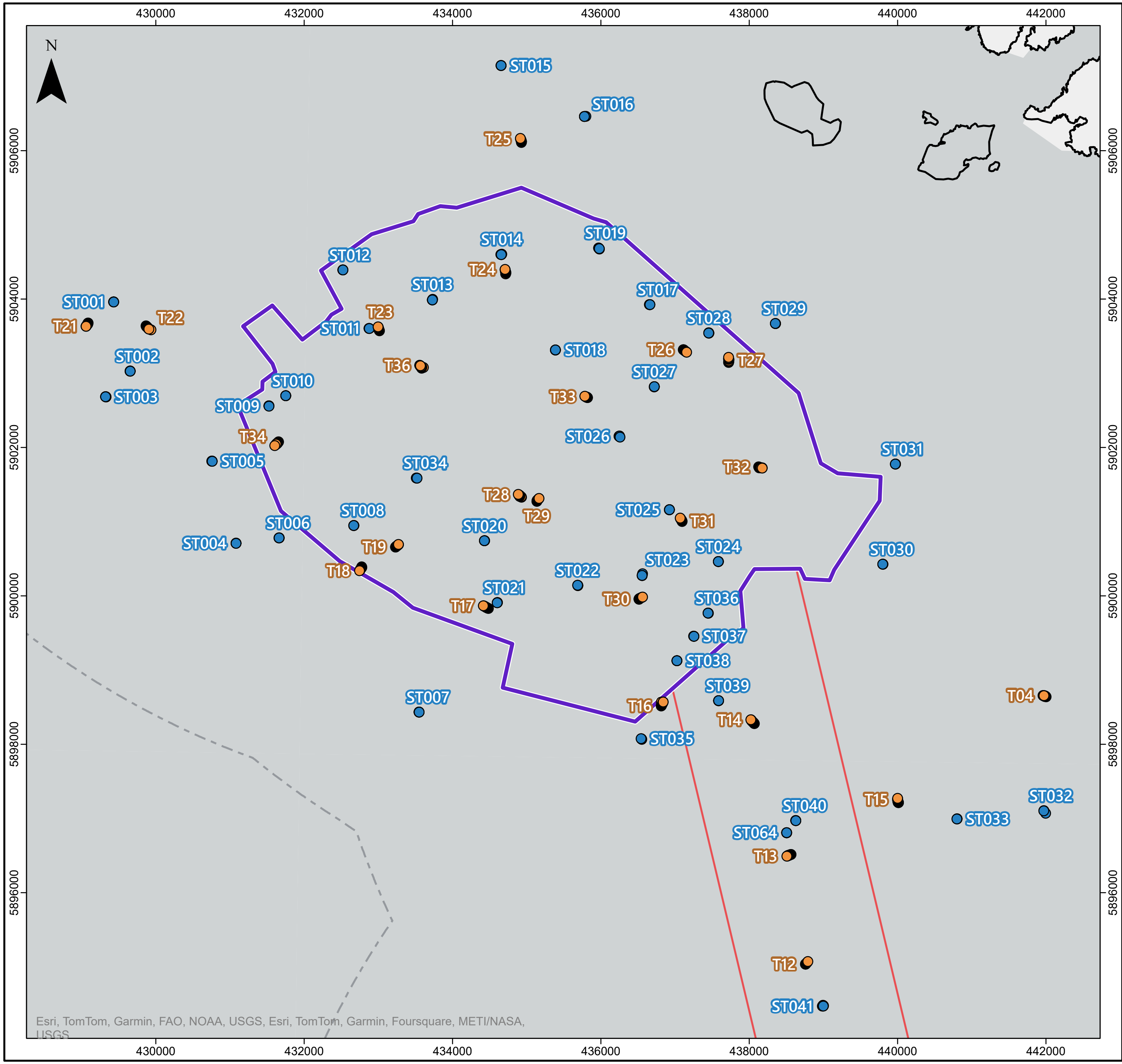
9.4.1.2.2 *Benthic Characterisation Survey*

Ocean Ecology Limited were contracted to undertake a benthic characterisation survey and habitat assessment analysis. The survey was completed between the 9th and 20th of October 2023. The survey focused on conducting ground truthing of geophysical data through utilisation of DDC, sediment grab sampling and water sampling (water contaminants and environmental DNA (eDNA)) at a number of sampling and transect locations across the OAA (Figure 9-1) and the OECC (Figure 9-2 and Figure 9-3) (Ocean Ecology Limited, 2023a;2024).

For grab sampling, 65 initial sampling stations (35 in the wider OAA survey area which covered the final OAA location, 30 along the OECC) were screened via high resolution seabed imagery (stills and videos) to determine suitability for sampling (i.e. no hazards or sensitive habitat(s) present) and to provide an indication of epibiota present for the habitat assessment (Ocean Ecology Limited, 2024). This resulted in 58 grab stations deemed suitable for sampling. Much of the survey area was interpreted as rocky substrate based on the geophysical data. Therefore, grab sampling was only conducted in areas identified as sedimentary in nature. Areas of rocky substrate and potential reef features were ground-truthed using DDC transects only, of which 21 were conducted in the OAA and 15 in the OECC.

Grab samples were collected and analysed for macrofaunal community composition, Total Organic Carbon (TOC) content, Particle Size Analysis (PSA) and sediment eDNA. Additionally, sediment chemical contaminant analysis was undertaken at 22 of the 65 stations. Three replicate samples were collected at each station for the macrofauna and sediment eDNA analysis.

An additional 36 DDC transects were recorded to characterise key features of interest (potential biogenic/geogenic reef) identified in the geophysical data, with 21 transects in the OAA and 15 along the OECC. Water sampling was conducted at 33 stations (details and results provided in Chapter 8: Water and Sediment Quality), with 10 of them selected for eDNA water analysis. Water samples for chemical analysis were collected as two replicates at two depths: subsurface and 2 m above the seabed. Water eDNA samples were collected as a single replicate at three different depths: subsurface, mid-water and 2 m above the seabed.



SCEIRDE ROCKS WINDFARM

Feirm Ghaoithe Charraigeacha Sceirde

LEGEND

- Offshore Array Area
- Offshore Export Cable Corridor
- Study Area
- Ireland 6 NM limit
- Ireland 12 NM Limit
- Sampling Locations
- Transect Locations

0 0.45 0.9 nm

0 1 2 km

Data Source: Contains public sector information, licensed under the Creative Commons licence v4.0; the Open Government Licence v3.0.

PROJECT TITLE

Sceirde Rocks

MAP TITLE

Sample Effort Array Area

VER	REMARKS	DATE	Drawn	Approved
1	DRAFT	06/12/2024	BQ	EE

DRAWING NO

Figure 9-1

SCALE	PAPER SIZE	DATUM	PROJECTION
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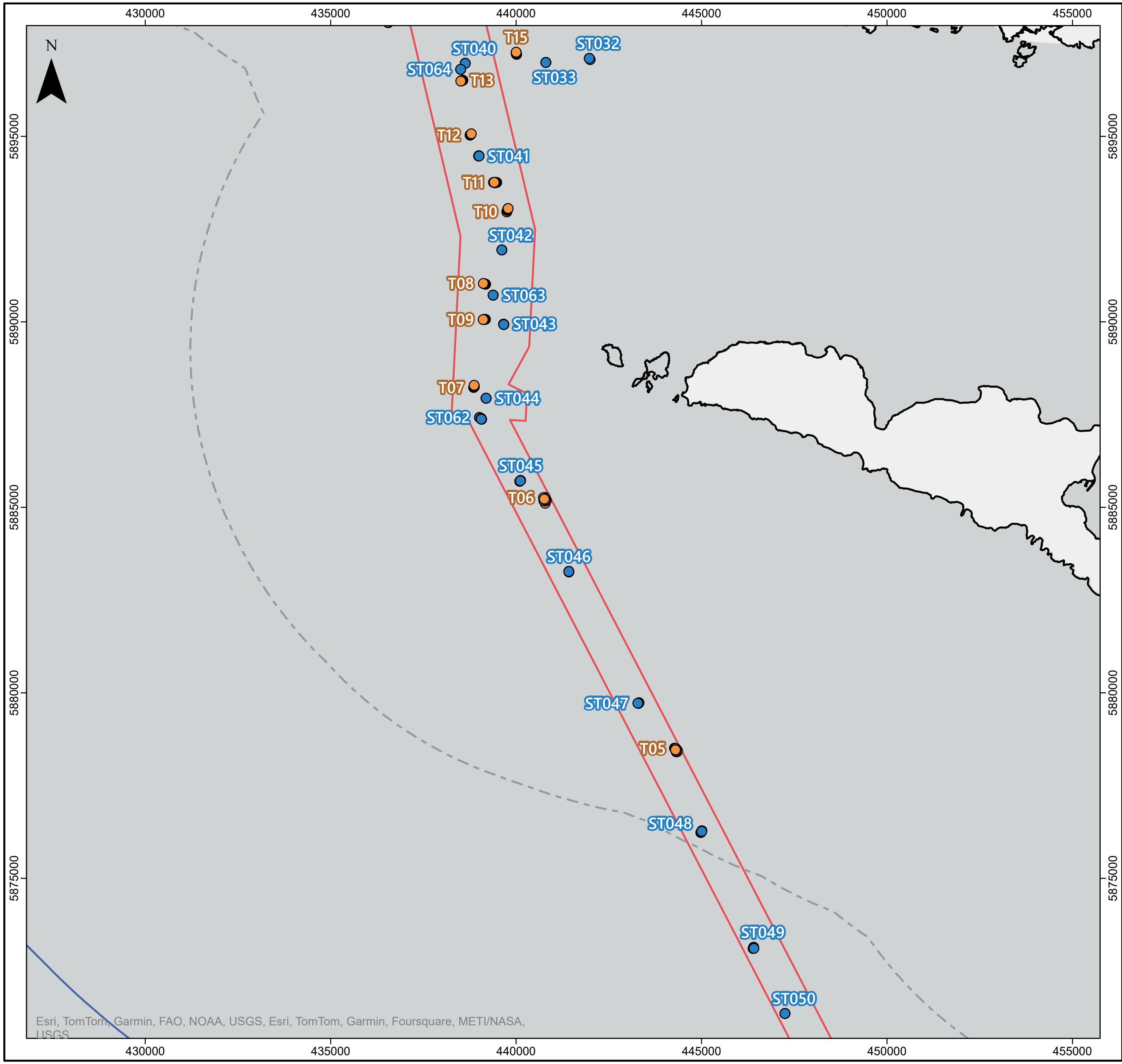

SCEIRDE ROCKS WINDFARM
Feirm Ghaoithe Charraigeacha Sceirde

LEGEND

- Offshore Array Area
- Offshore Export Cable Corridor
- Study Area
- Ireland 6 NM limit
- Ireland 12 NM Limit
- Sampling Locations
- Transect Locations

0 1 2 nm

0 1.5 3 km

Data Source: Contains public sector information, licensed under the Creative Commons licence v4.0; the Open Government Licence v3.0.

PROJECT TITLE

Sceirde Rocks

MAP TITLE

Sample Effort Export Cable Corridor 1

VER	REMARKS	DATE	Drawn	Approved
1	DRAFT	06/12/2024	BQ	EE

DRAWING NO

Figure 9-2

SCALE	PAPER SIZE	DATUM	PROJECTION
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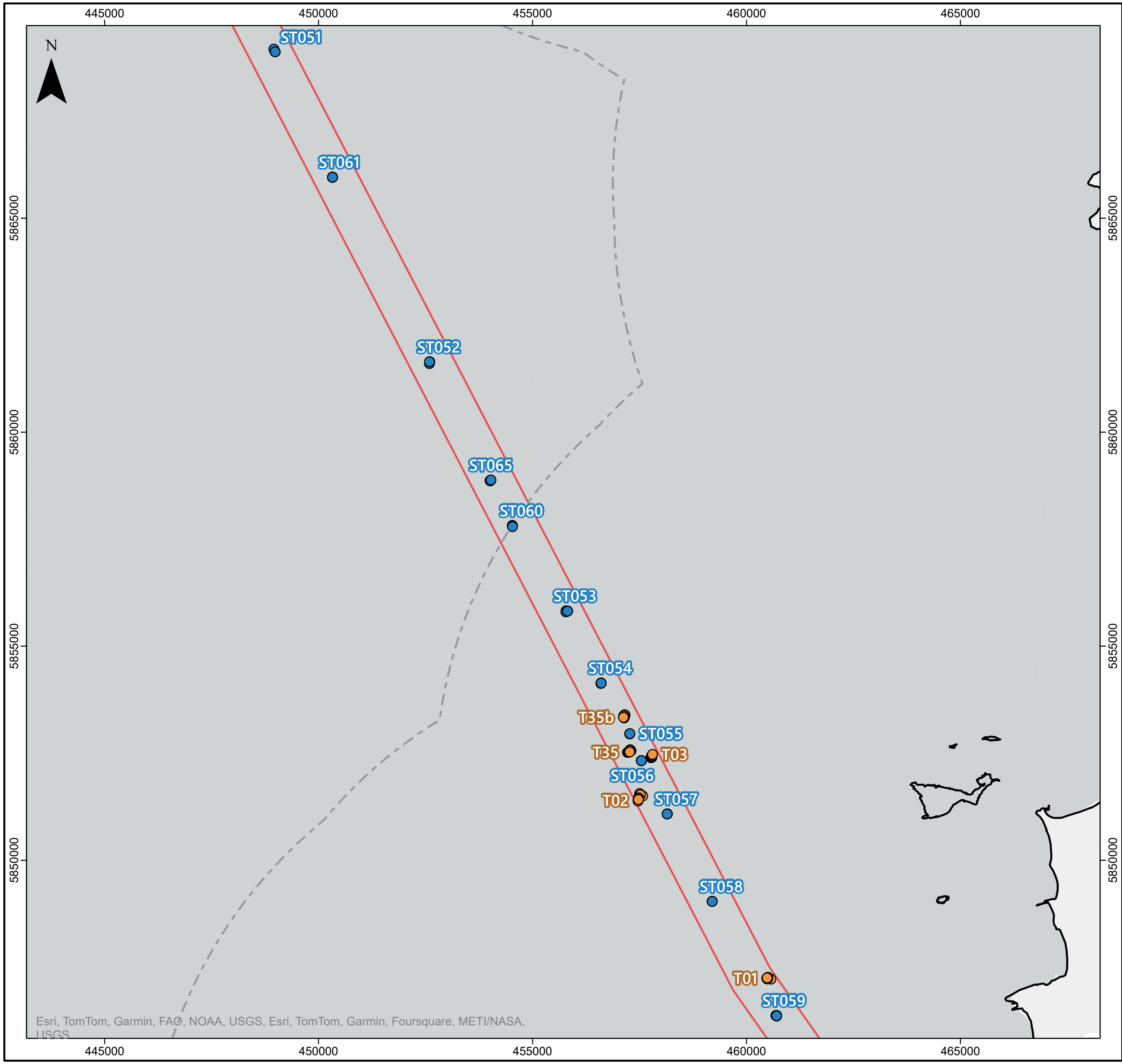
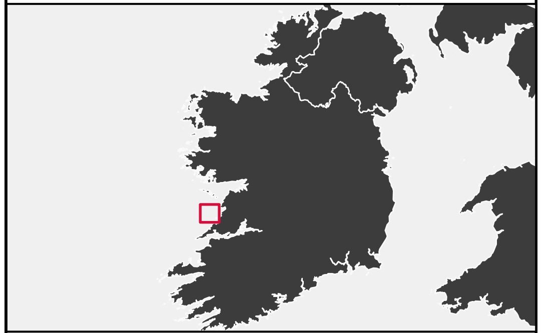


SCEIRDE ROCKS WINDFARM

Feirm Ghaoithe Charraigeacha Sceirde



LEGEND

- Offshore Array Area
- Offshore Export Cable Corridor
- Study Area
- Ireland 6 NM limit
- Ireland 12 NM Limit
- Sampling Locations
- Transect Locations

0 0.8 1.6 nm

0 1.5 3 km

Data Source: Contains public sector information, licensed under the Creative Commons licence v4.0; the Open Government Licence v3.0.

PROJECT TITLE

Sceirde Rocks

MAP TITLE

Sample Effort Export Cable Corridor 2

VER	REMARKS	DATE	Drawn	Approved
1	DRAFT	06/12/2024	BQ	EE

DRAWING NO

Figure 9-3

SCALE	PAPER SIZE	DATUM	PROJECTION
1:130,000	A4	WGS 84	UTM 29N

9.4.2 Consideration of data sources and quality

As described in section 9.4.1.2, a comprehensive environmental survey campaign has been undertaken using a combination of geophysical data acquisition, ground-truthed with camera stills and transects and sediment grab sampling within the Offshore Site. This has been supplemented through a comprehensive literature search of existing data sets and reports as per section 9.4.1.1. As such, it is considered that the survey method, number and quality of samples and associated analysis were provided a sufficiently robust data set to inform the consideration of likely significant effects on the benthic habitat and species in the vicinity of the Project.

9.4.3 Impact Assessment Methodology

9.4.3.1 Impacts Requiring Assessment

The potential impacts that have been scoped in for the benthic ecology impact assessment are detailed in Table 9-4 below.

Table 9-4 Potential impacts scoped in to the benthic ecology impact assessment

Potential Effect	Description
Construction	
Temporary habitat or species loss / disturbance	There is potential for the temporary loss or damage to habitats or species as a result of the activities relating to construction of the Project.
Long term loss / damage to benthic habitats and species	There is the potential for the long-term loss or damage to benthic habitats or species as a result of infrastructure placed on the seabed during the construction of the Project. The effect will last through the operational and maintenance phase, and some of which (e.g., jack up pads and cable protection) can be considered permanent as these will be decommissioned in situ.
Increased Suspended Sediment Concentrations (SSC) and associated deposition	Sediment disturbance resulting from construction activities will result in increased SSC and associated sediment deposition.
Increased risk of introduction and spread of Invasive and Non-Native Species (INNS)	Vessel movement and other activities (e.g., ballasting) during construction activities have the potential to introduce INNS. Furthermore, the potential temporary anchorage in the Shannon Estuary will present a risk of introduced INNS. In addition, the introduced rock and infrastructure such as gravity bases have the potential to provide a substratum that could be colonised by INNS.
Operational and Maintenance	
Hydrodynamic changes leading to scour around subsea infrastructure	Localised movement of seabed as a result of infrastructure placements relating to the Project.
Temporary habitat or species loss / disturbance	There is the potential for the temporary loss or damage to habitats or species as a result of activities relating to the operation and maintenance of the Project.
Increased SSC and associated deposition	Sediment disturbance resulting from operation and maintenance activities will result in increased SSC and associated deposition.
Colonisation of hard structures	Artificial structures placed on the seabed (i.e., Gravity-Base Structures (GBSs) and cable protection) will introduce the potential for colonisation by marine organisms, resulting in localised changes to biodiversity.

Potential Effect	Description
Effect of cable thermal load or Electromagnetic Fields (EMF) on benthic ecology	While the effect of thermal load or EMF are anticipated to be extremely localised (i.e., within centimetres (thermal) or metres (EMF) of cables), their production will be assessed throughout the operation and maintenance phases of the Project.
Increased risk of introduction and spread of INNS	Vessel movement and other activities (e.g., ballasting) during operational and maintenance activities have the potential to introduce INNS. Furthermore, the potential temporary anchorage in the Shannon Estuary will present a risk of introduced INNS. In addition, the introduced rock and infrastructure such as gravity bases have the potential to provide a substratum that could be colonized by INNS throughout operational period.
Decommissioning	
Removal of hard substrate during decommissioning	The removal of installed infrastructure during the decommissioning phase has the potential to result in species and/or habitat loss.

9.4.3.2 Assessment Methodology

9.4.3.2.1 *Characterisation of Effects*

An assessment of potential effects is provided for the construction (including pre-construction), operational and maintenance, and decommissioning phases of the Offshore Site. The assessment for benthic ecology is undertaken following the principles set out in Chapter 4: EIA Methodology, in line with the Environmental Protection Agency (EPA)'s Guidelines on the information to be contained in Environmental Impact Assessment Reports (2022) (hereafter 'EPA EIAR Guidelines') and the European Commission (2017) guidance on EIAR (Directive 2011/92/EU as amended by 2014/52/EU). Potential effects are characterised based on the following:

- **Quality of effects**: Whether an effect results in a change that improves (positive) or reduces (negative) the quality of the environment;
- **Extent**: Describes the size of the area, the number of sites and the proportion of a population affected by an effect;
- **Context**: Describes whether the extent, duration or frequency will conform or contrast with established (baseline) conditions;
- **Probability**: If effects are likely or unlikely;
- **Duration**: Describes the length of time an effect is expected to occur based on the set definitions within the guidelines;
- **Frequency:** Describes how often the effect will occur (once, rarely, occasionally, frequently, constantly – or hourly, daily, weekly, annually, etc.); and
- **Reversibility**: Whether an effect can be undone, through remediation or restoration.

The criteria for the sensitivity of benthic ecology receptors are presented in Table 9-5, and the magnitude of the effect in Table 9-6.

Table 9-5 Receptor sensitivity criteria

Sensitivity of Receptor	Definition
High	• The receptor has a very low capacity to accommodate a particular effect with a low ability to recover or adapt;

Sensitivity of Receptor	Definition
	› The receptor has high vulnerability and low recoverability to accommodate a particular effect; › The receptor is of national importance and listed as a qualifying feature of a protected site, and or a primary reason for the selection of a protected site; › The species is listed in Annex IV of Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (as amended) (EU Habitats Directive) as a European Protected Species and/or is a qualifying interest of a Special Area of Conservation (SAC) and a significant proportion of the national population (>1%) is found within the Offshore Site; and/or › The receptor is of very high (International) importance or rarity, e.g. listed on Annex I (habitats) or Annex II (Species) of the EU Habitats Directive, listed on Annex V (species) of the EU Habitats Directive (i.e. maerl (Corallinaceae)) and/or those listed on the OSPAR List of Threatened and/or Declining Species and Habitats, International Union for the Conservation of Nature (IUCN) Red List of Threatened Species (IUCN Red List) including those listed as vulnerable, endangered or critically endangered and/or a significant proportion of the international population (>1%) is found within the Offshore Site.
Medium	› High to Medium importance and rarity, a regional receptor with some capacity to absorb or accommodate change without significantly altering character. However, some damage to the receptor is anticipated to occur; and/or › The receptor may be of least concern on the IUCN Red List, listed in national biodiversity plans and/or a significant proportion of the regional population (>1%) is found within the Offshore Site.
Low	› Low to medium importance and rarity and the receptor is considered tolerant to change without significant detriment to its character; some limited or minor change may occur; and/or › The receptor has some tolerance to accommodate a particular effect or will be able to recover or adapt.
Negligible	› Very low importance and rarity, local receptor and is tolerant to change with no effect on its fundamental character.

Table 9-6 Receptor magnitude criteria

Magnitude criteria	Definition
High	› The effect occurs over a large spatial extent resulting in widespread changes in baseline conditions or affecting a large proportion of receptor extent or population; › The effect duration is permanent (i.e. effects lasting over sixty years) or long-term (i.e. effects lasting fifteen to sixty years); and/or › The effect is very likely to occur and/or will occur at a high frequency or intensity.
Medium	› The effect occurs over a local to medium extent or affects a moderate proportion of a receptor extent or population; › The effect duration is medium-term (i.e. effects lasting seven to fifteen years) or short-term (i.e. effects lasting one to seven years); and/or

Magnitude criteria	Definition
	The effect is likely to occur and/or will occur at a moderate frequency or intensity.
Low	The effect is localised leading to a detectable change in baseline conditions or a noticeable effect on a small proportion of a receptor extent or population; The effect duration is temporary (i.e. effects lasting less than a year); and/or The effect is unlikely to occur or likely to occur but at low frequency or intensity.
Negligible	The effect is highly localised with full rapid recovery expected to result in very slight or imperceptible changes to baseline conditions or receptor population; The effect duration is brief (i.e. effects lasting less than a day) or momentary (i.e. lasting from seconds to minutes); and/or The effect is very unlikely to occur; if it does, it will occur at a very low frequency or intensity.

9.4.3.2.2 Determining Significance of Effect

The EPA EIAR guidelines definitions for describing significance of effect have been used for the benthic effects assessment (Table 9-7).

Table 9-7 Significance of effect

Significance criteria	Definition	Significance
Imperceptible	An effect capable of measurement but without significant consequences.	Not Significant.
Not Significant	An effect which causes noticeable changes in the character of the environment but without significant consequences.	
Slight Effects	An effect which causes noticeable changes in the character of the environment without affecting its sensitivities.	
Moderate Effects	An effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends.	
Significant Effects	An effect which, by its character, magnitude, duration, or intensity, alters a sensitive aspect of the environment.	Significant. Mitigation measures must be in place to prevent, reduce, or avoid the effect, and if not possible then compensatory measures are proposed.
Very Significant	An effect which, by its character, magnitude, duration, or intensity, significantly alters most of a sensitive aspect of the environment.	
Profound Effects	An effect which obliterates sensitive characteristics.	

9.4.3.3 Design Parameters

The benthic ecology impact assessment has considered the design parameters which represent the greatest effect to benthic ecology receptors during the construction (including pre-construction activity), operational and maintenance, and decommissioning phases, as detailed in Table 9-8 Design parameters relevant to the benthic ecology assessment. The full design parameters are detailed within Chapter 5: Project Description.

Table 9-8 Design parameters relevant to the benthic ecology assessment

Potential Effect	Design Scenario	Justification
Construction		
Temporary habitat and species loss / disturbance	Up to 1,132,151* m^2 of temporary habitat or species loss / disturbance associated with: Pre-construction activities (e.g., seabed preparation) - Dredging*: Dredging of seabed sediment will be within the footprint of the stonebeds captured below. Disposal of dredged material from within the OAA will occur at two disposal sites within the OAA areas of 25,842 m^2 and 78,229 m^2 respectively; - Unexploded Ordnance (UXO) Clearance: UXO is considered highly unlikely following the UXO risk assessment and review of geophysical data; however, the EIAR assesses the potential for one high-order detonation of an 800 kg (net explosive quantity) UXO with a 0.5 kg donor charge; and - Boulder clearance/ Pre-Lay Grapnel Run (PLGR) within a 20 m wide temporary disturbance corridor and Controlled Flow Excavator (CFE) for seabed clearance within the OAA. Construction activities - Wind Turbine Generators (WTG) and Offshore Electrical Substation (OSS) installation via WTIV involving four feet per vessel with a total footprint of 728 m^2, with two jacking events at each WTG for a resulting temporary footprint on seabed per location of 1,456 m^2. The total area of the temporary disturbance associated with the WTIV jack up operation will be 29,120 m^2; - A total length of the OEC of 63.5 km. For the assessment it has been assumed that 78.5% of the OEC will be buried (e.g. burial via jet trencher, mechanical cutting trencher and/or controlled flow excavator (CFE) at a target depth of 1.0 m) resulting in a total seabed temporary disturbance of 996,950 m^2. and - Landfall: Trenchless landfall technology (i.e. Horizontal Directional Drilling (HDD)) will be used to bring the cable ashore via a 0.9 km duct. The area of disturbance due to dredged material will be 2,000 m^2. Construction activities spanning up to four years (including pre-construction activities).	The spatial extent and duration of temporary benthic habitat and species loss.

Potential Effect	Design Scenario	Justification
	*The indirect effects of *temporary habitat or species loss / disturbance* including that resulting from increased suspended sediment concentrations are assessed separately. Therefore, the dredging activities are encompassed within the assessment of increased suspended sediment concentrations and associated deposition below. The resulting temporary footprint assessed for the direct effects of *temporary habitat or species loss / disturbance* is 1,028,070 m^2.	
Long-term loss or damage to benthic habitats and species	Up to 1,674,346 m^2 of long-term / permanent habitat change associated with the following: - Stonebeds: Placement of stonebeds (i.e. rock aggregate to provide stability for the GBS foundations and Wind Turbine Installation Vessel (WTIV) jack-up legs). Stonebeds will be required for the 31 GBS foundations (30 WTGs and 1 Offshore Substation (OSS)) (total area of 117,604 m^2) with 11 additional stonebeds required for WTIV positioning at 10 WTGs and 1 OSS (total area of 110,187 m^2); - Installation of up to 73.0 km of Inter-Array Cables (IAC) connecting all 30 WTGs to the OSS. For the assessment it has been assumed that the IACs will be surface laid with cable protection (e.g. rock berm) resulting in a total footprint of 1,282,082 m^2; and - For the OEC, the remaining 21.5% (13.6 km) will be surface laid with cable protection (e.g. cast-iron shell, rock placement, concrete mattresses, rock bags and/or grout bags) with a footprint of 164,473 $m^{2.}$	The spatial extent and duration of disturbance and long-term loss or damage.
Increased suspended sediment concentrations and associated deposition	The design parameters are presented in Chapter 7: Marine Physical and Coastal Processes.	The spatial extent of seabed preparation and installation activities represent the greatest potential for suspended sediment. The volumes of sediment to be cleared and rock protection are also provided.
Increased risk of introduction and spread of INNS	The max anticipated number of vessels during construction phase is ca. 21.	The number of vessels transiting to and/or releasing ballast water within the Offshore Site representing the greatest potential for the introduction and spread of INNS. Introduced rock and new infrastructure may provide colonizing surfaces for INNS.

Potential Effect	Design Scenario	Justification
Operation and maintenance		
Hydrodynamic changes leading to scour around subsea infrastructure	The design parameters are presented in Chapter 7: Marine Physical and Coastal Processes.	The WTG layout has been assessed within the EIAR.
Temporary habitat and species loss / disturbance	Temporary habitat or species loss / disturbance resulting from seabed disturbance from the cable repair or replacement activities: - Expected to be less than five unscheduled cable repair interventions over life; - Cable repair or maintenance activities involving cable cutting, replacement and/or jointing of the cable sections and installation of additional cable protection; and - Operational life of 38 years	See description for 'Construction and decommissioning' above.
Increased suspended sediment concentrations and associated deposition	The design parameters are presented in Chapter 7: Marine Physical and Coastal Processes.	See description for 'Construction and decommissioning' above.
Colonisation of hard structures	Up to 2,545,582 m^3 of habitat creation associated with: - Volume of rock for GBS foundations stonebeds of 185,839 m^3; - Volume of rock for WTIV stonebeds of 702,209 m^3; - Volume of hard substrate for cable protection for IACs of 1,475,023 m^3; and - Volume of hard substrate for cable protection for the OEC of 182,511 m^3.	The spatial extent of installed infrastructure representing the greatest potential to result in colonisation. Assumes all protection including concrete mattresses are included in this volume.
Increased risk of introduction and spread of INNS	- Operational life of 38 years - Up to three maintenance vessels utilised, with four daily return vessel movements for the two crew-transfer vessels; and - It is anticipated there will be up to five (unscheduled) interventions for cable repair over the Project life. Furthermore, a cable survey will be conducted annually for the first five years and once every five years after that.	The number of vessels transiting to and/or releasing ballast water within the Offshore Site representing the greatest potential for the introduction and spread of INNS. Introducing rock and new infrastructure may provide colonising surfaces for INNS.

Potential Effect	Design Scenario	Justification
Decommissioning		
Removal of hard substrate during decommissioning	The decommissioning methodology for the Offshore Site will be the reverse of the installation process. Firstly, the WTG towers, blades, nacelle, and internal cabling are dismantled and removed from the Offshore Site. The OSS is separated from the GBS structure and removed from the Offshore Site. Then the GBS foundations are de-ballasted, re-floated, and towed from the site. Stonebeds both for the GBS foundations and the WTIV operations will be decommissioned *in situ*. The IAC and OEC decommissioning plans that any exposed or unburied and accessible cable will be cut and removed. However, any buried cables will be decommissioned *in situ*. Cable protection will be decommissioned *in situ*, as this method is likely to result in the lowest environmental impact. Decommissioning will span over two years. The Rehabilitation Schedule (and Decommissioning Plan) is detailed within Appendix 5-18 of Chapter 5: Project Description	The extent of decommissioning activities, including the extent of infrastructure that will be removed and that will be left *in situ*.

9.4.3.4 Mitigation by Design

Certain measures have been adopted as part of the Offshore Site design in order to reduce the potential for effects to the environment and specifically benthic ecology receptors. These measures will follow best practice and are outlined within Table 9-9.

Table 9-9 Mitigation by design measures relevant to benthic ecology

Measure	Design Requirement
Landfall Installation	Trenchless methods (e.g., HDD) will be undertaken at the Landfall to avoid any direct effects to the intertidal area.
Cable Burial	Cables will be sufficiently buried to a target depth. Where burial is not achieved, external cable protection will be used (e.g., cast-iron shell, rock placement, concrete mattresses, rock bags and/or grout bags) to ensure sufficient distance from sensitive receptors to thermal and EMF effects.
Management Plans	A Sceirde Rocks Marine Invasive Non-Native Species Management Plan (MINNSMP) has been developed for this project [Appendix 5-8]. The MINNSMP outlines specific measures to reduce the introduction of INNS. This includes compliance with the EU Invasive Alien Species Regulation 1143/ 2014 and all vessels commissioned will be required to comply with international regulations (e.g., the International Maritime Organization (IMO) International Convention for the Control and Management of Ships' Ballast Water and Sediments (BWM Convention').
Avoidance of Sensitive Features	Environmental survey data collected through the site surveys carried out for the Offshore Site has been used to inform cable routing and placement of GBS foundations and other infrastructure on the seabed, with emphasis on avoiding the most sensitive features to direct disturbance.

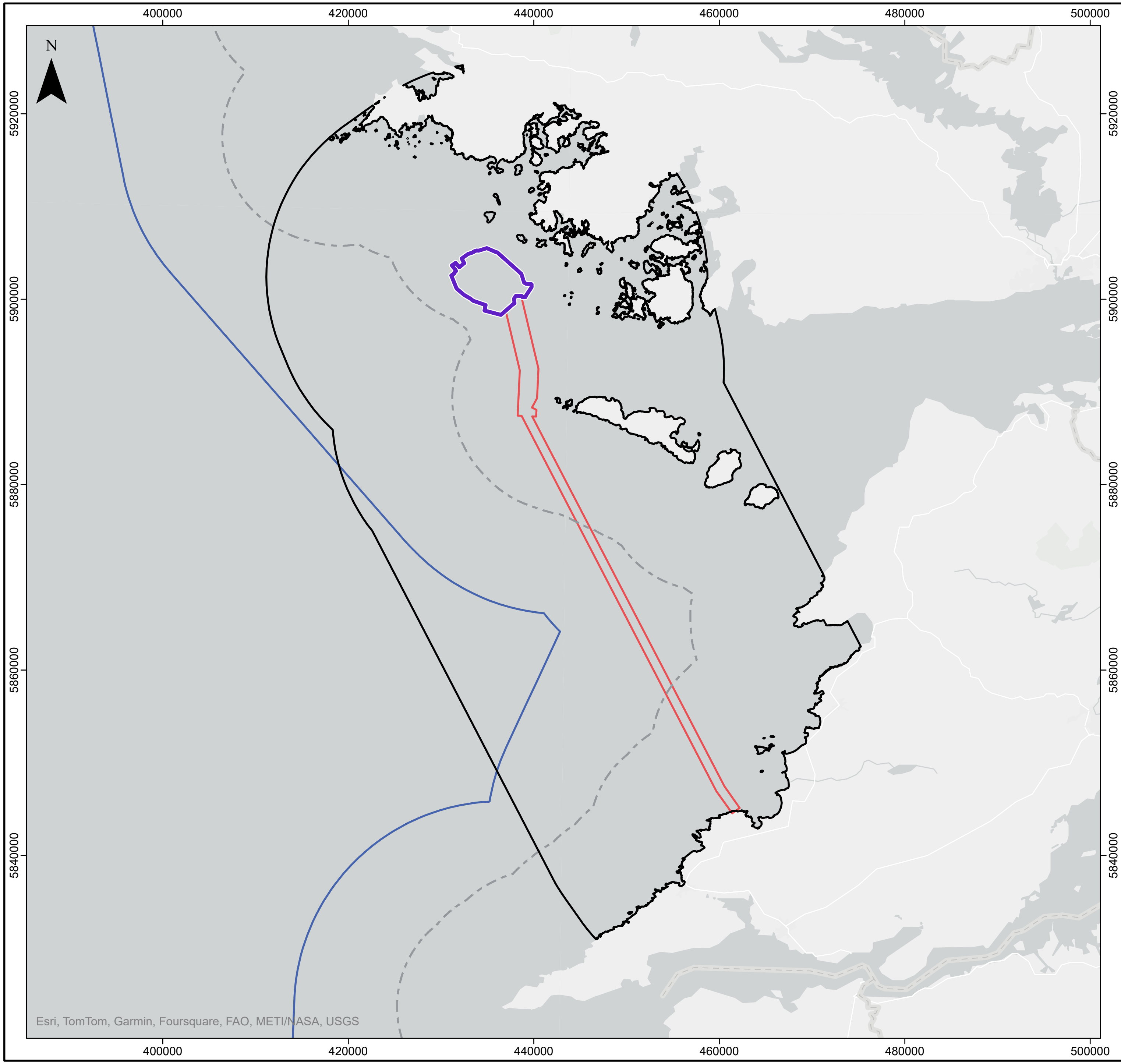
9.5 Baseline Conditions

This section summarises current knowledge on the presence and distribution of benthic ecology receptors within the benthic ecology study area. The characterisation of the current environment is established from a combination from the benthic survey results and desk-based study.

The objective of this section is to present the best available understanding of the current baseline for benthic ecology receptors, including the presence and distribution of benthic species and habitats, including those which are of conservation importance.

9.5.1 Study Area

The benthic ecology study area is defined as the OAA and OECC (red line boundary) area and a 15 km buffer around the Offshore Site (Figure 9-4). The benthic ecology study area is consistent with that of Chapter 7: Marine Physical and Coastal Processes which covers the area over which effects on marine physical processes may occur. The buffer is considered appropriate in order to capture the effects associated with pathways for tidal advection of sediment plumes from seabed disturbance activities (e.g. cable trenching), which may have implications on benthic ecology receptors due to sedimentation processes. Where appropriate, a larger effect area has been considered, for example, in relation to the potential introduction of INNS. In addition, while the Shannon Estuary is not shown in the study area, potential effects associated with a potential temporary anchorage in the area have been considered to the extent that there is information available at this stage.



SCEIRDE ROCKS WINDFARM
Feirm Ghaoithe Charraigeacha Sceirde

LEGEND

- Offshore Array Area
- Offshore Export Cable Corridor
- Study Area
- Ireland 6 NM limit
- Ireland 12 NM Limit

0 4 8 nm

0 7.5 15 km

Data Source: Contains public sector information, licensed under the Creative Commons licence v4.0; the Open Government Licence v3.0.

PROJECT TITLE
Sceirde Rocks

MAP TITLE
Benthic Ecology Study Area

VER	REMARKS	DATE	Drawn	Approved
1	DRAFT	06/12/2024	BQ	EE

DRAWING NO
Figure 9-4

SCALE	PAPER SIZE	DATUM	PROJECTION
1:600,000	A4	WGS 84	UTM 29N

9.5.2 Baseline Environment

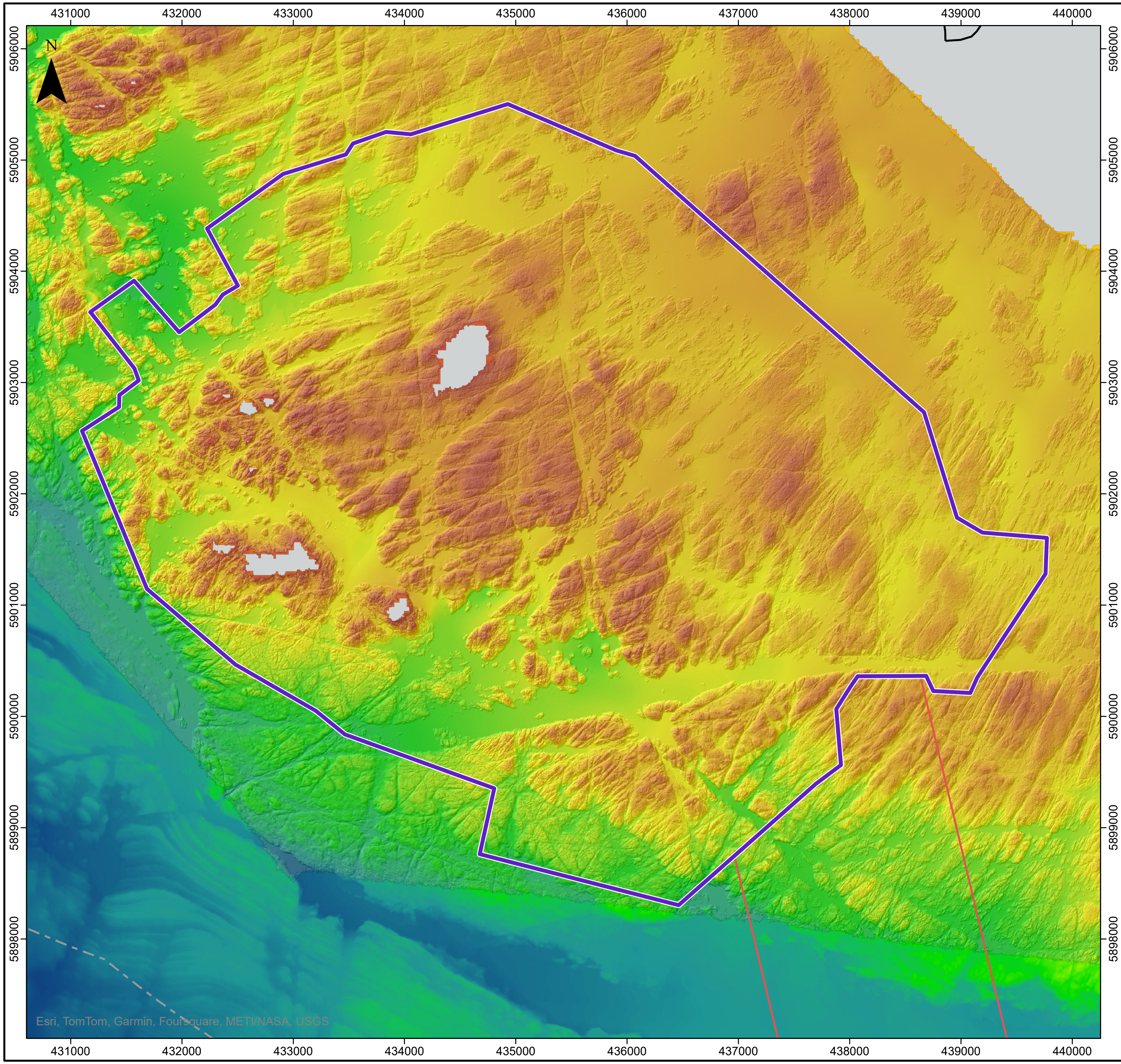
9.5.2.1 Bathymetry and Seabed Features

9.5.2.1.1 *Bathymetry*

The geophysical surveys (EGS, 2023a; EGS, 2023b) provide the most up-to-date description of the seabed bathymetry across the footprint of the Offshore Site based on a high-resolution MBES survey. This information along with the available seabed bathymetry for the West Coast of Ireland from INFOMAR and EMODnet has been used to inform bathymetry across the site.

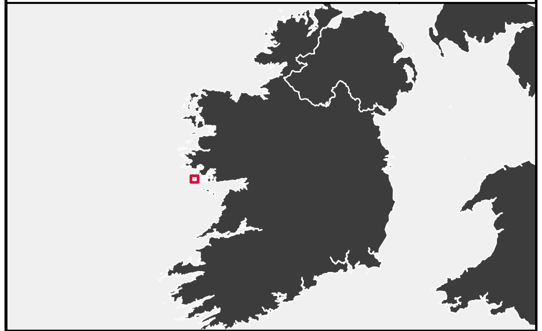
As illustrated in Figure 9-5, the seabed bathymetry across the Offshore Site is characterised by an abundance of rocky outcrops and deep gullies and channels. The OAA is roughly centred around the area of shoals and rocky islets, collectively known as 'Sceirde Rocks'. Within the OAA, seabed depths reach up to 60 m LAT but are generally between 25 m LAT and 40 m LAT, with the shallower areas occurring across the eastern extent of the OAA. Along the western area of the OAA, in proximity to the Irish continental shelf, seabed depths are on the order of 40 m LAT to 50 m LAT (Chapter 7: Marine Physical and Coastal Processes).

As illustrated in Figure 9-6, Depths along the OECC start at around 25 m LAT at the boundary with the OAA, increasing to about 90 m LAT west and offshore Inishmore island, before shallowing towards landfall, reaching a depth of around 30 m LAT, approximately 1 km offshore from the coast (Figure 9-6) (Chapter 7: Marine Physical and Coastal Processes). Irregular topography is observed at the beginning of the OECC and towards landfall where rocky outcrops are common (Figure 9-6).



SCEIRDE ROCKS WINDFARM

Feirm Ghaoithe Charraigeacha Sceirde



LEGEND

- Offshore Array Area
- Offshore Export Cable Corridor
- Ireland 6 NM limit

INFOMAR Bathymetry (m)

94

2

0 0.3 0.6 nm

0 0.6 1.2 km

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PROJECT TITLE

Sceirde Rocks

MAP TITLE

INFOMAR Bathymetry (2021, 2022)

VER	REMARKS	DATE	Drawn	Approved
1	DRAFT	06/12/2024	BQ	EE

DRAWING NO

Figure 9-5

SCALE	PAPER SIZE	DATUM	PROJECTION
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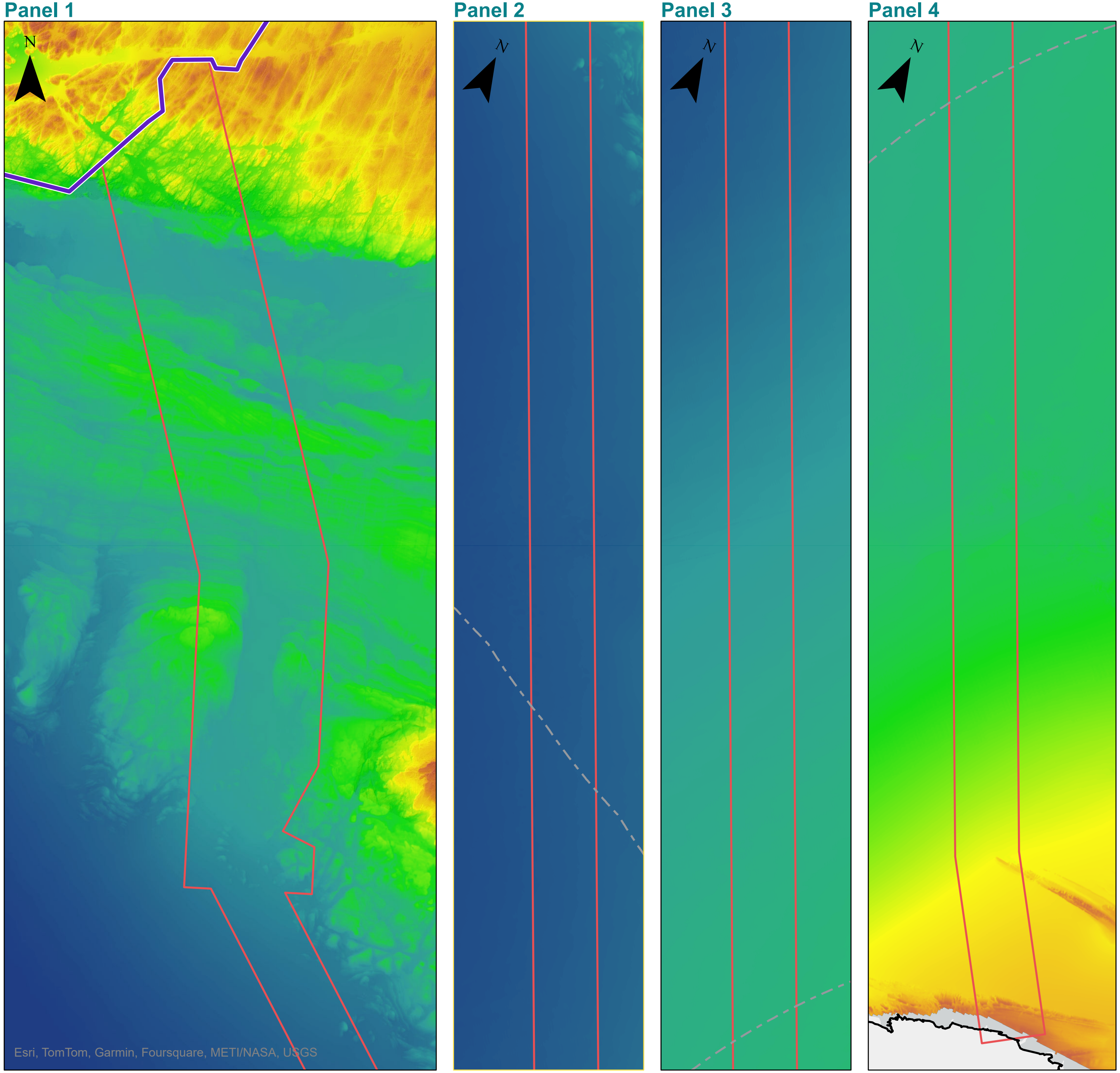
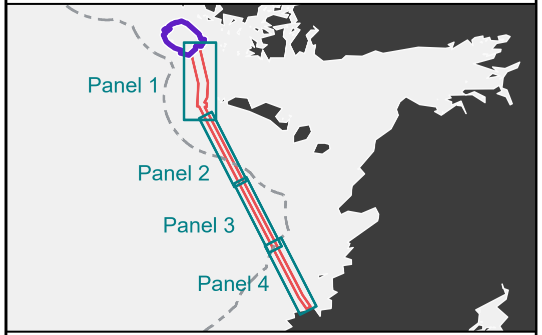


SCEIRDE ROCKS WINDFARM

Feirm Ghaoithe Charraigeacha Sceirde



LEGEND

- Sceirde Rocks Site Boundary
- Offshore Export Cable Corridor
- Ireland 6 NM limit

INFOMAR Bathymetry (m)

94

2

0 0.55 1.1 nm

0 1 2 km

Data Source: Contains public sector information, licensed under the Creative Commons licence v4.0; the Open Government Licence v3.0.

PROJECT TITLE

Sceirde Rocks

MAP TITLE

INFOMAR Bathymetry (2021, 2022)

VER	REMARKS	DATE	Drawn	Approved
1	DRAFT	06/12/2024	BQ	EE

DRAWING NO

Figure 9-6

SCALE	PAPER SIZE	DATUM	PROJECTION
1:90,000	A4	WGS 84	UTM 29N

9.5.2.1.2 Seabed Features

The seabed across the proposed Offshore Site is comprised of a variety of rocky and sediment substrates with the OAA being predominantly rocky outcrops with sparse sediment cover (Figure 9-7) and the OECC being largely sediment dominated with sands and mud substrates (Figure 9-7 and Figure 9-8). The survey data was generally in agreement with the predicted habitat data from INFOMAR and EUNIS broadscale habitat map, where comparisons could be made.

The seabed sediments present throughout the Offshore Site represent a variety of low to moderate energy muds, sands and coarse sediment. However, the OAA was characterised as having irregular topography with predominant rocky outcrops interspersed with sediments before significantly increasing in depth in the south and south-western region where sand and muddy sand were more prevalent. The OECC exhibited similar characteristics in irregular topography where it begins at the intersection with the OAA and towards Landfall; however, the central region of the OECC is considered to be relatively consistent in depth and largely comprised of sand and muddy sand with finer sediments throughout.

9.5.2.1.3 Rocky substrates

The OAA has been characterised as predominantly rocky outcrops with deep gullies and narrow channels present in between the rocky outcrops. Most of the OAA was interpreted as a rock substrate representative of wave exposed infralittoral rock in shallower waters and wave-exposed circalittoral rock in deeper waters. These rock habitats were made up of extensive areas of bedrock as well as stony material such as cobbles and boulders. Sediment coverage in the OAA is sparse, consisting primarily of coarse sandy sediments overlaying bedrock or filling gullies, faults and joints that exist within the rocky outcrops (Ocean Ecology Limited, 2024; see Appendix 9-1).

In the OECC, the rocky substrata were more limited in extent occurred in the northerly extend adjacent to the OAA and a patch in the southern part of the route, approximately 7.5 km from the proposed Landfall (Ocean Ecology Limited, 2024; see Appendix 9-1).

These rocky substrates were considered to represent potential Annex I reef. These features are discussed further in Section 9.5.2.3.2.

9.5.2.1.4 Seabed Sediments

As described in section 9.4.1.2.2, seabed sediment grab samples were collected as part of the benthic characterisation survey. The grab sampling was successfully achieved at 58 grab stations (30 in the OAA, 28 along the OECC) (Ocean Ecology Limited, 2023a). The grab samples were then analysed for full particle size classification and assigned a sediment type according to the Folk 1954 classification (Ocean Ecology Limited, 2024).

The results indicate that in the OAA 70% of the grab sample stations were coarse sediment, followed by sand and muddy sand (23.3%), mud and sandy mud (3.3 – 3.4%) and mixed sediment (3.3 – 3.4%) (Ocean Ecology Limited, 2024). The most frequently occurring sediment types were gravelly sand and sandy gravel. A spatial trend was observed in which sand and gravel were prominent in the central OAA, with mud concentration increasing towards the south (Ocean Ecology Limited, 2024) (Figure 9-7). This spatial trend is reflected in the bathymetry in which depths significantly increase in the south and south-west of the OAA (Figure 9-5).

The seabed sediment in the OECC consisted of 53.6% sand and muddy sand, followed by mud and sandy mud (25%) and coarse sediment (21.4%) (Ocean Ecology Limited, 2024). The most frequently occurring sediment types was muddy sand. There were smaller concentrations of slightly gravelly sand, slightly gravelly muddy sand, gravelly sand, sandy gravel and gravel. With regards to spatial distribution throughout the OECC, gravelly sand was common to the north at the intersection with the OAA (Figure 9-7). Throughout the length of the OECC sediments were considered generally heterogenous consisting of sand with gravel and/or mud, and towards the centre muddy sand was most common (Figure 9-8). Towards the Landfall location the sediment type was mainly sand (Ocean Ecology Limited, 2023b;2024).

Sediment composition throughout the survey area consisted of primarily sands and varying degrees of gravel and mud (Tabel 9-10). The sediment composition within the OAA and OECC both consisted of predominantly sand, with relatively high gravel content and low mud content in the OAA and vice versa along the OECC (Ocean Ecology Limited, 2024).

Table 9-10 Sediment composition throughout the Offshore Site, represented as mean proportion (%) (± Standard Error, SE) for gravels, sands and mud (Ocean Ecology Limited, 2024).

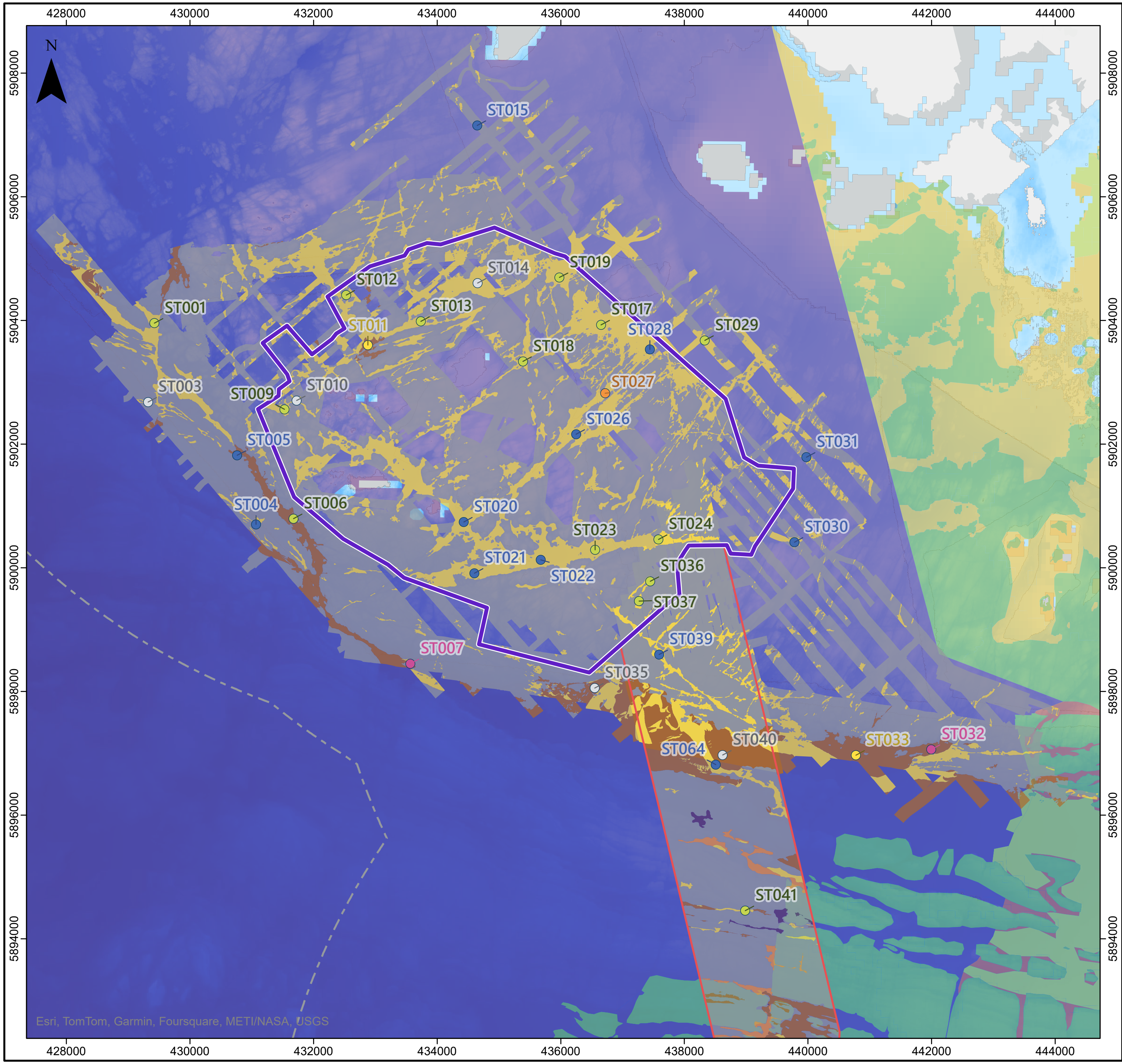
	Gravel	Sand	Mud
OAA	23% (± 20%)	75% (± 19%)	3% (± 6%)
OECC	8% (± 21%)	78% (± 20%)	14% (± 13%)

Sediment chemical analysis including key contaminants have also been undertaken for the grab samples. Twenty-two of the 58 grab stations were selected for full sediment chemical analysis in which samples were analysed for the eight main heavy and trace metals in addition to Aluminium (Al) and Lithium (Li), Polycyclic Aromatic Hydrocarbons (PAHs) and Total Hydrocarbon Content (THC), Polychlorinated Biphenyls (PCBs), Organotins (i.e. Dibutyltin (DBT) and Tributyltin (TBT) and Organochlorine Pesticides (OCPs).

The benthic survey concluded that metal concentrations were low through the OAA, with grab samples exceeding the Irish lower level threshold for arsenic at two stations (ST001 and ST004) and the OSPAR BAC threshold for arsenic at one station (ST001) (Ocean Ecology Limited, 2024; see Appendix 9-1). Metal concentrations were low along the OECC as well, with grab samples exceeding the Irish lower level threshold for arsenic at one station (ST041) and exceeding the Irish Lower Level, OSPAR BAC, EPA ERL and CSQG TEL and PEL thresholds for chromium at one station (ST060).

PAH concentrations were below the limit of detection[1] and well below thresholds across the survey area (Ocean Ecology Limited, 2024; see Appendix 9-1). THC within the OAA ranged from 221 µg kg^{-1} (ST013) to 4,430 µg kg^{-1} (ST007), with a mean (± SE) concentration of 1,176 µg kg^{-1} (± 317 µg kg^{-1}). Along the OECC, THC concentrations were between 1,070 µg kg^{-1} (ST036 and ST041) and 4,560 µg kg^{-1} (ST045). PCBs were below the limit of detection across the survey area (Ocean Ecology Limited, 2024; see Appendix 9-1). The total concentration of the seven measured PCBs was 1.32 µg kg-1, below the Irish Lower Level concentration of 7 µg kg-1; however, at one station in the OAA (ST026) thresholds exceeded the OSPAR BAC for PCB138, PCB153 and PCB180. Organotins were below the limit of detection across the survey area. OCP concentrations were below the limit of detection and below thresholds across the survey area (Ocean Ecology Limited, 2024; see Appendix 9-1).

[1] The limit of detection is a standardised reporting limit defined for each specific analyte (e.g. 0.14 mg/kg for arsenic) defined as the lowest quantity or concentration of an analyte that can be detected within a sample after adjustments are made for dilutions or percent moisture (Evard et al., 2016).



SCEIRDE ROCKS WINDFARM
Feirm Ghaoithe Charraigeacha Sceirde

LEGEND

- Offshore Array Area
- Offshore Export Cable Corridor
- Study Area
- Ireland 6 NM limit
- Ireland 12 NM Limit

Seabed Sediments

- Gravelly Sand
- Rock
- Sand
- Sandy Gravel
- Silty Sand

Bathymetry (m)

0
-130

PSA Sediment Classification

- Gravelly Sand
- Muddy Sand
- Muddy Sandy Gravel
- Sand
- Sandy Gravel
- Slightly Gravelly Sand

Seabed Classification (INFOMAR)

- Coarse sediment
- Mixed sediment
- Mud to muddy Sand
- Rock
- Sand
- Unclassified

0 0.55 1.1 nm
0 1 2 km

Data Source: Contains public sector information, licensed under the Creative Commons licence v4.0; the Open Government Licence v3.0. Corio Generation (2023).

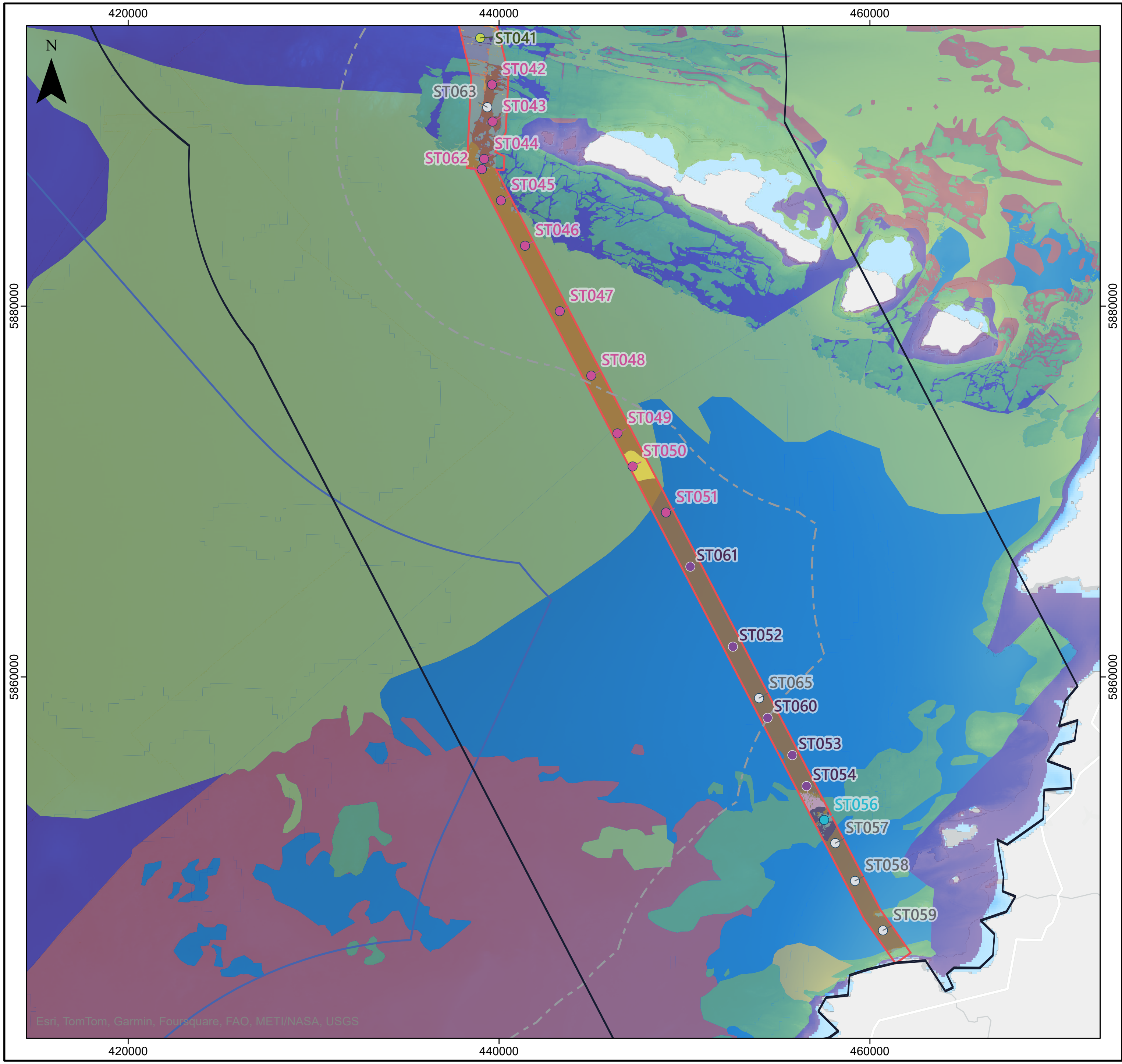
PROJECT TITLE
Sceirde Rocks

MAP TITLE
Seabed Sediments

VER	REMARKS	DATE	Drawn	Approved
1	DRAFT	06/12/2024	BQ	EE

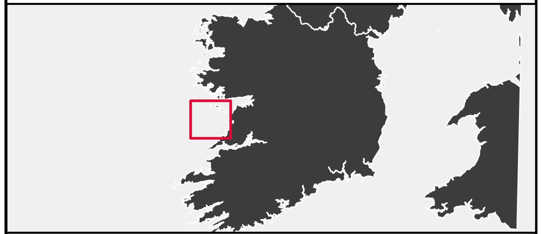
DRAWING NO
Figure 9-7

SCALE	PAPER SIZE	DATUM	PROJECTION
1:90,000	A4	WGS 84	UTM 29N



SCEIRDE ROCKS WINDFARM

Feirm Ghaoithe Charraigeacha Sceirde



LEGEND

Offshore Export Cable Corridor

Study Area

Ireland 6 NM limit

Ireland 12 NM Limit

Seabed Sediments

Gravelly Sand

Rock

Sand

Sandy Gravel

Sandy Gravel, intermittent rock outcrop and boulders

Silty Sand

Bathymetry (m)

0

-1302

PSA Sediment Classification

Gravel

Gravelly Sand

Muddy Sand

Slightly Gravelly Muddy Sand

Slightly Gravelly Sand

Seabed Classification (INFOMAR)

Coarse sediment

Mixed sediment

Mud to muddy Sand

Rock

Sand

Unclassified

0 2 4 nm

0 3.5 7 km

Data Source: Contains public sector information, licensed under the Creative Commons licence v4.0; the Open Government Licence v3.0.

PROJECT TITLE

Sceirde Rocks

MAP TITLE

Seabed Sediments

VER	REMARKS	DATE	Drawn	Approved
1	DRAFT	06/12/2024	BQ	EE

DRAWING NO

Figure 9-8

SCALE	PAPER SIZE	DATUM	PROJECTION
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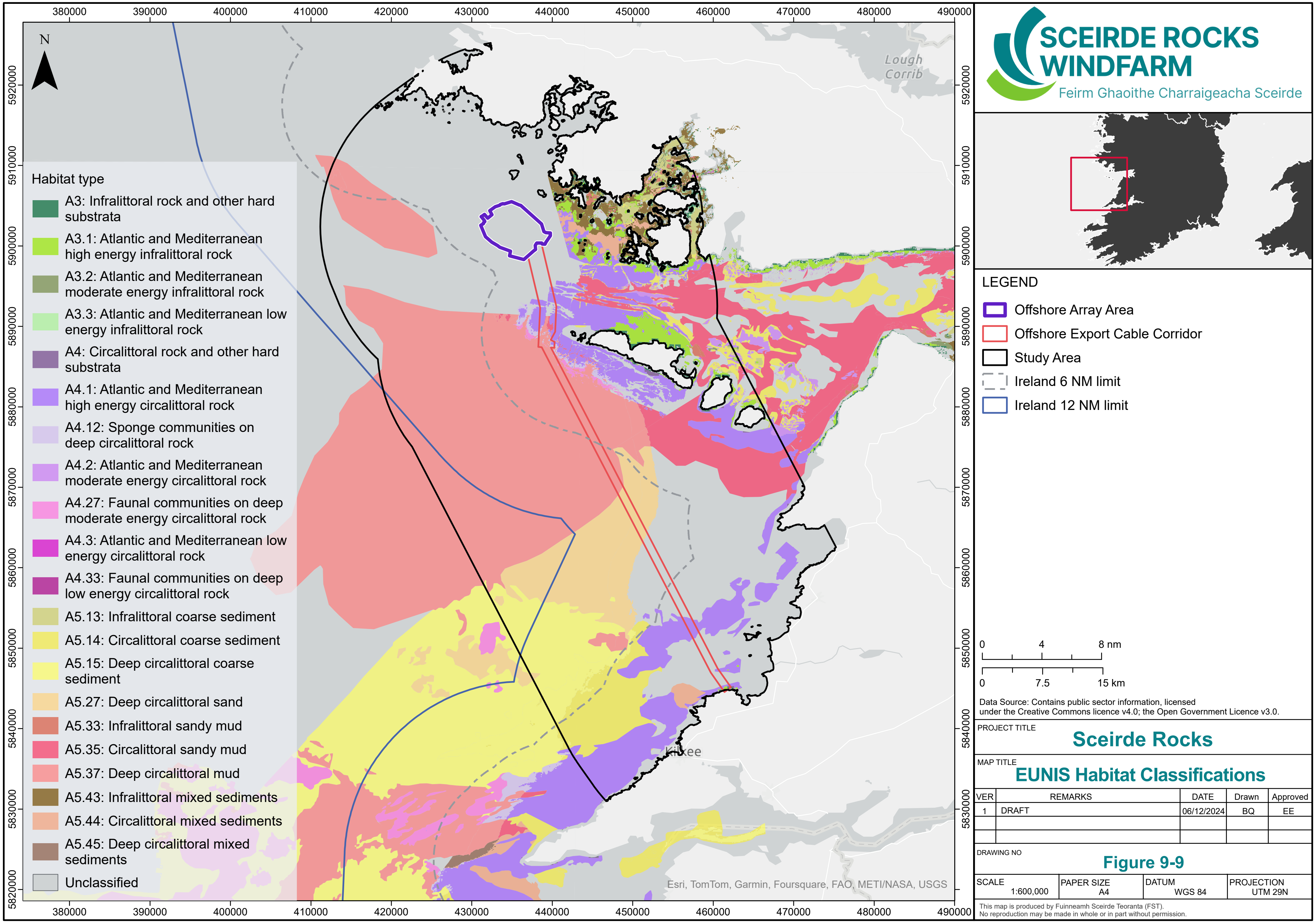


SCEIRDE ROCKS WINDFARM
Feirm Ghaoithe Charraigeacha Sceirde
N
Lough Corrib
Kilkee
Habitat type
A3: Infralittoral rock and other hard substrata
A3.1: Atlantic and Mediterranean high energy infralittoral rock
A3.2: Atlantic and Mediterranean moderate energy infralittoral rock
A3.3: Atlantic and Mediterranean low energy infralittoral rock
A4: Circalittoral rock and other hard substrata
A4.1: Atlantic and Mediterranean high energy circalittoral rock
A4.12: Sponge communities on deep circalittoral rock
A4.2: Atlantic and Mediterranean moderate energy circalittoral rock
A4.27: Faunal communities on deep moderate energy circalittoral rock
A4.3: Atlantic and Mediterranean low energy circalittoral rock
A4.33: Faunal communities on deep low energy circalittoral rock
A5.13: Infralittoral coarse sediment
A5.14: Circalittoral coarse sediment
A5.15: Deep circalittoral coarse sediment
A5.27: Deep circalittoral sand
A5.33: Infralittoral sandy mud
A5.35: Circalittoral sandy mud
A5.37: Deep circalittoral mud
A5.43: Infralittoral mixed sediments
A5.44: Circalittoral mixed sediments
A5.45: Deep circalittoral mixed sediments
Unclassified
LEGEND
Offshore Array Area
Offshore Export Cable Corridor
Study Area
Ireland 6 NM limit
Ireland 12 NM limit
0 4 8 nm
0 7.5 15 km
Data Source: Contains public sector information, licensed under the Creative Commons licence v4.0; the Open Government Licence v3.0.
Esri, TomTom, Garmin, Foursquare, FAO, METI/NASA, USGS
PROJECT TITLE
Sceirde Rocks
MAP TITLE
EUNIS Habitat Classifications
VER | REMARKS | DATE | Drawn | Approved
1 | DRAFT | 06/12/2024 | BQ | EE
DRAWING NO
Figure 9-9
SCALE 1:600,000
PAPER SIZE A4
DATUM WGS 84
PROJECTION UTM 29N
This map is produced by Fuinneamh Sceirde Teoranta (FST). No reproduction may be made in whole or in part without permission.

9.5.2.2 Benthic Species and Habitats

9.5.2.2.1 *Summary of EUNIS Habitat Classifications*

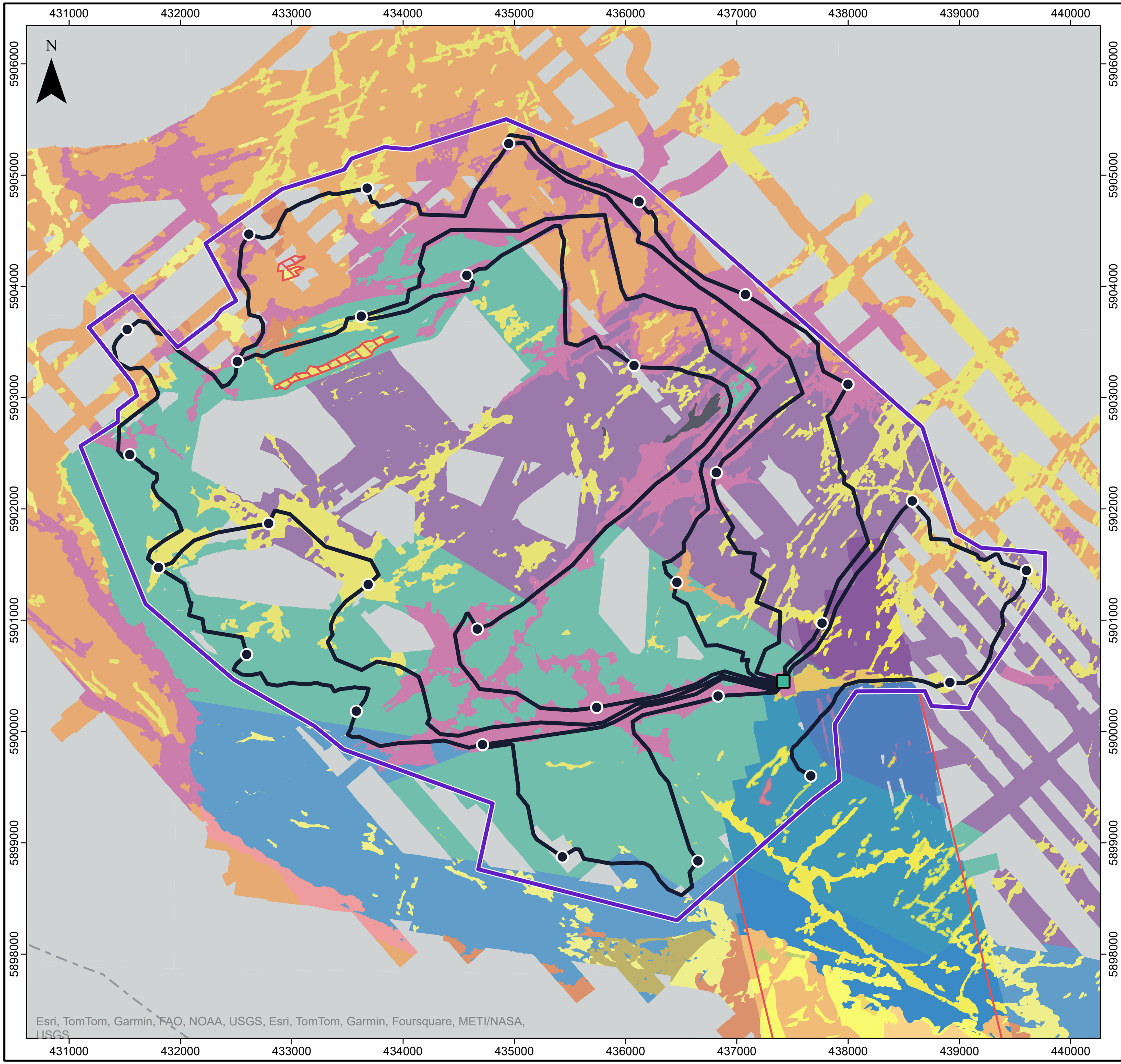
The benthic ecology study area is comprised of a variety of low to moderate energy muds, sands and coarse sediment with a higher density of rocky habitats towards the coast. The predicted EUNIS habitat classifications throughout the benthic ecology study area are illustrated in Figure 9-9 (EMODnet, 2023). However, this broad scale data does not cover the OAA or important sections of the OECC. Therefore, a more reflective overview of the EUNIS habitats present in the Offshore Site has been derived from habitat mapping for the Offshore Site, which has been undertaken as part of the habitat assessment report (Ocean Ecology Limited, 2023b; Figure 9-10). A summary of all the biotopes identified throughout the Offshore Site are provided below in Table 9-11.

The EUSeaMap data illustrates EUNIS habitat classifications throughout the benthic ecology study area (EMODnet, 2023). The main EUNIS habitat classifications are identified as A5.37 'Deep circalittoral mud' and A5.27 'Deep circalittoral sand' to the west and A5.15 'Deep circalittoral coarse sediment', A5.14 'Circalittoral coarse sediment' and A4.1 'Atlantic and Mediterranean high energy circalittoral rock' to the south-west (Figure 9-10). Towards the coast there are a variety of habitats, with widespread regions of A5.35 'Circalittoral sandy mud' and A3.1 'Atlantic and Mediterranean high energy infralittoral rock' in addition to A5.14 'Circalittoral coarse sediment' and A4.1 'Atlantic and Mediterranean high energy circalittoral rock' (Figure 9-10). The EUSeaMap data does not provide coverage for the region surrounding the OAA; however, the INFOMAR marine substrate data provides a characterisation of the seabed in the adjacent area at similar water depths. The seabed surrounding the OAA is considered to be shallow circalittoral and infralittoral seabed including mixed sediments and areas of rocky reef.

As can be seen in Figure 9-10, there is a complex matrix of biotopes present across the OAA and northern extent of the OECC that comprise a range of rocky habitats interspersed by coarse sands that support a diverse range of benthic communities that are determined by the water depth and degree of wave exposure. A summary of the full list of associated habitats across the Offshore Site is provided in Table 9-11. According to the benthic characterisation survey the patches of sediment in the northeast and centre of the OAA are classified as habitats A5.14 'Circalittoral coarse sediment' and A5.25 'Circalittoral fine sand' (Ocean Ecology Limited, 2023b). Figure 9-10 also indicates the presence of the EUNIS habitat A5.51 'Maerl beds'. The National Biodiversity Data Centre (2024) map of maerl distribution indicates that maerl beds are present along the coastline surrounding the OAA. During the benthic characterisation survey, it was determined that two locations in the central region of the OAA had potential to be maerl beds (ST027 and T33) (see section 9.5.2.3.3).

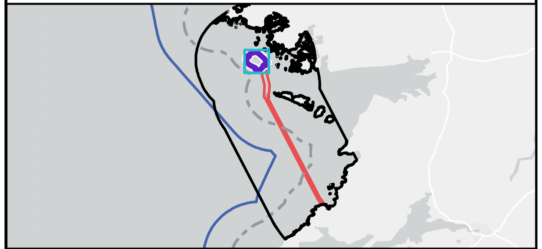
In the western, further offshore region of the OAA the habitat was classified as A5.15 'Deep circalittoral coarse sediment'. Finally, the southern region of the OAA has been recorded as representative of either A5.25 'Circalittoral fine sand' or A5.26 'Circalittoral muddy sand' (Figure 9-10).

The northernmost region of the OECC, where it intersects the OAA, has been classified as A5.14 'Circalittoral coarse sediment' (Ocean Ecology, 2023b) (Figure 9-11). The central region of the OECC was identified as A5.37 'Deep circalittoral mud'; however, the sediment analysis (PSD) revealed that the upper and lower central region of the OECC were characterised by sand and muddy sand. Ultimately the stations located in deeper waters were classified as A5.27 'Deep circalittoral sand' while those in shallower waters were classified as A5.26 'Circalittoral muddy sand'. As the OECC approaches Landfall the depth is also shallower and therefore the southern region of the OECC has also been classified as A5.26 'Circalittoral muddy sand'.



SCEIRDE ROCKS WINDFARM

Feirm Ghaoithe Charraigeacha Sceirde



LEGEND

- Offshore Array Area
- Offshore Export Cable Corridor
- Ireland 6 NM limit
- Ireland 12 NM Limit
- Offshore Substation (OSS)
- Wind Turbine Generators (WTG)
- Dredge Disposal Sites
- IAC Routes

Habitat Type

- A3.116: Foliose red seaweeds on exposed lower infralittoral rock
- A4.121: Phakellia ventilabrum and axinellid sponges on deep, wave-exposed circalittoral rock
- A4.212: Caryophyllia smithii, sponges and crustose communities on wave-exposed circalittoral rock
- A4.214: Faunal and algal crusts on exposed to moderately wave-exposed circalittoral rock
- A5.14: Circalittoral coarse sediment
- A5.143: Protodorvillea kefersteini and other polychaetes in impoverished circalittoral mixed gravelly sand
- A5.15: Deep circalittoral coarse sediment
- A5.25 or A5.26: Circalittoral fine sand or circalittoral muddy sand
- A5.253: Medium to very fine sand, 100-120 m, with polychaetes [Spiophanes kroyeri], [Amphipectene auricoma], [Myriochele] sp., [Aricidea wassi] and amphipods [Harpinia antennaria]
- A5.27: Deep circalittoral sand
- A5.37: Deep circalittoral mud
- A5.51: Maerl beds

0 0.3 0.6 nm

0 0.6 1.2 km

Data Source: Contains public sector information, licensed under the Creative Commons licence v4.0; the Open Government Licence v3.0. Corio Generation (2023).

PROJECT TITLE

Sceirde Rocks

MAP TITLE

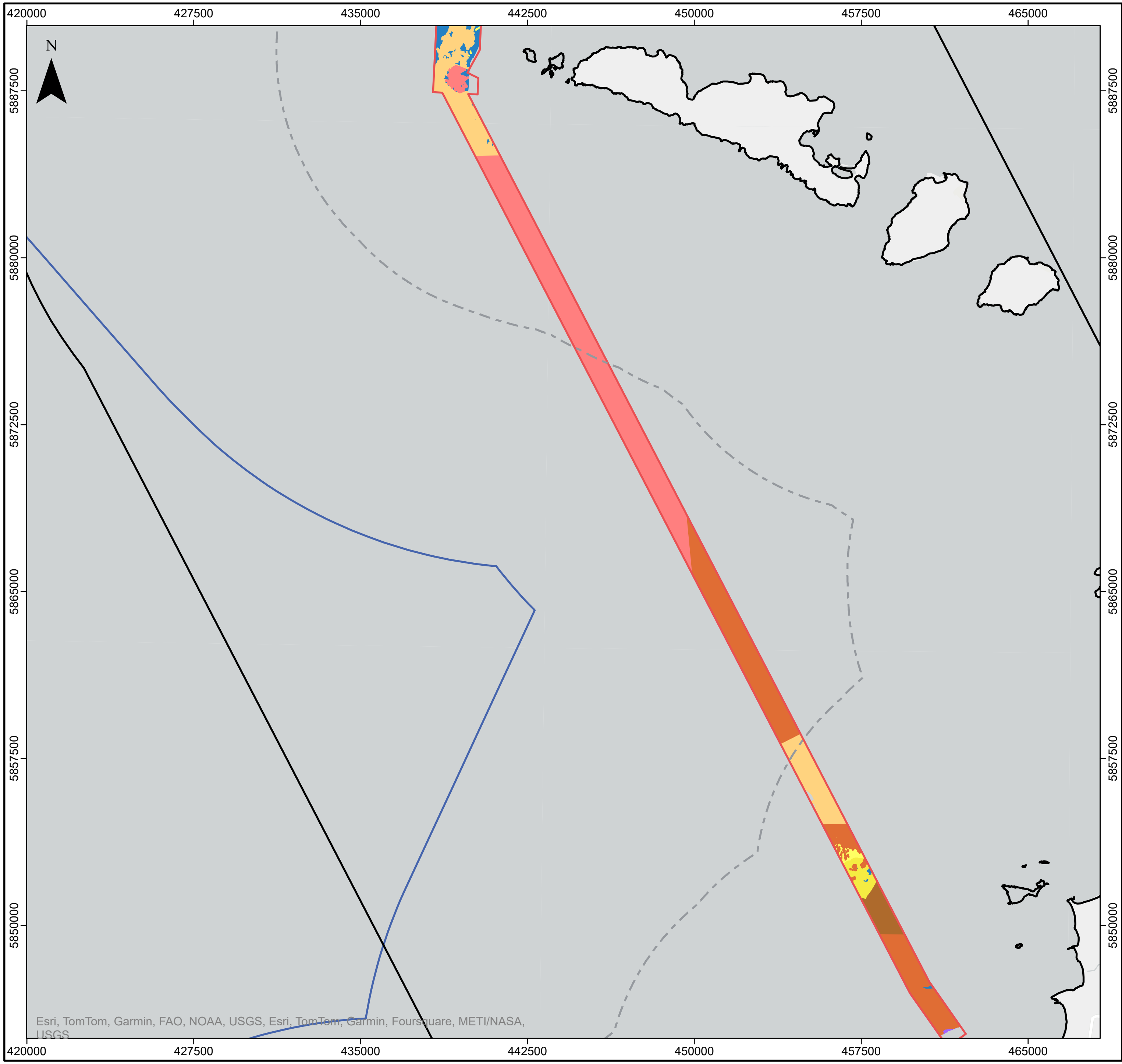
EUNIS Habitat & Inter-array Cables

VER	REMARKS	DATE	Drawn	Approved
1	DRAFT	06/12/2024	BQ	EE

DRAWING NO

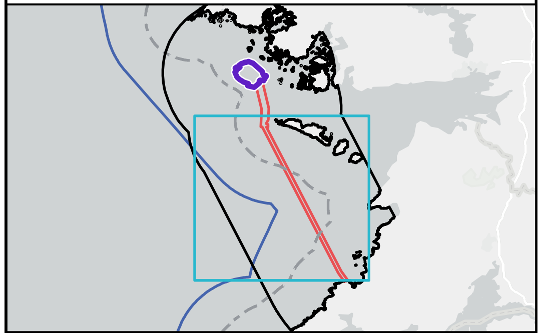
Figure 9-10

SCALE	PAPER SIZE	DATUM	PROJECTION
1:50,000	A4	WGS 84	UTM 29N



SCEIRDE ROCKS WINDFARM

Feirm Ghaoithe Charraigeacha Sceirde



LEGEND

- Offshore Array Area
- Offshore Export Cable Corridor
- Study Area
- Ireland 6 NM limit
- Ireland 12 NM Limit
- A4.1: Atlantic and mediterranean high energy circalittoral rock
- A4.121: Phakellia ventilabrum and axinellid sponges on deep, wave-exposed circalittoral rock
- A4.121: Phakellia ventilabrum and axinellid sponges on deep, wave-exposed circalittoral rock OR A5.15: Deep circalittoral coarse sediment
- A4.2146: [Caryophyllia smithii] with faunal and algal crusts on moderately wave-exposed circalittoral rock
- A5.14: Circalittoral coarse sediment
- A5.15: Deep circalittoral coarse sediment
- [Echinocyamus pusillus], [Ophelia borealis] and [Abra prismatica] in circalittoral fine sand
- A5.26: Circalittoral muddy sand
- A5.27: Deep circalittoral sand
- A5.37: Deep circalittoral mud

0 1.5 3 nm

0 3 6 km

Data Source: Contains public sector information, licensed under the Creative Commons licence v4.0; the Open Government Licence v3.0.

PROJECT TITLE

Sceirde Rocks

MAP TITLE

EUNIS Habitat ECR

VER	REMARKS	DATE	Drawn	Approved
1	DRAFT	06/12/2024	BQ	EE

DRAWING NO

Figure 9-11

SCALE	PAPER SIZE	DATUM	PROJECTION
1:250,000	A4	WGS 84	UTM 29N

Table 9-11 Summary of biotopes found across the Offshore Site

Summary and Key Issues	Offshore Site
	Offshore and nearshore habitats

	- The EUNIS broadscale habitats, habitats and biotope complexes identified throughout the Offshore Site based on a combination of grab analysis and habitat assessment ground truthing include:
	
	Rocky habitats
	
	- Atlantic and Mediterranean high energy infralittoral rock (A3.1):
	  - Foliose red seaweeds on exposed lower infralittoral rock (A3.116):
	    - Foliose red seaweeds with dense *Dictyota dichotoma* and/*or Dictyopteris membranacea* on exposed lower infralittoral rock (A3.1161).
	- Features of infralittoral rock (A3.7):
	  - Coralline crusts in surge gullies and scoured infralittoral rock (A3.716).
	- Atlantic and Mediterranean high energy circalittoral rock (A4.1):
	  - Sponge communities on deep circalittoral rock (A4.12):
	    - *Phakellia ventilabrum* and axinellid sponges on deep, wave-exposed circalittoral rock (A4.121).
	  - Mixed faunal turf communities on circalittoral rock (A4.13):
	    - Sponges and anemones on vertical circalittoral bedrock (A4.139).
	- Atlantic and Mediterranean moderate energy circalittoral rock (A4.2):
	  - Echinoderms and crustose communities on circalittoral rock (A4.21):
	    - *Caryophyllia smithii*, sponges and crustose communities on wave-exposed circalittoral rock (A4.212);
	    - Faunal and algal crusts on exposed to moderately wave-exposed circalittoral rock (A4.214); and
	    - *Caryophyllia smithii* with faunal and algal crusts on moderately wave-exposed circalittoral rock (A4.2146).
	    - Alcyonium digitatum and faunal crust communities on vertical circalittoral bedrock (A4.215).
	- Sublittoral coarse sediment (A5.1):
	  - Circalittoral coarse sediment (A5.14):
	    - *Pomatoceros triqueter* with barnacles and bryozoan crusts on unstable circalittoral cobbles and pebbles (A5.141)
	
	Sand and Gravel Habitats
	
	- Sublittoral coarse sediment (A5.1):
	  - Circalittoral coarse sediment (A5.14):
	    - *Protodorvillea kefersteini* and other polychaetes in impoverished circalittoral mixed gravelly sand (A5.143).
	  - Deep circalittoral coarse sediment (A5.15).

- Sublittoral sand (A5.2):
  - Circalittoral fine sand (A5.25):
    - Echinocyamus pusillus, Ophelia borealis and Abra prismatica in circalittoral fine sand (A5.251); and
    - Medium to very fine sand, 100-120 m, with polychaetes *Spiophanes kroyeri*, *Amphipectene auricoma*, *Myriochele* sp., *Aricidea wassi* and amphipods *Harpinia antennaria* (A5.253).
  - Circalittoral muddy sand (A5.26);
  - Deep circalittoral sand (A5.27):
    - *Owenia fusiformis* and *Amphiura filiformis* in deep circalittoral sand or muddy sand (A5.272).
-
- Sublittoral mixed sediments (A5.4):
  - Circalittoral mixed sediments (A5.44); and
  - Deep circalittoral mixed sediments (A5.45).

Mud habitats

- Sublittoral mud (A5.3):
  - Circalittoral sandy mud (A5.35); and
  - Deep circalittoral mud (A5.37):
    - *Myrtea spinifera* and polychaetes in offshore circalittoral sandy mud (A5.377).

Maerl habitat

- Sublittoral macrophyte-dominated sediment (A5.5):
  - Maerl beds (A5.51):
  - Phymatolithon *calcareum* maerl beds in infralittoral clean gravel or coarse sand (A5.511).

Key conservation habitats & species

- Annex I Reef habitat (stony and bedrock), and the pink sea fan *Eunicella verrucosa* ('Vulnerable' on the IUCN Red List);
- Ocean quahog (*Arctica islandica)* (OSPAR List of Threatened and/or Declining Species and Habitats); and
- Maerl beds (Annex V listed species and OSPAR List of Threatened and/or Declining Species and Habitats).

9.5.2.2.2 *Benthic Communities*

Macrobenthic community composition

Fifty-eight grab samples were obtained in replicates of three during the benthic survey, resulting in a total of 174 samples which were analysed for macrobenthic abundance, diversity and biomass (Ocean Ecology Limited, 2024; see Appendix 9-1). Ninety of these samples were collected from within the OAA and 84 along the OECC (Ocean Ecology Limited, 2024; see Appendix 9-1).

The infaunal communities within the OAA were primarily comprised of Annelida taxa in terms of abundance (43%) and species diversity (50%) (Figure 9-12). Miscellaneous taxa were the next highest in abundance (28%), followed by Mollusca. Echinodermata were the least abundant taxa (6%) but contributed the greatest total biomass (42%). Annelida taxa were also the most prominent taxa along the

OECC in terms of abundance (50%) and species diversity (52%), followed by Mollusca (Figure 9-12). Miscellaneous taxa contributed the most to total biomass along the OECC (37%) followed by Annelida (33%) (Figure 9-12).

Within the OAA Nemertea species were the most frequently occurring species (87.8%) followed by Nematoda species (85.6%) and *Polygordius sp.* (84.4%). Nematoda contributed to the highest average density (54.8 individuals per 0.1 m^2) whilst the long-clawed porcelain crab (*Pisidia longicornis*) was the species recorded the most times in a single sample at 983 individuals (ST027).

Along the OECC the juveniles of the brittle star family *Amphiuridae* were the most abundant taxon (12.2%), most frequently occurring species (76.2%) and had the highest average density (10.1 individuals per 0.1 m^2). Nemertea were the next most frequently occurring species (72.6%). Nematoda and *Polygordius* taxon were recorded the most times in a single sample at 115 and 108 individuals respectively.

The benthic survey also recorded Ocean quahog and Ross worm (*Sabellaria spinulosa*). Given these species are listed on the OSPAR List of Threatened and/or Declining Species and Habitats, they are discussed further in section 9.5.2.3.3 below. There were multiple instances of INNS recorded throughout the survey area, as discussed in section 9.5.2.2.3 below.

Finally, juvenile clams of the family *Veneridae*, a commercially important species, were recorded within the OAA twelve times with five individuals recorded at ST027 and recorded three times along the OECC. Another commercially important species, brown shrimp (*Crangon crangon*), was recorded once within the OAA (ST010).

The taxonomic assemblage from the grab sample locations indicates that the most commonly occurring sedimentary biotopes in the OAA were:

- **A5.143** – *Protodorvillea kefersteini* and other polychaetes in impoverished circalittoral mixed gravelly sand; and
- **A5.253** – Medium to very fine sand with polychaetes Spiophanes kroyeri, Amphipectene auricoma, Myriochele sp., Aricidea wassi and amphipod Harpinia antennaria.
- The most commonly occurring sedimentary biotopes along the OECC were:
- **A5.251** – Echinocyamus pusillus, Ophelia borealis and Abra prismatica in circalittoral fine sand;
- **A5.377** – *Myrtea spinifera* and polychaetes in offshore circalittoral sandy mud;
- **A5.272** – *Owenia fusiformis* and *Amphiura filiformis* in deep circalittoral sand or muddy sand; and
- **A5.143** – *Protodorvillea kefersteini* and other polychaetes in impoverished circalittoral mixed gravelly sand.

The communities identified in the OAA were associated with coarse sediments in shallow water and muddy to fine sand in deeper waters which is reflective of the range of depths and topographic variability observed throughout the OAA. Likewise, the communities along the OECC were representative of the higher proportion of sand and muddy sands along the OECC.

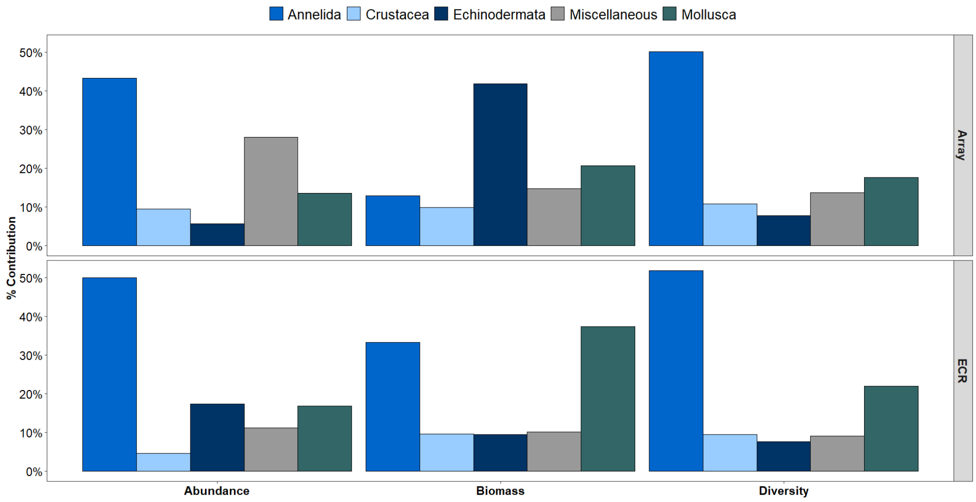


Figure 9-12 Relative contribution of the major taxonomic groups to the total abundance, diversity and biomass of the macrobenthos sampled across the OAA (top) and OECC (bottom) (Ocean Ecology Limited, 2024; see Appendix 9-1)

9.5.2.2.3 *Invasive Non-Native Species*

Two non-native taxa were identified during the benthic survey: the polychaete *Goniadella gracilis* and the amphipod *Monocorophium sextonae*. The polychaete *G. gracilis* was observed 42 times in low abundance (≤ 3 individuals) in ~45% of the grab samples across 17 stations in the OAA. (Ocean Ecology Limited, 2024; see Appendix 9-1) Both *G. gracilis* (one station, nine individuals) and *M. sextonae* (three stations, six individuals) were observed along the OECC. No assessment on the risk these species present is available although it is considered that these are of low risk (Welsh Government, 2017).

The polychaete *G. gracilis* is believed to have originated in South Africa and eastern North America. This species was first reported in Liverpool Bay in the 1970s (Walker, 1972). The amphipod *M. sextonae* is native to New Zealand and arrived in Irish waters in 1982 by natural means from southwest Britain (Costello, 1993).

Additional taxa recorded within the sediment eDNA samples include two INNS Japanese seaweeds: *Fibrocapsa japonica*, and *Dasysiphonia japonica* (Ocean Ecology Limited, 2024; see Appendix 9-1). While specimens of these seaweeds were not actually observed in the survey area, their DNA presence possibly indicate their presence in the area. While such red seaweed species have not been identified as particularly problematic in Ireland, there is evidence to suggest that *D. Japonica* is invasive and can have toxic effects on invertebrates and fish species (Young et al 2022), no live specimens were observed therefore their presence within the Sceirde Rocks area cannot be verified.

In addition to the above, it is noteworthy that there are two invasive species known to have been recorded in the Shannon Estuary where temporary anchorage may be provided for the gravity foundations. These species are the pacific oyster (*Magallana gigas*) and the bryozoan *Bugula neritina* (O'Shaughnessy *et al.*, 2023).

9.5.2.3 Features of Conservation Importance

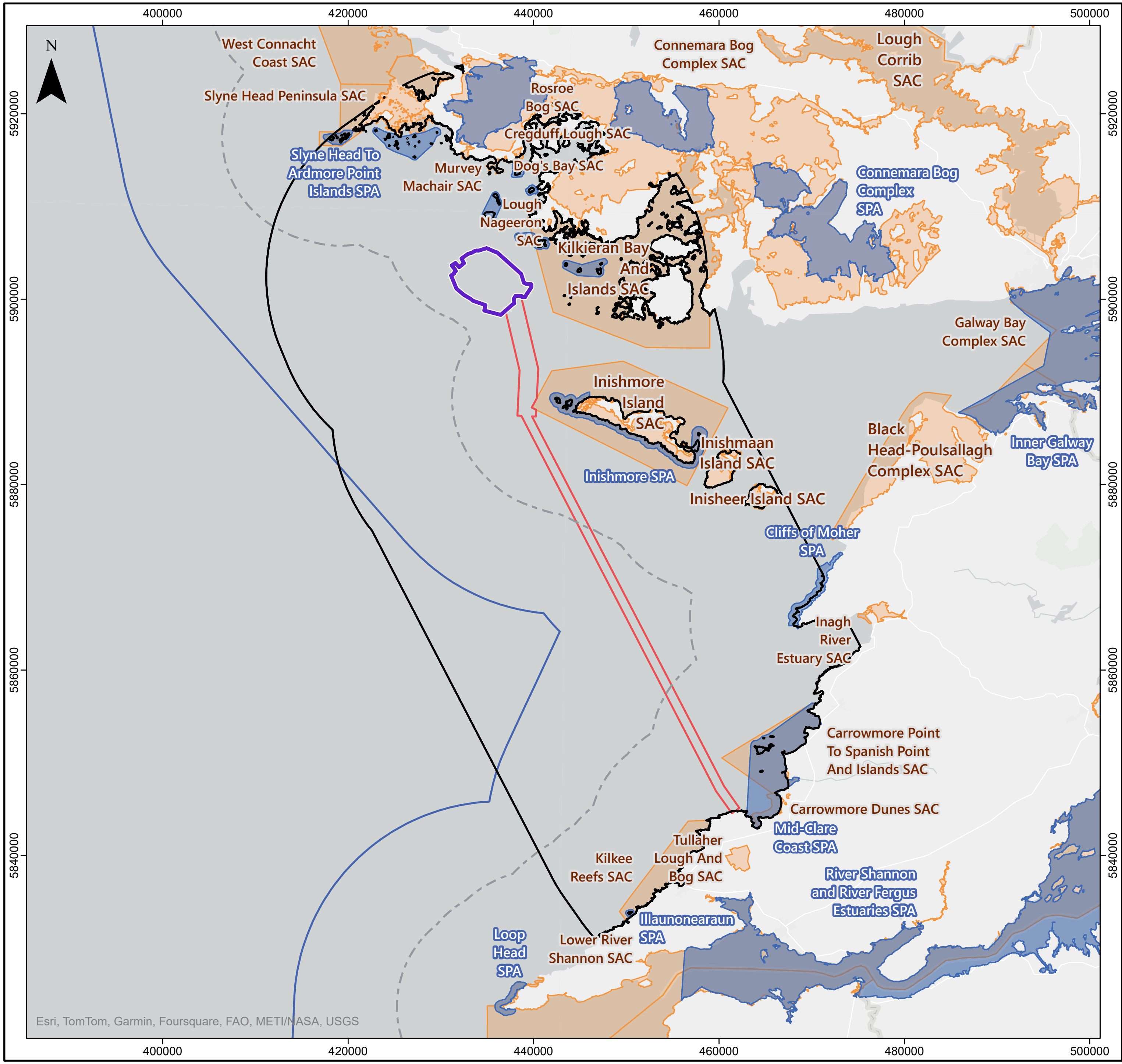
9.5.2.3.1 *Designated Sites*

The benthic ecology study area overlaps a number of designated sites with relevance to benthic ecology, as detailed in Table 9-12 below and illustrated in Figure 9-13; however, the Offshore Site does not directly overlap with any designated site (the OECC is specifically designed to avoid the bordering Inishmore Island SAC).

Table 9-12 Designated sites within the benthic ecology study area

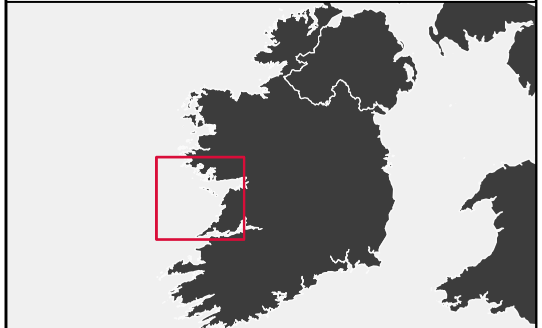
Site Name	Qualifying Interests (QIs) relevant to benthic ecology	Description of benthic communities	Distance from OECC (km)	Distance from OAA (km)	Source
Inishmore Island SAC	- Reefs; and - Submerged or partially submerged sea caves.	- Intertidal reef community complex; - Subtidal reef community complex; - *Laminaria*-dominated community complex; and - Sea cave community complex.	0 (adjacent with no overlap)	8.16	NPWS, 2015a
Carrowmore Point to Spanish Point and Islands SAC	- Reefs.	- Intertidal reef community complex; - *Laminaria*-dominated community complex; and - Mobile sand community complex (associated with the Mid-Clare Coast SPA which overlaps the SAC).	1.19	53.2	NPWS, 2014a
Carrowmore Dunes SAC	- Reefs.	- Intertidal reef community complex; and - *Laminaria*-dominated community complex. -	1.49	59.2	NPWS, 2014b
Kilkee Reefs SAC	- Large shallow inlets and bays; - Reefs; and - Submerged or partially submerged sea caves.	- Sediment community complex; - Exposed intertidal reef community complex; and - Exposed subtidal reef community complex.	2.4	58.2	NPWS, 2014c
Kilkieran Bay and Islands SAC	- Mudflats and sandflats not covered by seawater at low tide;	- *Zostera*-dominated community complex; - Maërl-dominated community complex; - Pachycerianthus multiplicatus-dominated community; - Intertidal sand with polychaetes community complex; - Mixed sediment dominated by polychaetes community complex;	2.9	1.5	NPWS, 2014d

Site Name	Qualifying Interests (QIs) relevant to benthic ecology	Description of benthic communities	Distance from OECC (km)	Distance from OAA (km)	Source
	- Coastal lagoons; - Large shallow inlets and bays; and - Reefs.	- Sand with nemerteans and crustaceans' community complex; - Deep water sand dominated by bivalves and polychaetes community complex; - Intertidal reef community complex; - Subtidal sponge and ascidian community complex; - Deep water faunal crust and sponge community complex; - Exposed to moderately exposed subtidal reef community complex; and - *Laminaria*-dominated community complex.			
Connemara Bog Complex SAC	- Coastal lagoons; and - Reefs.	- *Serpula vermicularis*-dominated community complex; and - Intertidal reef community complex.	10.3	8.3	NPWS, 2015b
Inishmaan Island SAC	- Reefs.	- Intertidal reef community complex; and - Sand community complex.	13.1	26.8	NPWS, 2014e
Inisheer Island SAC	- Coastal lagoons; and - Reefs.	- Exposed intertidal reef community complex; and - Sand community complex.	15.9	32.0	NPWS, 2014f
Slyne Head Peninsula SAC	- Coastal lagoons; - Large shallow inlets and bays; and - Reefs.	- Exposed intertidal reef community complex; - *Laminaria*-dominated community; and - Exposed subtidal reef with echinoderms and encrusting algae community.	20.2	13.9	NPWS, 2015c



SCEIRDE ROCKS WINDFARM

Feirm Ghaoithe Charraigeacha Sceirde



LEGEND

- Offshore Array Area
- Offshore Export Cable Corridor
- Study Area
- Ireland 6 NM limit
- Ireland 12 NM Limit
- SAC (Special Areas of Conservation)
- SPA (Special Protection Area)

0 4 8 nm

0 7.5 15 km

Data Source: Contains public sector information, licensed under the Creative Commons licence v4.0; the Open Government Licence v3.0.

PROJECT TITLE

Sceirde Rocks

MAP TITLE

Conservation Areas

VER	REMARKS	DATE	Drawn	Approved
1	DRAFT	06/12/2024	BQ	EE

DRAWING NO

Figure 9-13

SCALE	PAPER SIZE	DATUM	PROJECTION
1:600,000	A4	WGS 84	UTM 29N

9.5.2.3.2 *Annex I Reef Habitats*

Given the extent of rocky habitat present across the Offshore Site, Ocean Ecology Limited (2024) undertook a reef habitat assessment on the digital photographic stills and video footage acquired during the benthic survey to determine whether habitats met the criteria of Annex I reef habitats (see Appendix 9-1). The reef habitat assessment was based on Irving (2009) characteristics of stony reefs and the latest Joint Nature Conservation Committee (JNCC) guidance on the characterisation of 'low resemblance' Annex I stony reef (Golding *et al.,* 2020) (see Table 9-13).

Seabed imagery was analysed across both sampling stations and transects. The results indicate that the circalittoral rock and coarse sediments observed in the Offshore Site met the qualifying criteria of Annex I bedrock and stony reefs ('Low' and 'Medium') (Ocean Ecology Limited, 2024; see Appendix 9-1). While some of the rock habitats observed across the OAA and OECC met the qualifying criteria of Annex I reefs being a complex of bedrock reef and low and medium stony reefs, there is no overlap with the boundaries of a designated site (e.g. SAC) and therefore these reef features are not protected as a qualifying interest of a protected site designated under the EU Habitats Directive.

Table 9-13 Characteristics of a stony reef (Irving, 2009) used in the 'reefiness' assessment (Ocean Ecology Limited, 2024)

Characteristic	Not a Reef	'Reefiness'		
		Low	Medium	High
Composition (proportion of boulders/cobbles (>64 mm))	<10%	10-40% matrix supported	40-95%	>95% clast-supported
Elevation	Flat Seabed	<64 mm	64 mm – 5 m	>5 m
Extent	< 25m^2	> 25m^2		
Biota	Dominated by infaunal species	>80% of species present composed of epibiotal species		

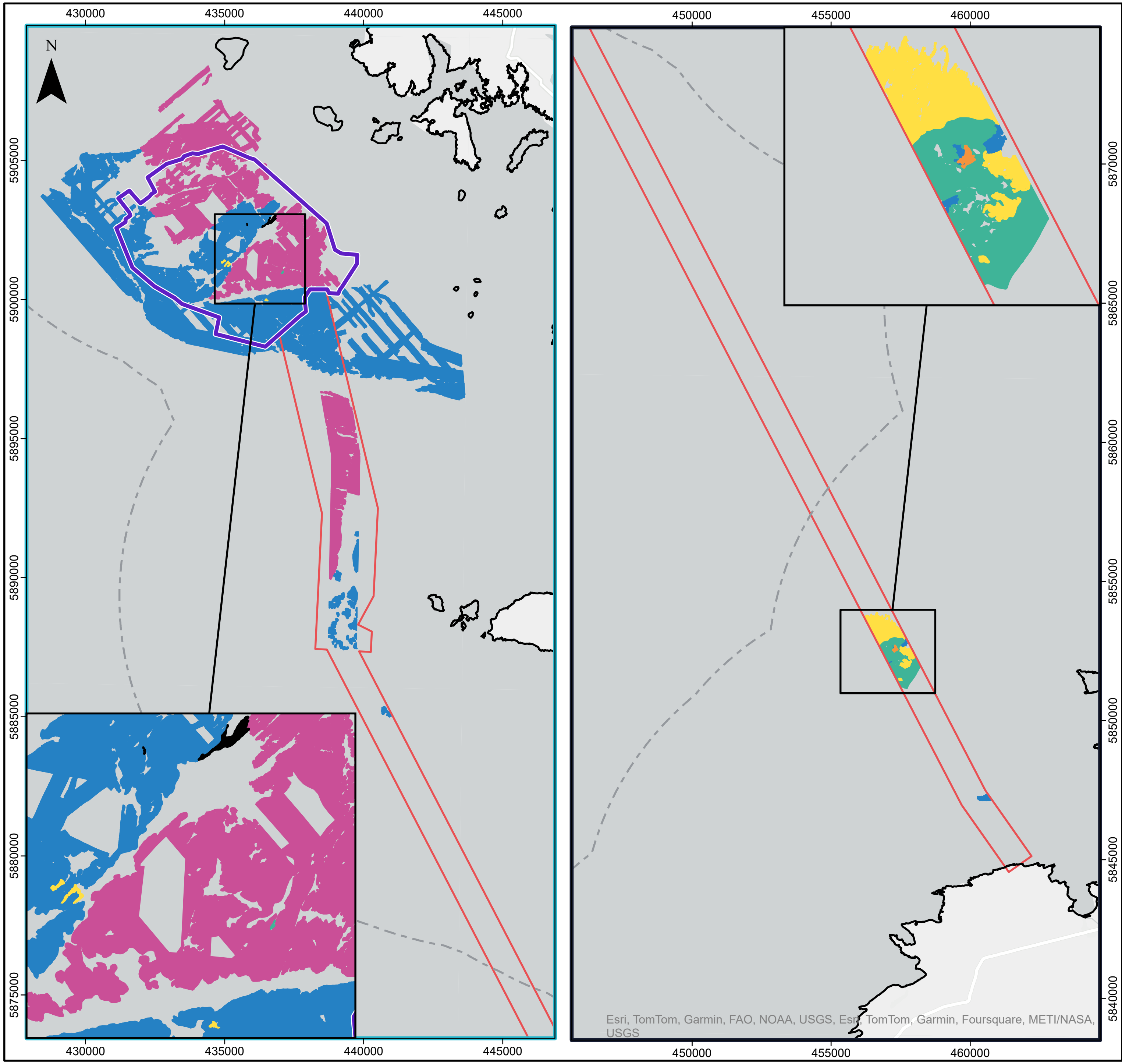
The reef habitat within the OAA is mainly comprised of bedrock reef and medium stony reefs, with smaller regions of low stony reef and medium stony reef (Figure 9-14). The reef habitat within the northernmost extent of the OECC to the intersection with the OAA is predominantly bedrock reef and a mix of bedrock and medium stony reefs. The reef habitat within the southern region of the OECC is largely low stony reef and medium stony reef, interspersed with medium and low stony reef and bedrock reef (Figure 9-14). There is also an isolated patch of bedrock reef identified towards Landfall.

In the OAA, the areas of reef were delineated as circalittoral rock interspersed with circalittoral coarse sediment which resembled low (Figure 9-14; ST016, ST025) and medium (Figure 9-14; ST034) stony reef, assigned as the circalittoral rock biotope complex EUNIS A4.214 'Faunal and algal crusts on exposed to moderately wave-exposed circalittoral rock'. Along the OECC, the areas of reef were delineated as circalittoral rock interspersed with circalittoral mixed sediment which resembled low stony reef (Figure 9-3; ST055 and ST036), assigned as A4.214 'Faunal and algal crusts on exposed to moderately wave-exposed circalittoral rock' (ST055) and A4.2146 '*Caryophyllia smithii* with faunal and algal crusts on moderately wave-exposed circalittoral rock' (ST036).

Further analysis of the seabed imagery along the transects resulted in the OAA reefs being classified as bedrock occurring as both infralittoral and circalittoral rock habitats which resembled medium and low stony reefs as well as the mosaic bedrock and medium stony reefs, and the classification of bedrock reef, medium stony reef, low stony reef, and a mosaic between bedrock and low stony reef.

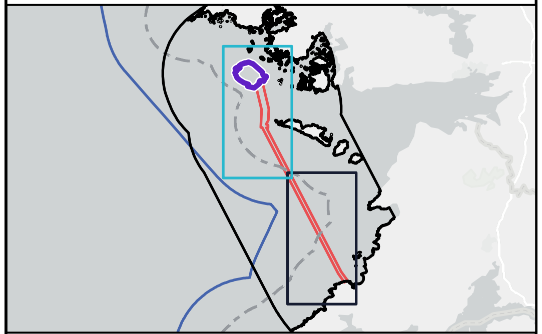
The pink sea fan (*Eunicella verrucosa*) is listed as 'Vulnerable' on the IUCN Red List and is known as an associated feature of protected Annex I reefs at the Inishmore Island SAC and Carrowmore Point to Spanish Point and Islands SAC. Given the association of this species with Annex I reef and its likely presence in the Offshore Site, the benthic survey undertook an assessment of sea fan presence across the OAA (Figure 9-15)) and the OECC (Figure 9-16).

Pink sea fans as well as unidentified sea fans were observed in association with reef habitat within the OAA as well as the OECC, with relatively high numbers of pink sea fan (two to three specimens per image) along transects T06 and T01 along the OECC as well as unidentified sea fans observed at five stations around the periphery of the OAA.



SCEIRDE ROCKS WINDFARM

Feirm Ghaoithe Charraigeacha Sceirde



LEGEND

- Offshore Array Area
- Offshore Export Cable Corridor
- Study Area
- Ireland 6 NM limit
- Ireland 12 NM Limit

Annex I Habitats

- Bedrock & Medium Stony Reefs
- Bedrock Reef
- Low Stony Reef
- Medium & Low Stony Reefs
- Medium Stony Reef
- Potential Maerl Beds

0 1 2 nm

0 2.5 5 km

Data Source: Contains public sector information, licensed under the Creative Commons licence v4.0; the Open Government Licence v3.0.

PROJECT TITLE

Sceirde Rocks

MAP TITLE

Annex I Habitats

VER	REMARKS	DATE	Drawn	Approved
1	DRAFT	06/12/2024	BQ	EE

DRAWING NO

Figure 9-14

SCALE	PAPER SIZE	DATUM	PROJECTION
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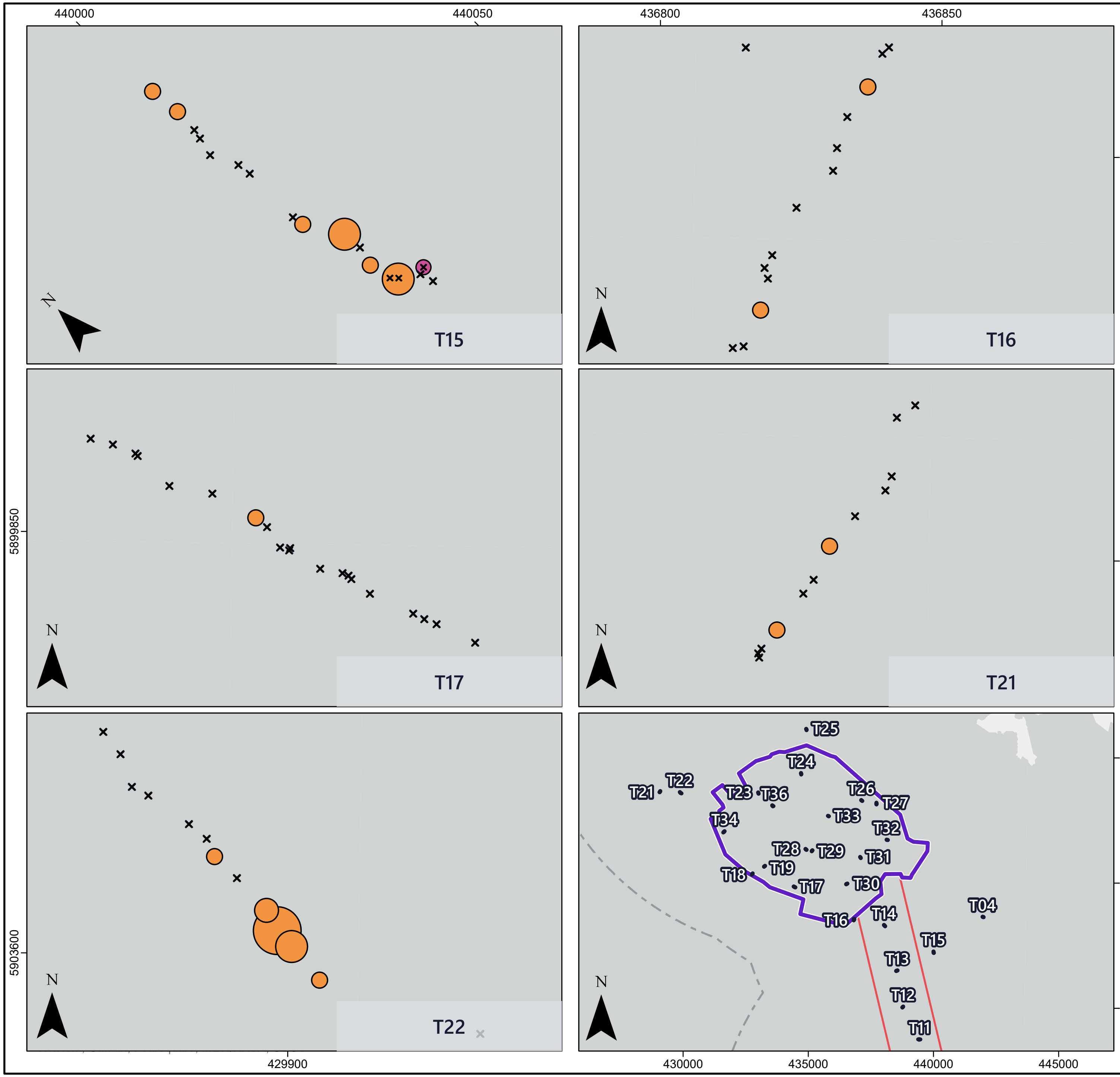

SCEIRDE ROCKS WINDFARM

Feirm Ghaoithe Charraigeacha Sceirde

LEGEND

- Offshore Array Area
- Offshore Export Cable Corridor
- Ireland 6 NM limit
- Transect Locations

E. verrucosa observations

- 0
- 1
- 2
- 3

Unidentified sea fan observations

- 0
- 1
- 2
- 3 - 4
- 5 - 13

0 0.01 0.01 nm

0 0.01 0.02 km

Data Source: Contains public sector information, licensed under the Creative Commons licence v4.0; the Open Government Licence v3.0.

PROJECT TITLE

Sceirde Rocks

MAP TITLE

Sea Fan Observations Offshore Array Area

VER	REMARKS	DATE	Drawn	Approved
1	DRAFT	06/12/2024	BQ	EE

DRAWING NO

Figure 9-15

SCALE	PAPER SIZE	DATUM	PROJECTION
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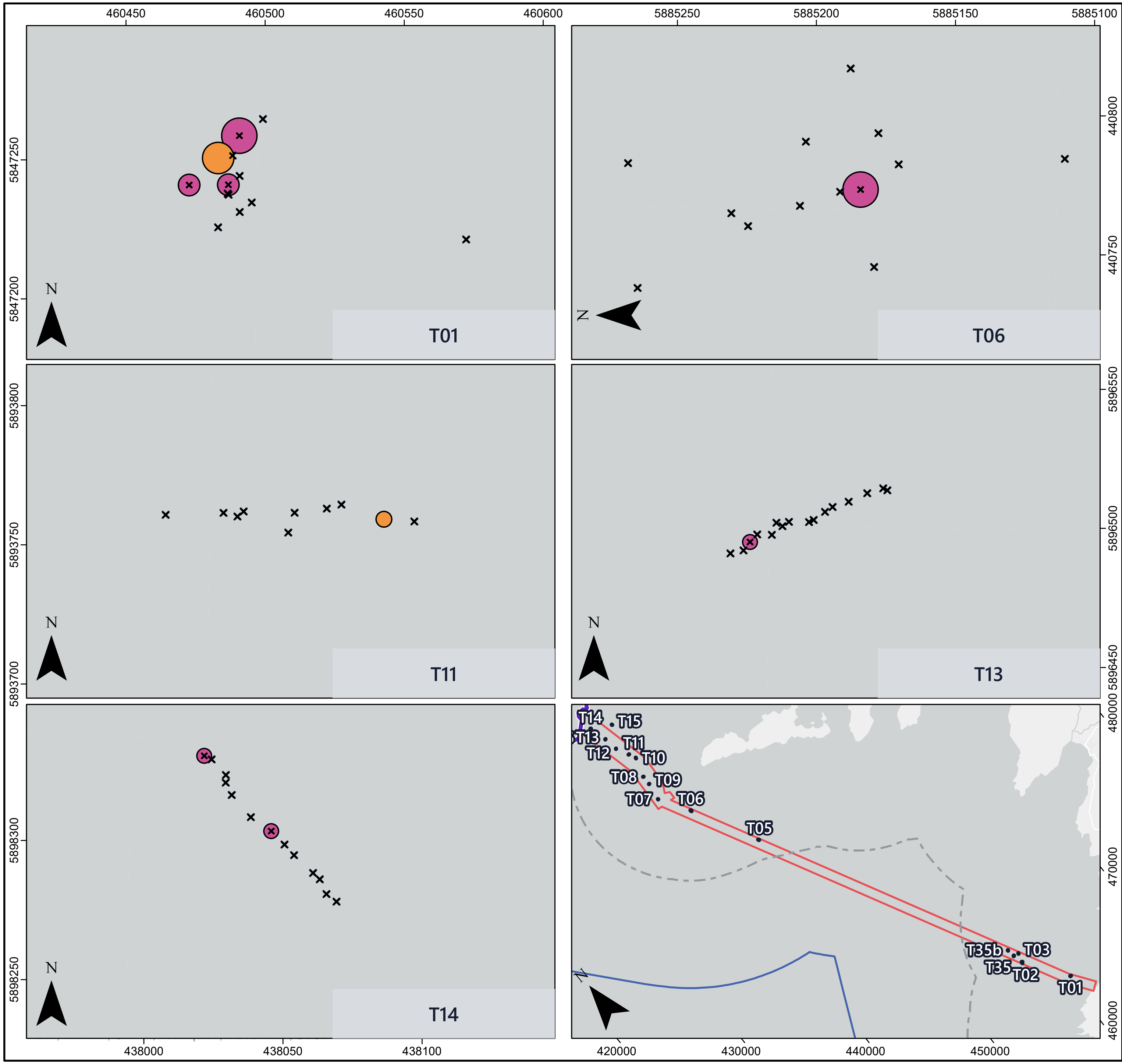


SCEIRDE ROCKS WINDFARM
Feirm Ghaoithe Charraigeacha Sceirde

LEGEND

- Offshore Array Area
- Offshore Export Cable Corridor
- Ireland 6 NM limit
- Transect Locations

E. verrucosa observations

- 0
- 1
- 2
- 3

Unidentified sea fan observations

- 0
- 1
- 2
- 3 - 4
- 5 - 13

0 0.01 0.02 nm
0 0.03 0.05 km

Data Source: Contains public sector information, licensed under the Creative Commons licence v4.0; the Open Government Licence v3.0.

PROJECT TITLE
Sceirde Rocks

MAP TITLE
Sea Fan Observations Export Cable Corridor

VER	REMARKS	DATE	Drawn	Approved
1	DRAFT	06/12/2024	BQ	EE

DRAWING NO
Figure 9-16

SCALE	PAPER SIZE	DATUM	PROJECTION
1:2,000	A4	WGS 84	UTM 29N

9.5.2.3.3 OSPAR List of Threatened and/or Declining Species and Habitats

The designated sites within the benthic ecology study area have the below designated features that are included on the OSPAR List of Threatened and/or Declining Species and Habitats:

- Intertidal mudflats;
- Intertidal *Mytilus edulis* beds;
- Zostera beds;
- Kelp forests;
- Modiolus beds;
- Maerl beds;
- Flat oyster (*Ostrea edulis*); and
- Ocean quahog.

However, the results of the benthic survey only found the following to be present within the Offshore Site:

- Maerl beds (OAA); and
- Ocean quahog (OECC).

There were two additional potential OSPAR habitats recorded during the survey: '*S. spinulosa* reefs' and 'sea pens and burrowing megafauna'.

A single Ross worm (*S. spinulosa*) was recorded along the OECC. Ocean Ecology Limited (2024) noted that there are no previous records of *S. spinulosa* occurring within or in the vicinity of the survey area, and that no reef forming features were observed where the individual was recorded. The Ross worm is protected as an Annex I species when associated with reefs and listed on OSPAR List of Threatened and/or Declining Species and Habitats as '*S. spinulosa* reefs'. Given that no reef forming features were observed, this species has not been considered further in the assessment.

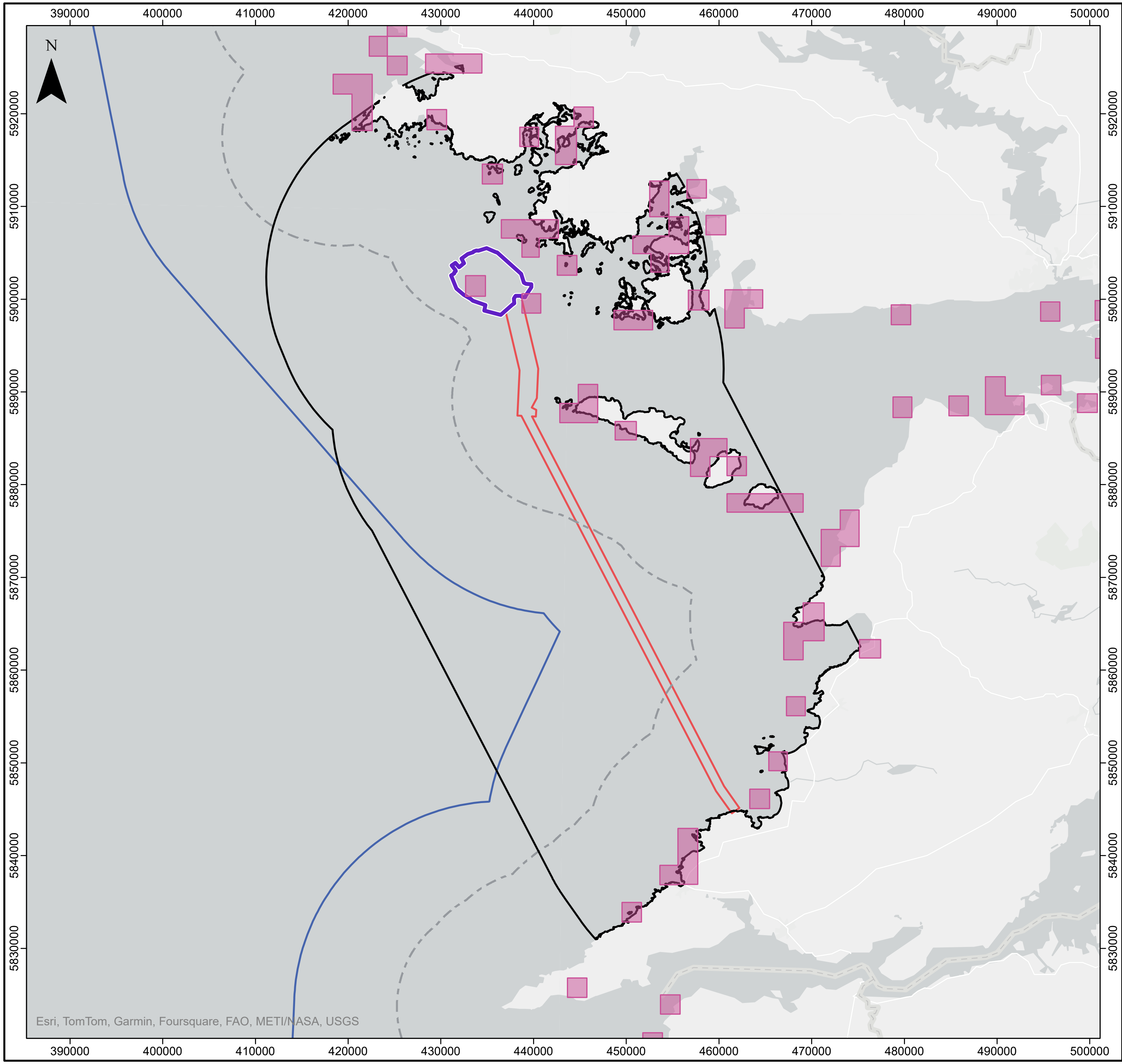
Faunal burrows were recorded which have the potential to support sea pens and burrowing megafauna; however, aside from a sighting of the slender sea pen (*Virgularia mirabilis*) in low density at one station, there were no visible fauna observed. Ocean Ecology Limited (2024) concluded that in order to qualify as the OSPAR habitat 'sea pens and burrowing megafauna', the mud must be heavily bioturbated by burrows and conspicuous populations of sea pens must also be present which was not the case. Thus, sea pens and burrowing megafauna have not been considered further.

Maerl Beds

A maerl assessment was undertaken following the identification of the Annex V listed species maerl within the OAA. The maerl bed observed within the OAA is located approximately 6.5 km from the closest known maerl communities occurring within the Kilkieran Bay and Islands SAC. The National Biodiversity Data Centre Ireland (2024) illustrates the records of maerl, with one potential historical record situated within the boundary of the OAA (Figure 9-17). The results of the maerl assessment found that there were two locations that had potential for maerl beds: ST027 and T33. The presence of 2D and 3D maerl structures (encrusting, hedgehog maerl and maerl nodules) was recorded at station ST027, along with 5% to 20% cover of live maerl (estimated 40,917 m^2) and therefore was assigned A5.51 'Maerl beds'. Along transect T33 bed forming maerl was observed along with 5% live maerl cover (729 m^2) as well as dead maerl, and therefore assigned as habitat A5.511 '*Phymatolithon calcareum* maerl beds in infralittoral clean gravel or coarse sand'. The distribution of these maerl beds identified in the site-specific survey in the OAA are shown in Figure 9-14. An assessment of the potential effects on maerl beds has been considered further in Section 9.6.

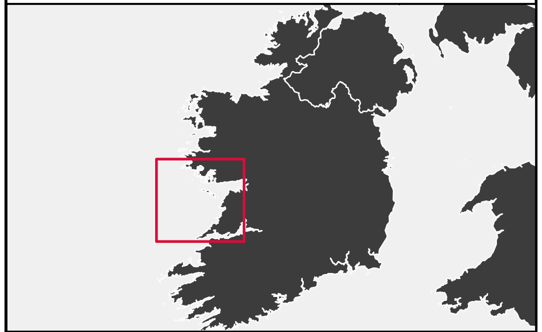
Ocean Quahog

The ocean quahog is a long-lived bivalve mollusc with a slow growth rate and low juvenile survival rate. This species is listed in the OSPAR List of Threatened and/or Declining Species and Habitats due to its vulnerability to mechanical damage has meant that this vulnerable species is now experiencing a decline, prompting increased attention to its conservation. Its primary habitat occurs within depths of between 10 m and 280 m and is found in around the Irish nearshore and offshore area. However, there were no adults observed in any of the grab samples collected from the Offshore Site and there was no evidence of siphons identified from seabed video evidence. Given that only three juveniles were identified, it is assumed that the Offshore Site is not important for this species. Therefore, the potential effects to Ocean quahog aggregations are not considered further in this assessment.



SCEIRDE ROCKS WINDFARM

Feirm Ghaoithe Charraigeacha Sceirde



LEGEND

- Offshore Array Area
- Offshore Export Cable Corridor
- Ireland 6 NM limit
- Ireland 12 NM Limit
- Maerl (Corallinaceae) Presence 2km Resolution

0 4 8 nm

0 7.5 15 km

Data Source: Contains public sector information, licensed under the Creative Commons licence v4.0; the Open Government Licence v3.0. National Biodiversity Data Centre, Ireland, Maerl (Corallinaceae), <https://maps.biodiversityireland.ie/Species/50>

PROJECT TITLE

Sceirde Rocks

MAP TITLE

Maerl Bed Biodiversity

VER	REMARKS	DATE	Drawn	Approved
1	DRAFT	06/12/2024	BQ	EE

DRAWING NO

Figure 9-17

SCALE	PAPER SIZE	DATUM	PROJECTION
1:600,000	A4	WGS 84	UTM 29N

9.6 Likely Significant Effects and Associated Mitigation Measures

9.6.1 Do Nothing Scenario

The 'do nothing' scenario is a consideration of the baseline if the Project was not developed. This section therefore predicts the future baseline scenario for the benthic ecology study area in the absence of the Offshore Site.

The future benthic ecology environment is likely to experience long term changes as a result of a combination of climatic (e.g. rising sea temperatures) and non-climatic factors (e.g. fishing pressure), which may interact and influence responses to climate change (Moore and Smale, 2020).

In the long term, climate change is predicted to result in increased sea temperatures, changed ocean chemistry, sea-level rise, changed salinities and oceanographic patterns and an increased frequency of extreme events including storms and heatwaves (Hughes *et al.*, 2018). The biological environment will be affected by these changes in the physical environment. Indirect effects of climate change may also arise through changes in habitat provision, species distribution, predator-prey relationships, physiological responses, amongst others.

The predicted rise in sea temperatures may result in an increased abundance of warm-water species and a decline in cold-water species, with associated shifts in abundances and species composition (Moore and Smale, 2020). An example includes the increase in warmer-water kelp species *Laminaria ochroleuca* in the Western English Channel which now competes with *L. hyperborea* (Smale *et al.*, 2015).

There is great uncertainty surrounding the effect of climate change on the environment, namely due to uncertainty in the modelled predictions used to describe and define the changing climate; uncertainty around the response of the physical, biological and socio-economic environment to changes in climate variables; and difficulties in attributing changes in the physical, biological and socio-economic environment to climate change. Based on the best scientific evidence available at the time of this report, the future baseline for benthic ecology is likely to change in response to direct and indirect pressures associated with climate change (Moore and Smale, 2020).

9.6.2 Quantification of Effects

9.6.2.1 Direct Temporary and Long-Term Offshore Site Footprint

The design parameters for the direct physical footprint on benthic ecology is summarised in Table 9-14 for temporary and long-term effects. The temporary effect is associated with temporary (i.e. less than one year in duration) one-off disturbances which will occur during seabed preparation and construction activities and are not predicted to fundamentally change the substrate type in the long term and recoverability is expected. The long-term effects are those associated with the installed infrastructure where there is a fundamental change to the seabed substrate. In the case of long-term footprint, it is worth noting that this will occur within the boundary of the temporary footprint, so there will be physical overlap between the two. The proportion of the direct footprint for the temporary and long-term effects are presented in Table 9-15.

Table 9-14 Overview of Offshore Site footprint on the seabed

Infrastructure/Activity Type	Description	Temporary seabed footprint (km^2)	Long term/permanent seabed footprint (km^2)	Assumptions
OAA				
WTGs and OSS	Stonebed placement for WTG and OSS (GBS foundations)	-	0.118	All 30 WTGs and 1 OSS GBS foundations (31 total) will require stonebeds. The total area of rock for these stonebeds is 117,604 m^2.
Dredging	Dredging of seabed sediment within the footprint of the stonebeds (captured above). The temporary footprint associated with the disposal of dredged material at two disposal sites (104,071 m^2) - covered in Section 9.6.2.4.1	0.118 -	-	Dredging of seabed sediment will be within the footprint of the stonebeds captured above (i.e., 117,604 m^2). Note: Dredge disposal considered temporary when affecting sediment habitat but long term when affecting rocky habitat (as results in change in substrate type).
Jack up operations	WTIV jack up operations where stonebed is not required at 20 locations. Stonebed placement for WTIV jack up operations at 10 WTG locations and 1 OSS location.	0.029	0.110	The temporary seabed footprint is associated with the jack up operations where stonebeds are not required (e.g., 20 locations). There will be four WTIV feet per vessel (728 m^2 footprint) with two jacking events at each WTG, resulting in a WTIV temporary footprint of 1,456 m^2. Therefore 20 * 1,456 = 29,120 m^2. The long-term footprint is associated with the placement of stonebeds for WTIV jack up operations which will be required at 11 locations (10 WTGs and 1 OSS) resulting in a total area of rock required of 110,187 m^2.

Infrastructure/Activity Type	Description	Temporary seabed footprint (km^2)	Long term/permanent seabed footprint (km^2)	Assumptions
IAC	Installation of up to 73 km of IACs. The assessment has assumed 100% surface lay with cable protection (e.g., rock berm).	-	1.282	Based on the total area of the cable protection assuming 100% of the IACs requiring rock berm resulting in an area of 1,282,082 m^2. Note: assuming full length of IAC is rock protected, any temporary disturbance associated with IAC installation is assumed to occur within the long-term footprint and therefore has been omitted to avoid double counting.
OAA Total Footprint		0.147	1.51	
OECC				
OEC	Installation of up to 63.5 km for the OEC. The assessment has assumed 78.5% burial (e.g., via jet trenching) with a target depth of 1.0 m and 21.5% surface lay with cable protection (e.g., cast iron shell, rock placement, concrete mattresses, rock bags and/or grout bags).	0.996	0.164	Based on burial via trenching for 49.8 km of the cable route with a 20 m wide temporary disturbance corridor associated with trenching. The 20 m corridor includes temporary footprint from PLGR/Boulder Clearance and UXO clearance. Total seabed temporary disturbance of 996,950 m^2. Where cable is surface laid with cable protection, the footprint of the long-term cable protection will be up to 164,473 m^2.
Landfall	HDD exit pit (dredged)	0.002	-	Calculation based on one exit pit with the dimensions 50 m width, 2 m height and 20 m length. Therefore, the total footprint for one HDD exit pit is 50 m x 20 m = 1,000 m^2. The area of disturbance due to sidecasting of dredged material will be 1,000 m^2.
OECC Total Footprint		0.999	0.164	
Overall Offshore Site Total Footprint (excluding sediment disposal)		1.146	1.674	

Table 9-15 Proportion of the temporary and long-term footprint across the OAA and OECC

Project area	Total Area (km^2)	Temporary footprint (km^2)	Temporary footprint (%)	Long-term footprint (km^2)	Long-term footprint (%)
OAA	37.3	0.291	0.08	1.510	4.05
OECC	72.8	0.999	1.37	0.164	0.23
Offshore Site Total	110.1	1.03	0.93	1.674	1.52

9.6.2.2 Quantification of Direct Effects to Reef Habitat

Within the OAA, there is approximately 21.1 km^2 of reef habitat comprising bedrock and medium stony reefs, bedrock reef, low stony reef and medium stony reef. Given the OAA has an area of 37.3 km^2, the area of reef represents ~56.5% of the OAA. For the OECC, there is 9.2 km^2 of reef habitat comprising bedrock and medium stony reef, bedrock reef, low stony reef, medium and low stony reefs and medium stony reef habitat. Given the OECC has an area of 72.8 km^2, the area of reef represents ~12.6% of the OECC. Overall, there is approximately 30.3 km^2 of reef habitat present in the Offshore Site (27.5%).

While the reef habitats observed across the Offshore Site met the qualifying criteria of Annex I reefs being a complex of bedrock reef and low and medium stony reefs, there is no overlap with the boundaries of a designated site (e.g. SAC) and therefore these reef features are not protected as a qualifying interest of a protected site designated under the EU Habitats Directive.

Table 9-16 Quantification of the area (km^2) of reef habitat across the Offshore Site

Project area	Area (km^2)	Area of Bedrock and Medium Stony Reef (km^2)	Area of Bedrock Reef (km^2)	Area of Stony Reef (Medium) (km^2)	Area of Stony Reef (Low) (km^2)	Area of Medium & Low Stony Reef (km^2)	Total Area of Reef habitat (km^2)
OAA	37.3	10.5	10.6	0.02	0.001	N/A	21.1
OECC	72.8	4.12	3.01	1.17	0.02	0.88	9.2
Offshore Site (Total)	110.1	14.62	13.61	1.19	0.021	0.88	30.3

Table 9-17 Quantification of the temporary and long-term habitat disturbance footprint (km^2) on reef habitat

Project area	Total Area of Reef habitat (km^2)	Temporary habitat disturbance footprint (km^2)	Long term habitat disturbance footprint (km^2)	Area of Reef Affected Temporarily		Area of Reef Affected Long-Term	
				km^2	%	km^2	%
OAA	21.1	0.291	1.510	0.01	0.06	0.47	2.2
OECC	9.2	0.999	0.164	0.02	0.2	0.11	1.2
Offshore Site (Total)	30.3	1.03	1.674	0.03	0.1	0.58	1.9

9.6.2.3 Quantification of Effects to Annex I Reef in Regional Context

The total extent of reef habitat affected by the proposed activities in the Offshore Site has been compared against the extent of protected reef features within SACs across the benthic ecology study area (i.e. within 15 km). It should be noted that the Offshore Site does not overlap with any European site and therefore the reef features within European sites will not be affected by the Project activities. The comparison helps to put into context the amount of reef affected within the Offshore Site compared to the unaffected protected reef in nearby European sites and is intended to aid discussion when assessing the effects on the reef ecological function. It is worth noting that there are also known significant rocky outcrops along the coastline out with designated SACs and the project area that have potential to meet the criterion of Annex I reef. However here, we only compare surveyed / confirmed reef presence in Offshore Sites with confirmed / surveyed reef presence in the SAC.

A conservative approach has been taken in the quantification of temporary and long-term effects on the reef habitat within the Offshore Site. It should be noted the actual spatial extent will be smaller in scale. Furthermore, it should be noted that reef habitat is widespread in the region. The proportion of reef habitat that would be directly affected in comparison to the protected Annex I reef in European sites within the 15 km study area (see Figure 9-13) is demonstrated in Table 9-18.

Table 9-18 A quantification of the temporary and long-term effects to reef habitat within the Offshore Site in comparison with protected reef habitat in regional European sites (i.e. Annex I Reef) adjacent to the benthic ecology study area.

Regional extent of protected Annex I Reefs (European Sites) (km^2)*	Proportion of reef habitat temporarily affected (within Project) versus the area of regional protected Annex I Reefs [European Sites] not affected (outwith Project) (%)	Proportion reef habitat long-term affected (within Project) versus the area of regional protected Annex I Reefs [European Sites] not affected (outwith Project) (%)
215.55	0.016 %	0.27 %
*The total protected reef in SACs located within the 15 km radius representing the benthic ecology study area = 215.55 km^2: - Inishmore Island SAC – 63.3 km^2; - Carrowmore Point to Spanish Islands SAC – 28.92 km^2; - Carrowmore Dunes SAC – 2.11 km^2; - Kilkee Reefs SAC – 23.91 km^2; - Kilkieran Bay and Islands SAC and MPA – 90.84 km^2; - Connemara Bog Complex SAC – 0.06 km^2; - Inishmaan Island SAC – 0.70 km^2; and - Slyne Head Peninsula SAC - 5.7 km^2.		
Sources: NPWS, 2012, 2014a-e, 2015a-c ***NB** there is no overlap or potential effects from the Project on protected Annex I Reefs within designated sites and this comparison is only to provide context with the area affected in relation to the wider extent of Annex I reef habitat within European Sites in the region.*		

9.6.2.4 Quantification of Sediment Deposition (Smothering)

The quantification of sediment depositing (smothering) has been undertaken within Chapter 7: Marine Physical and Coastal Processes and used to inform the assessment of sediment deposition on benthic receptors. Sediment deposition will result from the following construction (including pre-construction) activities:

- Preparatory work from PLGR and boulder / UXO clearance (previously covered under OEC temporary disturbance corridor of 20 m);
- Seabed preparatory works including dredging and/or use of CFE in OAA; and
- Construction activities within the OECC including the installation of the OEC which will be buried via jet trenching and surface laid with cable protection.
- A summary of the predicted modelling outputs (extracted from Chapter 7: Marine Physical and Coastal Processes) that are used in the assessment of the benthic community are included in Table 9-19.
- The modelling outputs and discussion on deposition in this EIA are focussed primarily on the deposition of more coarse sands and gravel material which will fall out of suspension closer to the ejection point and therefore have the higher potential to cause a smothering effect.

Table 9-19 Quantification of sediment deposition assumptions used for Benthic Ecology Assessment (based on Section 7.6.3.1 of Chapter 7: Marine Physical and Coastal Processes)

Location/ Activity	Scenario	Deposition thickness (m)	Dispersal distance (m)	Sedimentation area (km^2)
OAA Seabed Clearance	TSHD - Uniform deposition over 100% disposal area.	1.44	-	0.1
	CFE deposition of very coarse sand at 5 m height above seabed (current speed 0.2 m/s).	1.62		0.05
	CFE deposition (V. coarse sand) at 5 m height above seabed (current speed 0.8 m/s).	0.40	-	0.21
OAA - IACs trenching using CFE	IAC trenching (CFE) very coarse sand dispersal 1 m height (current speed 0.2 m/s).	0.47	0.7	0.05*1
	IAC trenching (CFE) very coarse sand 1 m height above seabed.	0.12	2.8	0.2*1
OEC trenching using CFE	OEC trenching (CFE) at 1 m above seabed (max) 0.2 m/s current Speed (coarse sand).	0.2 m	1.4	0.09*2
	OEC trenching CFE at 1 m above seabed (max) 0.8 m/s current speed (coarse sand).	0.05	5.7	0.36*2
*1 - Deposition area along IAC based on cable length of 73 km. *2- Deposition area along OEC based on cable length of 63.5 km.				

9.6.2.4.1 Seabed clearance and deposition in OAA

There are two potential methods that have been considered for undertaking the seabed clearance activities within the OAA. These include the Trailer Suction Hopper Dredge (TSHD), with discrete deposition areas using a fall pipe and the alternative using Controlled Flow Excavator (CFE) with sediment resuspension and settlement in areas adjacent to the dredge locations. Each of these scenarios are discussed below.

Scenario 1: Seabed clearance using TSHD and deposition using Fall pipe.

As indicated in Chapter 7: Marine Physical and Coastal Processes, a quantification has been provided on the extent of smothering that may be encountered via the deposition of up to 150,000 m^3 dredged material from TSHD via a fall pipe within discrete areas of the OAA.

There are two discrete areas within the OAA, measuring 25,842 m^2 and 78,229 m^2 respectively, which have been identified as targets for sediment deposition totalling 0.104 km^2. These areas are primarily sedimentary in nature and have been selected due to their relative expected absence of more sensitive or protected habitats or species (i.e. rocky substrata). As the deposition will be undertaken via fall pipe, the assumption used for the effects on benthic ecology is a uniform deposition across the 100% of the selected deposition areas (0.1 km^2), with an average depth of deposition of up to 1.5 m thickness. Therefore, it is considered that this deposition could incur a heavy smothering event across the full deposition area.

9.6.2.4.2 *Sediment Deposition from cable trenching using CFE*

There is anticipated to be sediment deposition from the use of CFE for the cable trenching, for OEC along the OECC. Modelling was also undertaken to account for cable trenching of the IAC (in the OAA), although for benthic assessment, it is assumed that IAC will be surface laid, and rock protected.

In the OAA, the maximum deposition thickness that may to occur as a result of the resettlement of material from CFE is 0.47 m which is primarily associated with coarse sand which is found in this area, will fall out of suspension very close (approximately ~0.7 m) from the dredged area. Based on this assumption, the resulting deposition will have the potential to affect an area of 0.05 km^2. A lower level of deposition of up to 0.12 m may potentially occur over an area of 0.2 km^2.

Along the OECC, the maximum deposition thickness that is anticipated to occur as a result of the resettlement of dredged material is 0.2 m which is primarily associated with coarse sand which will fall out of suspension very close (approximately ~1.4 m) from the dredged area. Based on this assumption, the resulting deposition will have the potential to affect an area of 0.09 km^2. The finer material found within the OECC has potential to disperse over a larger area (up to 0.36 km^2); however, the depth of deposition of fines will be very minor (0.05 m).

9.6.2.4.3 *Sediment disturbance and deposition at nearshore HDD location (exit pit and berm)*

The HDD exit pit will occur at approximately 30 m LAT water depth and will extend across a nearshore area of approximately 0.001 km^2 (50 m length by 20 m width) to a depth of 2 m, resulting in the redistribution of 2,000 m^3 of sediment. The resulting berm is predicted to measure 3.4 m in height and measure 588 m^2 (16.2 m x 36.3 m). The sediment berm is expected to be present for four months and therefore temporary in nature (i.e. less than one year).

9.6.2.5 Quantification of Electromagnetic Fields (EMF)

The Earth has its own geomagnetic field, meaning that EMF effects are always naturally present, and this is known to vary between 25 microtesla (µT) and 65 µT (National Oceanic and Atmospheric Administration (NOAA), 2021a). A reference magnitude of the Earth's magnetic field at a particular location can be estimated from models publicly available (NOAA, 2021b).

The IACs and OEC emit EMFs, which have both Electric (E) components, measured in volts per metre, and magnetic components (known as B-fields), measured in Tesla (T). The direct electric field is encapsulated within the cable structure through electrical insulation and a metallic screen and is not detectable to any significant degree at the cable surface or beyond. The B-field does extend beyond the cable structure and is detectable at varying distances. B-fields are emitted into the marine environment, with the resultant induced Electric (iE) field, causing a highly localised change in EMFs. Cables used for power transmission create a highly localised change in electric and magnetic fields. The voltage, size, and operational characteristics of IACs and OEC differ from one another and between offshore wind energy project designs, and these all influence the level of additional EMF locally.

High-Voltage Alternating Current (HVAC) cables result in a dynamic, low-frequency sinusoidal B-field (Gill and Desender, 2020). The dynamic alternating B-field causes relative motion between the cable's B-field and the surrounding water, which therefore generates a weak iE-field in close proximity to the cable (Taormina *et al.*, 2018). Natural iE-fields also result from sea water interacting with the natural background geomagnetic field, due to relative motion caused by the Earth's rotation, and tidal currents (Gill and Desender, 2020). The strength of iE-fields increases with current flow and both B and iE field strengths decrease with distance from the cable (Taormina *et al.*, 2018). Given the weakness of iE fields, there is no perceptible effect and thus have not been considered further.

EMF B-field strength associated with the IACs and OEC are presented in Table 9-20. As background geomagnetism at the Offshore Site is ca. 50 µT, it is likely that EMF levels are not detectable above background geomagnetism beyond the immediate proximity of the cable.

Table 9-20 EMF B-field levels associated with the IACs and OEC. No cable sheath was incorporated in the modelling to obtain these result

	Inter-Array Cable (IAC)			Offshore Export Cable (OEC)		
Current (A)	814			1218		
Location	At seabed surface		At Cast Iron Shell (CIS) surface	At seabed surface		At Cast Iron Shell (CIS) surface
Burial depth (m)	1.0	2.0	0.0	1.0	2.0	0.0
B-field (µT)	17.7	4.6	30.3	25.3	7.0	48.3

9.6.3 Construction Phase

9.6.3.1 Temporary habitat or species loss / disturbance

There is the potential for the temporary loss or damage to benthic habitats or species as a result of seabed preparation and construction activities within the Offshore Site. The Offshore Site does not overlap with any designated sites. Indirect effects associated with this activity, such as increases in SSC and associated deposition, are discussed separately in Section 9.6.3.3. As quantified in Table 9-14 and Table 9-15, there will be up to 1.146 km^2 of temporary habitat or species loss / disturbance associated with Project activities within the Offshore Site.

Temporary habitat or species loss / disturbance will result from the area of WTIV jack up operations where stonebeds are not required (29,120 m^2) within the OAA, the temporary seabed disturbance associated with burial of 78.5% of the OEC via jet trenching (996,950 m^2) along the OECC and finally the construction of the HDD exit pit and associated sidecast dredging (2,000 m^2) for the Landfall.

The total area of the OAA is 37.3 km^2. The area of temporary habitat disturbance within the OAA will be 0.291 km^2 (Table 9-14), resulting in a temporary footprint on 0.08% of the OAA (Table 9-15). The OECC has a total area of 72.8 km^2. The area of temporary habitat disturbance within the OECC will be 0.999 km^2 (Table 9-14), resulting in a temporary footprint on 1.372% of the OECC (Table 9-15).

As described above the total area of temporary habitat disturbance is 1.03 km^2. Given that the overall area of the Offshore Site is 110.1 km^2, the area of temporary habitat disturbance represents 0.93% of the Offshore Site (Table 9-15).

9.6.3.1.1 *Stony and bedrock reef*

Description of Effect

Within the Offshore Site, habitat resembling Annex I stony and bedrock reef is present across 30.3 km^2 (21.1 km^2 within the OAA and 9.2 km^2 along the OECC). These areas of reef were delineated as high energy infralittoral rock and high and moderate energy circalittoral rock interspersed with circalittoral coarse or mixed sediment which resembled 'low' and 'medium' stony reef. The biotope complexes prevalent vary between seaweed and faunal dominated habitats on wave-exposed rock, including:

- Foliose red seaweeds with dense *Dictyota dichotoma* and/or *Dictyopteris membranacea* on exposed lower infralittoral rock (A3.1161);
- Coralline crusts in surge gullies and scoured infralittoral rock (A3.716);
- *Phakellia ventilabrum* and axinellid sponges on deep, wave-exposed circalittoral rock (A4.121);
- Sponges and anemones on vertical circalittoral bedrock (A4.139);
- *Caryophyllia smithii,* sponges and crustose communities on wave-exposed circalittoral rock (A4.212);
- Faunal and algal crusts on exposed to moderately wave-exposed circalittoral rock (A4.214);
- *Caryophyllia smithii* with faunal and algal crusts on moderately wave-exposed circalittoral rock (A4.2146);
- *Alcyonium digitatum* and faunal crust communities on vertical circalittoral bedrock (A4.215); and
- *Pomatoceros triqueter* with barnacles and bryozoan crusts on unstable circalittoral cobbles and pebbles (A5.141).

While some of the rock habitats observed across the array met the qualifying criteria of Annex I reef, being a complex of bedrock reef and low and medium stony reefs, there is no overlap with the boundaries of a designated site (e.g., SAC) and therefore these reef features are not protected as a qualifying interest of a protected site designated under the EU Habitats Directive. The nearest SACs that include Annex I reef as designated features include the Kilkieran Bay and Islands SAC which is only 1.5 km distance to the OAA. In addition, there are other sites also in close proximity to the EICC such as Inishmore Island SAC and the Carrowmore Point to Spanish Point and Islands SAC that are also designated for reefs. Given the proximity to these sites, it has been taken into account that there is a potential for ecological connectivity between the rocky reef that occurs within the OAA and EICC, particularly with regard to the origin, settlement and colonization of sessile species that have planktonic life phases (i.e., eggs and larvae) as do many seaweeds, bivalve molluscs, cnidarians and echinoderms. Therefore, consideration has been given for the potential temporary impact to reef features in the project area to have a consequential effect to the nearby European Sites designated for Annex I reef.

Temporary habitat or species loss / disturbance will have a likely, temporary adverse effect on stony and bedrock reef. Temporary habitat or species loss / disturbance will result from the area of WTIV jackup operations where stonebeds are not required. It should be noted that the effects on reefs associated with suspended sediments and deposition are discussed separately in section 9.6.3.3, covering dredge disposal in the OAA, the burial of the OEC along the OECC and the HDD exit pit for the Landfall.

It is anticipated that the temporary disturbance may result in some direct mortality of reef epifauna that is directly affected by the activities. It has been considered that such losses could potentially temporarily affect higher trophic levels at a local level by reducing the availability of prey species until recovery and recolonisation occurs, although the effect of this disturbance pathway is expected to be negligible. There will be further temporary disturbance to these habitats during cable installation (although cable installation will mostly be long term/permanent as per Section 9.6.3.2.1); however, this habitat is considered to have a high recoverability to temporary disturbance and re-colonisation of these epifaunal communities on rocky substrata can be expected following temporary disturbance.

Characterisation of Unmitigated Effect

Temporary habitat or species loss / disturbance on stony and bedrock reef will result from the overlap of the temporary habitat disturbance footprint with the stony and bedrock reef habitat. There is ~21.1 km^2 of reef habitat in the OAA (Table 9-16). The temporary habitat disturbance footprint in the OAA on reef habitat is 0.01 km^2 (Table 9-17). Therefore, the area of reef affected by temporary disturbance represents 0.06% of the overall reef habitat in the OAA. For the OECC, there is 9.2 km^2 of reef habitat (Table 9-16). The temporary habitat disturbance footprint in the OECC on reef habitat is 0.02 km^2 (Table 9-17). Therefore, the area of reef affected by temporary disturbance represents only 0.2% of the overall reef habitat in the OECC.

Furthermore, Annex I 'Reefs' are a qualifying interest of several nearby SACs (see Table 9-12), illustrating that reef habitat is widespread in this region. There is 215.55 km^2 of Annex I 'Reefs' within the nearby SACs (Table 9-18). To put this into context, the total area of reef habitat within the Offshore Site is 30.3 km^2. The temporary habitat disturbance footprint for the Offshore Site on reef habitat is 0.03 km^2. Therefore, the area of reef affected by temporary disturbance represents 0.1% of the overall reef habitat in the Offshore Site. In the scale of the wider Annex I 'Reefs', this proportion would be equivalent to 0.016%. To reiterate, the Project does not overlap with any European site and therefore there will no effect on the Annex I 'Reefs' associated with these SACs as a result of temporary habitat loss from construction activities. The purpose of this comparison is to demonstrate that the wider ecological function of reef habitats, within the Offshore Site and on a regional scale, will not be compromised as a result of temporary habitat disturbance.

Overall, the temporary habitat or species loss / disturbance on stony and bedrock reef will be highly localised, spatially limited to the proportion of the temporary habitat disturbance footprint which overlaps the area of stony and bedrock reef as detailed above. The duration of activities will be short-term in nature (up to four years in total); however, the actual duration of when habitat loss / disturbance will occur will be temporary (i.e. days) to brief (i.e. less than a day). The effect will cease following the completion of seabed preparation and installation activities, with an expected high recoverability following disturbance. The overall magnitude of effect is therefore **low**.

Most of the species within the high energy, wave exposed stony and bedrock reef habitats such as faunal and algal crusts produce short-lived larvae resulting in good local recruitment (Stamp *et al.,* 2023). As such, most of these associated characterising flora and fauna such as *Alcyonium digitatum* and red seaweeds are generally considered to have a high resilience and recoverability to temporary disturbance of the substratum (Readman *et al.*, 2023a; Stamp *et al.*, 2023). However, there are some associated fauna such as sponge communities and sea fans which are less resilient (Readman, 2023b, 2023c). In particular, the pink sea fan is listed as vulnerable on the IUCN Red List and is itself associated with other epifaunal species and therefore has biodiversity value (Readman *et al.,* 2023b). Sea fans such as *E. verrucosa* are potentially very slow growing and long-lived, making this species particularly vulnerable to seabed disturbance with very low resilience (Readman *et al.,* 2023b). These species are also a feature of protected Annex I reefs within nearby offshore European sites.

The available information on the larval cycle and recruitment is that larval settlement is generally near the parent colony and has a short planktonic phase (it is noted that records of recruitment have been reported several hundred meters from parent colonies) (Readman 2023b). Therefore, while the connectivity to sea fan populations in neighbouring SACs cannot be ruled out, the extent of connectivity is expected to be very limited. When taking into account the presence of these vulnerable species and the conservation value of these habitats overall, it is considered that the stony and bedrock reef habitats are of **medium** sensitivity to temporary disturbance.

Assessment of Significance Prior to Mitigation

Given the assessment of sensitivity and magnitude as described above, the temporary habitat or species loss / disturbance during construction will have a **slight, negative effect** on stony and bedrock reef habitat which is Not Significant.

Mitigation

- Mitigation by design which includes avoidance where possible of sensitive features. Specifically, the layout of WTGs, OSS, IAC and OEC has been designed to avoid exposed rock as much as possible and known locations of sensitive species such as sea fan (which are largely outside of the OAA area) were avoided.
- Further information provided in Chapter 3: Consideration of Alternatives, including the design decisions (e.g. placement of infrastructure on the seabed) which have been made to mitigate environmental effects. Environmental data has been used to inform these decisions.

Residual Effect Following Mitigation

Given the mitigation by design and consideration of the medium sensitivity of stony and bedrock reef, with consideration of the short-term and intermittent nature of the works limited to discrete areas with good potential for recovery and the added avoidance of rocky outcrops and sensitive species such as sea fans, the magnitude of temporary effects to stony and bedrock reef has been reduced to **negligible** the residual effect is therefore a **not significant, negative** effect which is Not Significant.

Furthermore, given the relatively small proportion of reef habitat affected in the offshore site, and that fact that this is deemed as not significant, it is considered that there would not be an adverse effect on the integrity of qualifying interest of any European site such Annex I reef habitats that it would affect the integrity of the European site through ecological connectivity.

9.6.3.1.2 *Subtidal sands and gravels*

Description of Effect

The results of the benthic survey indicate that the subtidal sands and gravels within the Offshore Site are representative of EUNIS habitats including circalittoral coarse sediment, deep circalittoral coarse sediment, circalittoral fine sand, circalittoral muddy sand, deep circalittoral sand, circalittoral mixed sediments and deep circalittoral mixed sediments. This is reflected in the particle size analysis, in which the sediment composition is predominantly sands and gravels for the Offshore Site. The biotope complexes associated with subtidal sands and gravels include:

- *Protodorvillea kefersteini* and other polychaetes in impoverished circalittoral mixed gravelly sand (A5.143);
- Echinocyamus pusillus, Ophelia borealis and Abra prismatica in circalittoral fine sand (A5.251);
- Medium to very fine sand, 100-120 m, with polychaetes *Spiophanes kroyeri*, *Amphipectene auricoma*, *Myriochele sp.*, *Aricidea wassi* and amphipods *Harpinia antennaria* (A5.253); and
- *Owenia fusiformis* and *Amphiura filiformis* in deep circalittoral sand or muddy sand (A5.272).

Temporary habitat or species loss / disturbance will have a likely, temporary adverse effect on subtidal sands and gravels. Temporary habitat or species loss / disturbance will result from the area of WTIV jackup operations where stonebeds are not required and the dredge disposal in the OAA, the burial of the OEC along the OECC and the HDD exit pit for the Landfall.

Characterisation of Unmitigated Effect

Temporary habitat or species loss / disturbance on subtidal sands and gravels will result from the overlap of the temporary habitat disturbance footprint with the subtidal sands and gravels habitat. As demonstrated in Table 9-21, the Offshore Site overlaps with 42.5 km^2 of subtidal sands and gravels habitat, consisting of 8.2 km^2 in the OAA and 34.4 km^2 in the OECC. The temporary habitat disturbance footprint within the OAA overlapping with subtidal sands and gravels will be 0.13 km^2, which represents 1.65% of the overall subtidal sands and gravels habitat within the OAA (Table 9-21). For the OECC, the temporary habitat disturbance is 0.58 km^2, representing 1.69% of the subtidal sands and gravels habitat within the OECC (Table 9-21). Overall, the temporary habitat disturbance associated with the Offshore Site on subtidal sands and gravels habitat will only affect 1.68% of the total subtidal sands and gravels habitat available (Table 9-21). Furthermore, subtidal sands and gravels habitat is widespread in the region, as illustrated through the INFOMAR (Figure 9-7; Figure 9-8) and EUNIS (Figure 9-9) datasets. Therefore, the temporary habitat disturbance is considered to be highly localised and will not affect the ecosystem functioning of this habitat. The duration of activities will be short-term in nature (i.e. four months pre-construction activities and 18-months construction activities); however, the actual duration of when habitat loss / disturbance will occur will be temporary (i.e. days) to brief (i.e. less than a day). The effect will cease following the completion of seabed preparation and installation activities, with an expected high recoverability following disturbance. The magnitude of effect is therefore **low**.

All subtidal sands and gravels are considered to have low sensitivity to abrasion / disturbance of the surface of the substratum or seabed and penetration or disturbance of the substratum subsurface, with high resilience and medium to low resistance (Tillin and Watson, 2023, 2024), except for the sediment biotope '*Owenia fusiformis* and *Amphiura filiformis* in deep circalittoral sand or muddy sand' which has a medium sensitivity, resilience and low resistance (De-Bastos, 2023) which was present at three grab stations along the OECC (Ocean Ecology, 2024). Overall, subtidal sands and gravels are assessed as **Low** sensitivity to temporary disturbance.

Table 9-21 Quantification of the temporary habitat disturbance footprint on subtidal sands and gravels habitat

Project Area	Total Area of subtidal sands and gravels habitat (km^2)	Temporary habitat disturbance footprint on subtidal sands and gravels habitat	
		km^2	%
OAA	8.2	0.13	1.65
OECC	34.4	0.58	1.69
Offshore Site (Total)	42.5	0.71	1.68

Assessment of Significance Prior to Mitigation

Given the assessment of sensitivity and magnitude as described above, the temporary habitat or species loss / disturbance during construction will have a **slight, negative** effect on subtidal sands and gravels habitats which is Not Significant.

Mitigation

- The first choice of cable protection will be burial. The sufficient burial of cables in subtidal sands and muds is anticipated to be achieved and therefore will mitigate against the requirement for long-term placement of rock protection.

Residual Effect Following Mitigation

Given the mitigation by design and consideration of the low sensitivity of subtidal sands and gravels, with consideration of the short-term, intermittent and localised nature of the works, the residual effect will be **a likely, temporary, slight negative effect** which is **Not Significant**.

9.6.3.1.3 *Subtidal muds*

Description of Effect

The benthic survey found that subtidal muds were less prevalent throughout the Offshore Site as a whole, with the highest subtidal mud concentrations along the OECC and smaller proportions observed within the OAA. The subtidal muds habitats were classified as circalittoral sandy mud and deep circalittoral mud, with the biotope '*Myrtea spinifera* and polychaetes in offshore circalittoral sandy mud' (A5.377).

Temporary habitat or species loss / disturbance will have a likely, temporary adverse effect on muds.

Temporary habitat or species loss / disturbance will result from the burial of the OEC along the OECC and the HDD exit pit for the Landfall.

Characterisation of Unmitigated Effect

Temporary habitat or species loss / disturbance on muds will result from the overlap of the temporary habitat disturbance footprint with the muds habitat, which will only occur along the OECC where muds are present. As demonstrated in Table 9-22, the OECC overlaps with 20.2 km^2 of muds habitat. The temporary habitat disturbance footprint overlapping with muds will be 0.41 km^2, which represents ~ 2 % of the overall mud habitat within the OECC and the Offshore Site (Table 9-22). Furthermore, muds habitat is widespread in the region, as illustrated through the INFOMAR (Figure 9-7; Figure 9-8) and EUNIS (Figure 9-9) datasets. Therefore, the temporary habitat disturbance is considered to be highly localised and will not affect the overall ecological functioning of the mud habitat. The duration of activities will be short-term in nature (i.e. four months pre-construction activities and 18-months construction activities); however, the actual duration of when habitat loss / disturbance will occur will be temporary (i.e. days) to brief (i.e. less than a day). The effect will cease following the completion of seabed preparation and installation activities, with an expected high recoverability following disturbance. The magnitude of effect is therefore **low**.

The subtidal mud biotope '*Myrtea spinifera* and polychaetes in offshore circalittoral sandy mud' is considered to have low sensitivity to abrasion / disturbance of the surface and subsurface, with high resilience and medium resistance (De-Bastos, 2016). There is medium sensitivity and resilience to removal Overall, mud habitats are assessed as of **medium** sensitivity.

Table 9-22 Quantification of the temporary habitat disturbance footprint on muds habitat

Project Area	Total Area of muds habitat (km^2)	Temporary habitat disturbance footprint on muds habitat	
		km^2	%
OAA	0	0	0
OECC	20.2	0.41	2.0
Offshore Site (Total)	20.2	0.41	2.0

Assessment of Significance Prior to Mitigation

Given the assessment of sensitivity and magnitude as described above, the temporary habitat or species loss / disturbance during construction will have a **likely, temporary slight, negative** effect on subtidal muds which is Not Significant.

Mitigation

- The first choice of cable protection will be burial. The sufficient burial of cables in subtidal muds is anticipated to be achieved and therefore will mitigate against the requirement for long-term placement of rock protection.

Residual Effect Following Mitigation

Given the mitigation by design and consideration of the medium sensitivity of subtidal sands, with consideration of the short-term, intermittent and localised nature of the works, the residual effect will be a **likely, temporary, slight, negative** effect which is Not Significant.

9.6.3.1.4 *Maerl beds*

Description of Effect

Maerl beds were identified at two locations within the OAA and classified as the habitat complexes A5.51 'Maerl beds' and A5.511 '*Phymatolithon calcareum* maerl beds in infralittoral clean gravel or coarse sand', located ~ 6.5 km from the closest known maerl beds occurring at the Kilkieran Bay and Islands SAC. The maerl observed consisted of pink encrusting algae, hedgehog maerl, maerl nodules and maerl gravel (Ocean Ecology Limited, 2024; see Appendix 9-1). As these habitats are present in the OAA, consideration has been given for these habitats to be directly disturbed by the construction activities.

Characterisation of Unmitigated Effect

Following the identification of maerl beds in the environmental survey data, the Project has taken measures to design around the maerl to avoid direct disturbance (see Figure 9-10). In particular, the citing of IACs and associated rock, foundation installation and placement of Jack up spud cans will all avoid areas of known maerl. The nearest infrastructure (IACs and associated rock protection) will be approximately 85 m away. Therefore, given there will be no direct temporary effect on maerl beds, the magnitude of effect on from temporary disturbance is considered to be **negligible.**

Maerl beds have slow growth rates and are considered to have 'very low recoverability' and 'low recovery potential' respectively (FeAST, 2023). Given that maerl beds have a very low capacity to accommodate habitat loss / disturbance, are vulnerable due to their low recoverability, and are of high (international) importance or rarity as listed on the OSPAR list of threatened and/or endangered species and habitats, and as an Annex V species under the EU Habitats Directive, their sensitivity is **high**.

Assessment of significance Prior to Mitigation

Given the assessment of sensitivity and magnitude as described above, the temporary habitat or species loss / disturbance during construction will be a **not significant negative** effect which is Not Significant.

Mitigation

As described above, mitigation by design has been incorporated through cable-routeing to avoid sensitive features, especially the identified maerl beds within the OAA.

Residual Effect Following Mitigation

With designed in mitigation to avoid any temporary effects to maerl beds through appropriate siting (avoiding maerl), the overall residual effect being an **imperceptible negative effect** which is Not Significant.

9.6.3.2 Long-term loss or damage to benthic habitats and species

There is the potential for the long-term loss or damage to benthic habitats or species as a result of the placement of hard substrate and infrastructure (e.g. stonebeds, rock protection associated with IACs and

OEC) onto the seabed within the Offshore Site. As quantified in Table 9-14 and Table 9-15, there will be up to 1.674 km^2 of long-term habitat loss or disturbance associated with Project activities within the Offshore Site.

Long-term loss or damage will result from the area of stonebed placement for WTGs and the OSS (117,604 m^2), the placement of stonebeds at 11 locations (10 WTGs and 1 OSS) for WTIV jack up operations (110,187 m^2), the total area of cable protection (i.e. rock berm) for the IACs (assuming 100% of the IACs requiring rock berm; 1,282,082 m^2) and finally from the 21.5% of the OEC which will be surface laid with cable protection (164,473 m^2) (Table 9-14). Given that the area of the Offshore Site is 110.1 km^2, the area of long-term loss or damage represents 1.52% of the Offshore Site (Table 9-15).

It should be noted that this disturbance area accounts for the area that will be directly disturbed in the long term but does not include the indirect seabed disturbance associated with deposited material from the excavation activities which is discussed further in section 9.6.3.3. The potential effects are discussed below for each of the key benthic receptors within the long-term disturbance footprint.

9.6.3.2.1 *Stony and bedrock reef*

Description of Effect

As described in section 9.6.3.1.1, habitat resembling Annex I stony and bedrock reef is present across 30.3 km^2 (21.1 km^2 within the OAA and 9.2 km^2 along the OECC). The biotope complexes prevalent vary between seaweed and faunal dominated habitats on wave-exposed rock.

While the rock habitats observed across the array met the qualifying criteria of Annex I reefs being a complex of bedrock reef and low and medium stony reefs, there is no overlap with the boundaries of a designated site (e.g. SAC) and therefore these reef features are not protected as a qualifying interest of a protected site designated under the EU Habitats Directive.

Long-term loss or damage to benthic habitats and species will have a likely, long-term adverse effect on stony and bedrock reef. Long-term loss or damage will result from the placement of hard substrate and infrastructure (e.g. stonebeds, rock protection associated with IACs and OEC) onto the seabed. It is anticipated that long-term loss or damage will result in some direct losses to epifaunal communities, which in turn could affect higher trophic levels at a local level by reducing the availability of prey species in these areas until recovery and recolonisation occurs (see Chapter 10: Fish and Shellfish Ecology and Chapter 12: Marine Mammals and Other Megafauna), which is dependent on the sensitivity of the reef biotopes as described in the characterisation of unmitigated effect.

The nearest SACs that include Annex I reef as designated features include the Kilkieran Bay and Islands SAC which is only 1.5 km distance to the OAA. In addition, there are other sites also in close proximity to the EICC such as Inishmore Island SAC and the Carrowmore Point to Spanish Point and Islands SAC that are also designated for reefs. Given the proximity to these sites, it has been taken into account that there is a potential of some ecological connectivity between the rocky reef communities within the OAA and EICC, particularly with regard to the origin, settlement and colonization of sessile species that have planktonic life phases (i.e. eggs and larvae) as do many seaweeds, bivalve molluscs, cnidarians and echinoderms. Therefore, consideration has been given for the potential long term/permanent impact to reef features in the project area to have a knock-on effect to the nearby European Sites designated for Annex I reef.

Characterisation of Unmitigated Effect

Long-term habitat loss or damage on stony and bedrock reef will result from the overlap of the long-term habitat disturbance footprint with the stony and bedrock reef habitat. There is ~ 21.1 km^2 of reef habitat in the OAA (Table 9-16). The long-term habitat disturbance footprint in the OAA on reef habitat is 0.47 km^2 (Table 9-17). Therefore, the area of reef affected by long-term habitat loss or damage represents 2.2%

of the overall reef habitat in the OAA. For the OECC, there is 9.2 km^2 of reef habitat (Table 9-16). The long-term habitat disturbance footprint in the OECC on reef habitat is 0.11 km^2 (Table 9-17). Therefore, the area of reef affected by long-term habitat loss or damage represents 1.2% of the overall reef habitat in the OECC.

Furthermore, Annex I 'Reefs' are a qualifying interest of several nearby SACs (see Table 9-12), illustrating that reef habitat is widespread in this region. There is 215.55 km^2 of Annex I 'Reefs' within the nearby SACs (Table 9-18). In addition, there are known to be further areas of similar reef habitat that hasn't been classified or quantified to date in the surrounding area. To put this into context, the total area of reef habitat within the Offshore Site is 30.3 km^2. The long-term habitat disturbance footprint for the Offshore Site on reef habitat is 0.58 km^2. Therefore, the area of reef affected by long-term disturbance represents 1.9% of the overall reef habitat in the Offshore Site. In the scale of the wider Annex I 'Reefs', this proportion would be equivalent to 0.27%. To reiterate, the Project does not overlap with any European site and therefore there will no effect on the Annex I 'Reefs' associated with these SACs as a result of Project activities. The purpose of this comparison is to demonstrate that the wider ecological function of reef habitats, within the Offshore Site and on a regional scale, will not be compromised as a result of long-term habitat loss or damage.

Overall, the long-term habitat loss or damage to stony and bedrock reef will be highly localised, spatially limited to the proportion of the long-term habitat disturbance footprint which overlaps the area of stony and bedrock reef as detailed above. Nevertheless, the duration is permanent (i.e. lasting > 60 years in the case of rock beds for turbine foundations, and jack-up vessel pads and installed rock berms for cable protection). Given the relatively low proportion of reef habitat affected by long-term habitat loss or damage compared with the wider availability of reef habitat in the region, it is predicted that the ecological function of the stony and bedrock reef habitat would not be compromised. Therefore, the magnitude is considered to be **low**.

Most of the species within the high energy, wave exposed stony and bedrock reef habitats such as faunal and algal crusts produce short-lived larvae resulting in good local recruitment (Stamp *et al.,* 2023). Due to the exposed nature of the rocky habitats present, most of these associated characterising flora and fauna including *Alcyonium digitatum* and red seaweeds are generally considered to have a high resilience and recoverability (e.g. recovery within 2 years) (Readman *et al.*, 2023a; Stamp *et al.*, 2023). Nonetheless these species are considered to have high sensitivity to a change in substrate type. While it can be assumed that the rock placement and GBS foundations that makes up the majority of the seabed footprint will in some way provide attachment surfaces for recolonisation (see section 9.6.4.5), it cannot be assumed that the newly formed artificial surface will fully recolonise to the same degree and offer the same quality of habitat. Furthermore, there are some associated fauna such as sponge communities and sea fans which are less resilient and likely take longer to recolonise (Readman, 2023b, 2023c). In particular, the pink sea fan is listed as vulnerable on the IUCN Red List and is itself associated with other epifaunal species and therefore has biodiversity value (Readman *et al.,* 2023b). Sea fans such as *E. verrucosa* are potentially very slow growing and long-lived, making this species particularly vulnerable to seabed disturbance with very low resilience (Readman *et al.,* 2023b). These sea fan species are also a feature of protected Annex I reefs within nearby offshore European sites. The available information on the larval cycle and recruitment is that larval settlement is generally near the parent colony and has a short planktonic phase (it is noted that records of recruitment have been reported several hundred meters from parent colonies) (Readman 2023b). Therefore, while the connectivity to sea fan populations in neighbouring SACs cannot be ruled out, the extent of connectivity is expected to be very limited. When considering the presence of these vulnerable species and the conservation value of these habitats overall, it is considered that the stony and bedrock reef habitats are of **high** sensitivity.

Assessment of Significance Prior to Mitigation

Given the assessment of sensitivity and magnitude as described above, the long-term loss or damage during construction will have a **moderate, negative** effect on stony and bedrock reef which is Not Significant.

Mitigation

- Mitigation by design which includes avoidance where possible of sensitive features. Specifically, the layout of WTGs, OSS, IAC and OEC has been designed to avoid exposed rock as much as possible and known locations of sensitive species such as sea fan (which are largely outside of the OAA area) were avoided.
- Further information provided in Chapter 3: Consideration of Alternatives, including the design decisions (e.g. placement of infrastructure on the seabed) which have been made to mitigate environmental effects. Environmental data has been used to inform these decisions.

Residual Effect Following Mitigation

An important aspect that has been taken into consideration when determining the significance of the long-term effect is whether the effect is likely to incur a change in biological diversity or community composition that may affect ecosystem function and higher trophic levels including birds, fish and mammals. When considering the extent of the reef habitat as a whole, its ecological function and general character is expected to remain in line with the baseline conditions and therefore there will be no effect on ecosystem function.

Given the mitigation by design and consideration of the high sensitivity of stony and bedrock reef, with the permanent nature of the effect occurring at a low frequency (once), the residual effect will be a **likely, permanent, moderate negative** effect and therefore is assessed to be Not Significant given that the most sensitive reef features such as prominent rocky outcrops and sea fans will be avoided and that the area of reef that is affected is relatively small compared to the surrounding unaffected reef area.

Furthermore, given the relatively small proportion of reef habitat affected in the offshore site it is considered that there would not be an adverse effect on the integrity of qualifying interests of any European site such as Annex I reef habitats through ecological connectivity.

9.6.3.2.2 *Subtidal sands and gravels*

Description of Effect

As described in section 9.6.3.1.2, there are a variety of subtidal sands and gravels present within the Offshore Site including circalittoral coarse sediment, deep circalittoral coarse sediment, circalittoral fine sand, circalittoral muddy sand, deep circalittoral sand, circalittoral mixed sediments and deep circalittoral mixed sediments. The biotope complexes associated with subtidal sands and gravels include:

- *Protodorvillea kefersteini* and other polychaetes in impoverished circalittoral mixed gravelly sand (A5.143);
- Echinocyamus pusillus, Ophelia borealis and Abra prismatica in circalittoral fine sand (A5.251);
- Medium to very fine sand, 100-120 m, with polychaetes *Spiophanes kroyeri*, *Amphipectene auricoma*, *Myriochele sp.*, *Aricidea wassi* and amphipods *Harpinia antennaria* (A5.253); and
- *Owenia fusiformis* and *Amphiura filiformis* in deep circalittoral sand or muddy sand (A5.272).

Characterisation of Unmitigated Effect

Long-term habitat loss or damage on subtidal sands and gravels will result from the overlap of the long-term habitat disturbance footprint with the subtidal sands and gravels habitat. As demonstrated in Table 9-23, the Offshore Site overlaps with 42.5 km^2 of subtidal sands and gravels habitat, consisting of 8.2 km^2 in the OAA and 34.4 km^2 in the OECC. The long-term habitat disturbance overlapping with subtidal sands and gravels will be 0.85 km^2, which represents 10.5% of the subtidal sands and gravels habitat within the OAA (Table 9-23). For the OECC, the long-term habitat disturbance is 0.15 km^2, representing 0.42% of the subtidal sands and gravels habitat within the OECC (Table 9-23). Overall, the long-term habitat disturbance associated with the Offshore Site on subtidal sands and gravels habitat will only affect 2.3% of the total subtidal sands and gravels habitat available (Table 9-23). Furthermore, subtidal sands and gravels habitat is widespread in the region, as illustrated through the INFOMAR (Figure 9-7; Figure 9-8) and EUNIS (Figure 9-9) datasets. Therefore, the long-term habitat disturbance is considered to be highly localised and will not affect the ecosystem functioning of this habitat. Nevertheless, the duration is considered to permanent (i.e. lasting > sixty years in the case of installed rock protection). Given the relatively low proportion of subtidal sands and gravels habitat affected by long-term habitat loss or damage compared with the wider availability of subtidal sands and gravels habitat in the region, it is predicted that the ecological function of the subtidal sands and gravels habitat would not be compromised. Therefore, the magnitude is considered to be **low**.

All subtidal sands and gravels are considered to have high sensitivity to physical change to another seabed type, which is the primary impact mechanism when introducing hard substrata to areas dominated by sediments. As such the sediment habitats in the immediate vicinity of the disturbance will be lost and replaced with anthropogenic substrata (further discussed under Section 9.6.4.5). This disturbance will result in no opportunity for recovery of the affected area to pre-disturbance conditions. Therefore, overall, subtidal sands and gravels are assessed as **high** sensitivity to long term loss or damage during construction.

Table 9-23 Quantification of the long-term habitat disturbance footprint on subtidal sands and gravels habitat

Project Area	Total Area of subtidal sands and gravels habitat (km^2)	Long-term habitat disturbance footprint on subtidal sands and gravels habitat	
		km^2	%
OAA	8.2	0.85	10.46
OECC	34.4	0.15	0.42
Offshore Site (Total)	42.5	0.99	2.35

Assessment of Significance Prior to Mitigation

Given the assessment of sensitivity and magnitude as described above, the long-term loss or damage during construction will have a **moderate, negative** effect on subtidal sands and gravels which is Not Significant.

Mitigation

- The first choice of cable protection along the OECC will be burial. The sufficient burial of cable in subtidal sands and gravels habitat is anticipated to be achieved along the majority of the OECC and therefore will mitigate against (or significantly reduce) the requirement for long-term placement of rock protection in the sands and gravels habitat.
- The project is also looking at ways to reduce the volume of rock berms for cable protection within the OAA, although details will be subject to further studies and commitments to these cannot be made at the time of writing.

As there is some uncertainty on the proposed mitigation, these mitigations to minimise long term impacts have not been considered to reduce the level effect that was originally assessed.

Residual Effect Following Mitigation

Given the consideration of the high sensitivity of subtidal sands and gravels, low magnitude and consideration of the wider sands and gravels habitat in the region which will result in no significant effects on the overall ecological function of the habitat, the residual effect will be a **moderate, negative** effect which is Not Significant.

9.6.3.2.3 *Subtidal muds*

Description of Effect

The benthic survey found that subtidal muds were less prevalent throughout the Offshore Site as a whole, with the highest subtidal mud concentrations along the OECC and smaller proportions observed in the outer region to the south of the OAA (the latter of which will not be directly affected by the construction activities). The subtidal muds habitats were classified as circalittoral sandy mud and deep circalittoral mud, with the biotope '*Myrtea spinifera* and polychaetes in offshore circalittoral sandy mud' (A5.377).

Characterisation of Unmitigated Effect

Long-term habitat loss or damage on muds will result from the overlap of the long-term habitat disturbance footprint with the muds habitat, which will only occur along the OECC where muds are predominantly present. As demonstrated in

Table 9-24, the OECC overlaps with 20.2 km^2 of muds habitat. The long-term habitat disturbance footprint overlapping with muds will be 0.01 km^2, which represents 0.05% of the mud habitat within the OECC and subsequently the Offshore Site. Furthermore, muds habitat is widespread in the region, as illustrated through the INFOMAR (Figure 9-7; Figure 9-8) and EUNIS (Figure 9-9) datasets. Therefore, the long-term habitat disturbance is considered to be highly localised and will not affect the ecosystem functioning of this habitat. Nevertheless, the duration is permanent (i.e. lasting >60 years in the case of installed rock protection). Given the relatively low proportion of muds habitat affected by long-term habitat loss or damage compared with the wider availability of muds habitat in the region, it is predicted that the ecological function of the mud habitat will not be compromised. It should be noted however, that due to designed in mitigation and a focus towards cable retrenching and burial along the OEC, the actual area of muds likely to be affected by the permanent installation of rock is expected to be very small and limited to discrete areas along the OEC in areas where target burial depth cannot be met (see Table 9-24) Therefore, the magnitude is considered to be **negligible**.

As with subtidal sands and gravels, the subtidal mud biotopes such as '*Myrtea spinifera* and polychaetes in offshore circalittoral sandy mud' are considered to have high sensitivity to physical change to another seabed type, which is the primary impact mechanism when introducing hard substrata to areas dominated by sediments. As such the mud habitats in the immediate vicinity of the disturbance will be lost and replaced with anthropogenic substrata (further discussed under Section 9.6.4.5). This disturbance will result in no opportunity for recovery of the affected area to pre-disturbance conditions. Therefore, overall, subtidal muds are assessed as **high** sensitivity to potential long term disturbance during construction.

Table 9-24 Quantification of the long-term habitat disturbance footprint on muds habitat

Project Area	Total Area of muds habitat (km^2)	Long-term habitat disturbance footprint on muds habitat	
		km^2	%
OAA	0	0	0
OECC	20.2	0.01	0.05
Offshore Site (Total)	20.2	0.01	0.05

Assessment of Significance Prior to Mitigation

Given the assessment of sensitivity and magnitude as described above, the long-term loss or damage during construction will have **a not significant, negative** effect on subtidal muds which is Not Significant.

Mitigation

- The first choice of cable protection along the OECC will be burial. The sufficient burial of cable in mud habitat is anticipated to be achieved along the majority of the OECC and therefore will mitigate against (or significantly reduce) the requirement for long-term placement of rock protection in the subtidal mud habitat.
- The project is also looking at ways to reduce the volume of rock berms for cable protection within the OAA, although details will be subject to further studies and commitments to these cannot be made at the time of writing.

Residual Effect Following Mitigation

While the subtidal mud habitat has the high sensitivity to a change in substrata type, the permanent installation of any rock placement along the but highly localised nature of the works with wider availability of habitat which will not impair overall ecological function, the residual effect will be a **likely, not significant negative effect** which is **Not Significant.**

9.6.3.2.4 *Maerl beds*

Description of Effect

Maerl beds were identified at two locations within the OAA and classified as the habitat complexes A5.51 'Maerl beds' and A5.511 '*Phymatolithon calcareum* maerl beds in infralittoral clean gravel or coarse sand', located ~ 6.5km from the closest known maerl beds occurring at the Kilkieran Bay and Islands SAC. The maerl observed consisted of pink encrusting algae, hedgehog maerl, maerl nodules and maerl gravel (Ocean Ecology Limited, 2024; see Appendix 9-1). Maerl is listed as an Annex V species under the EU Habitats Directive. As these habitats are present in the OAA, consideration has been given for these habitats to be directly disturbed by the construction activities.

Characterisation of Unmitigated Effect

Following the identification of maerl beds in the environmental survey data, the Project has taken measures to design around the maerl to avoid direct disturbance (see Figure 9-10). In particular, the citing of IACs and associated rock, foundation installation and placement of Jack up spud cans will all avoid areas of known maerl, with the nearest infrastructure (being IAC and associated rock protection) being cited approximately 85 m away. Therefore, given there will be no direct long term/permanent effect on maerl beds, the magnitude of effect is considered to be **negligible.**

Maerl beds have slow growth rates and are considered to have 'very low recoverability' and 'low recovery potential' respectively (FeAST, 2023). Given that maerl beds have a very low capacity to accommodate habitat loss / disturbance, are vulnerable due to their low recoverability, and are of high (international) importance or rarity as listed on the OSPAR list of threatened and/or endangered species and habitats, and as an Annex V species under the EU Habitats Directive, their sensitivity is **high**.

Assessment of significance Prior to Mitigation

Given the assessment of sensitivity and magnitude as described above, the long term or permanent habitat or species loss to maerl beds resulting from construction activities will be a **not significant negative effect** which is Not Significant.

Mitigation

As described above, mitigation by design has been incorporated through cable-routeing to avoid sensitive features, especially the identified maerl beds within the OAA.

Residual Effect Following Mitigation

With designed in mitigation to avoid any temporary effects to maerl beds through appropriate siting (avoiding maerl), the overall residual effect being a **not significant negative effect** which is Not Significant**.**

Maerl is considered to be of very high (international) importance or rarity as listed on the OSPAR List of Threatened and/or Declining Species and Habitats and as an Annex V species under the EU Habitats Directive and is therefore considered to be of high sensitivity. Following the identification of maerl beds in the environmental survey data, the Project has taken measures to design around the maerl to avoid direct disturbance (see Figure 9-10). Therefore, there will be **no direct effect** on maerl beds which is Not **Significant.**

9.6.3.3 Increased suspended sediment concentrations and associated deposition

Sediment disturbance during seabed preparation and installation activities will result in increased SSC. Benthic ecology receptors may be directly or indirectly effected by the increased SSCs and the associated deposition, such as indirect temporary disturbance or as a result of smothering.

The seabed preparation activities and the more extensive sediment resuspension and deposition resulting from seabed clearance activities in the OAA which have been assessed using either TSHD, as well as the trenching of IAC and OEC using CFE. It is acknowledged that there is also likely to be some relatively localised and short-term sediment resuspension resulting from stonebed rock placement, and installation of infrastructure such as the placement of gravity-based foundations and placement of rock protection will disturb seabed sediments and result in a temporary increase in SSC, which are anticipated to be negligible in scale compared to the dredging and cable trenching activities.

This section focusses primarily on the seabed clearance and trenching activities which are the activities which result in the most extensive volumes of sediment resuspension and deposition and have the potential to smother adjacent benthic habitats and species. The quantification of sediment deposition from the planned seabed clearance areas and cable trenching are described in detail in Section 9.6.2.4 which is based on the modelling undertaken within Chapter 7: Marine Physical and Coastal Processes.

Depending on the discharge parameters (e.g. current speed, sediment grain size, height above seabed), there is a range of resulting sediment deposition. These all represent theoretical possibilities. The method to be deployed for seabed clearance in the OAA will be TSHD and selected modelling outputs used to provide a realistic quantification of impacts.

For seabed clearance in the OAA using TSHD, there will be an average burial of 1.5m across an area of 0.1 km^2, targeting discrete sedimentary disposal areas (from fall pipe) which is considered to represent heavy smothering.

In summary the following is assumed for the impact assessment:

- For seabed clearance in OAA significant smothering of up to 1.5m across an area of 0.1 km^2 using TSHD);
- For trenching of the IACs in the OAA, smothering up to 0.47 m may occur up to an area of 0.05 km^2;
- For trenching of the OEC, smothering of up to 0.2 m may occur up to an area of 0.09 km^2; and

- The excavation and deposition of HDD exit pit is predicted to affect a total area of 0.0016 km^2.

Based on the assumptions above, there will be up to 0.35 km^2 of seabed affected by deposition with a minimum burial of 0.2 m.

Furthermore, the described increase in SSC and resulting plume would be near bed and with increasing distance and duration from the release, dilution would occur resulting in further reduction of the SSC to hundreds and tens of mg/l. By the estimated plume excursion extent, SSC would be at background levels. Furthermore, any deposition fine sediment fraction will become readily incorporated into the surrounding seabed and consequently will become part of the sediment transport regime. This process will redistribute sediments throughout the Offshore Site area and beyond, which would occur regardless of deposition induced by construction activities. For sediment deposition, as discussed above the dredging activities will result in direct deposits of sediment on the seabed.

9.6.3.3.1 *Stony and bedrock reef*

Description of Effect

As described in section 9.6.3.1.1, habitat resembling Annex I stony and bedrock reef is present across 30.3 km^2 (21.1 km^2 within the OAA and 9.2 km^2 along the OECC). The biotope complexes prevalent vary between seaweed and faunal dominated habitats on wave-exposed circalittoral rock. Increased SSCs have the potential to result in clogging of feeding and respiratory structures, especially for filter feeding species as suspended sediments re-settle to the seabed. The deposition of sediment has the potential to replace stony reef habitat, smothering the existing epifauna and modifying the substrate from rock to sand thus preventing any recovery and loss of the biotope in the immediate area.

Characterisation of Unmitigated Effect

Increased SSC and associated deposition will have a likely, brief adverse effect on stony and bedrock reef. Increased SSC and associated deposition will result from seabed preparation and installation activities.

The excavated fine sediment that enters suspension will disperse over a relatively wide area, leaving a very thin veneer (< 1 mm) of fine sediment on the seabed. Increased SSC and associated siltation can impair filter feeding efficiency; however, it should be noted that the largest areas of reef habitat occur in the OAA and the sediments that are planned to be excavated in this area are primarily comprised of coarser material which have a much lower potential to become suspended and widely dispersed.

For the fines that do become suspended, the effect will only last up to 14 hours, thus the disturbance from suspended sediments is unlikely to disrupt the ecological functioning of the reef. As mentioned above, the associated deposition in the OAA is more associated with the coarser sediment fractions that will be deposited closer to the ejection point, resulting in smothering of the seabed habitats. Overall, up to approximately 0.1 km^2 of area within the OAA may be buried to a depth of 1.5 m which may take several years to clear, were it to be deposited over areas of bedrock. However, it should be noted that the rocky substrate will be avoided by the selection of the deposition sites (see Figure 9-10). Any cable trenching activities could affect reef habitat by much shallower burial depth with fines which given the tide swept nature of the environment present is expected to be short term in nature as tidal and wave action is expected to remove the deposited sediment away within a year (Stamp *et al.*, 2023). Therefore, it is reasonable to assume that within two to three years, the majority of deposited sediment could potentially clear, if deposited directly on exposed rock. The potential for thicker deposits of up to 0.47 m would be highly limited in extend and reduced to a maximum footprint of 0.05km^2. However, the modelling has shown that seabed clearance dredging, and deposition could smother discrete areas measuring 0.1 km^2 of up to 1.5 m depth (utilising TSHD), which could theoretically result in loss of habitat over a longer period, although in reality, the vast majority of the habitats that would be smothered from this disturbance would be sedimentary in nature as per as the selected disposal areas within the OAA which would be deposited using a fall pipe for accuracy.

Furthermore, even if it were assumed that all the sediment deposition area up to 0.2 m (0.35 km) was to affect reef, the proportion of reef affected over the combined OAA and OECC would be very small (1.15 %).

Increased SSC will be brief (i.e. up to 14 hours), with return to background levels thereafter; however, sediment deposition may be considered long -term in nature, resulting in a potential change from rock to sediment substrata, in places which is expected to clear within a year. However, it is important to note that the most significant levels of smothering will be restricted to sediment areas which have been actively selected as dredge disposal sites from the TSHD (Figure 9-10). Overall, given the relatively small areas of reef that will be affected compared to the wider presence of the reef habitats, the magnitude of effect is likely to be **low**.

The epifaunal communities of the reef habitats are predicted to have a low intolerance, high resistance and high resilience to suspended sediments, (Stamp *et al.,* 2023), and therefore are not considered as sensitive to suspended sediments. Stony and bedrock reef are assessed to have a very low resilience to physical change to another seabed type which could occur through sediment deposition with the complete loss of rocky substratum.

This is particularly true of greater deposition associated with the seabed clearance dredging and deposition that could smother discrete areas measuring 0.1 km^2 of up to 1.5 m depth, which could have the potential to completely smother large boulders and characteristic epifauna such as sponges and sea fans, that latter which are considered to be particularly vulnerable due to slow growth rates, thus recovery could take many years. Without the mitigation of selecting of deposition area and avoiding the rocky habitat, the level of this extent of smothering (up to 1.5 m depth) could have the potential to change areas of reef habitat type from a rocky one to sedimentary one. Therefore, stony and bedrock reef that is affected by sediment suspension and deposition are assessed to be of **high** sensitivity.

Assessment of Significance Prior to Mitigation

Given the assessment of sensitivity and magnitude as described above, the increased SSC and associated deposition during construction will have a **moderate, negative** effect on stony and bedrock reef which is considered Not Significant.

Mitigation

- Mitigation by design such that the deposition of dredged material will be confined to the defined disposal areas through the use of a fall pipe for precision placement (CFE will not be used for the sediment clearance activities in the OAA); and
- Mitigation by avoidance as the disposal areas selected are those that are sedimentary in nature and will limit potential effects on stony and bedrock reef by avoiding the habitat.

Residual Effect Following Mitigation

Given the mitigation by design to avoid stony reef where possible when depositing the dredge material in the OAA using TSHD rather than CFE, the worst-case area affected would be avoided and controlled deposition in a sediment habitat would ensure the that the magnitude of the effect is considered to be reduced from low to **negligible**. Therefore, the residual effect is a **not significant, negative** effect which is Not Significant.

9.6.3.3.2 *Subtidal sands and gravels*

Description of Effect

As described in section 9.6.3.1.2, there are a variety of subtidal sands and gravels present within the Offshore Site including circalittoral coarse sediment, deep circalittoral coarse sediment, circalittoral fine sand, circalittoral muddy sand, deep circalittoral sand, circalittoral mixed sediments and deep circalittoral mixed sediments. The biotope complexes associated with subtidal sands and gravels include:

- *Protodorvillea kefersteini* and other polychaetes in impoverished circalittoral mixed gravelly sand (A5.143);
- Echinocyamus pusillus, Ophelia borealis and Abra prismatica in circalittoral fine sand (A5.251);
- Medium to very fine sand, with polychaetes Spiophanes kroyeri, Amphipectene auricoma, Myriochele sp., Aricidea wassi and amphipods Harpinia antennaria (A5.253); and
- *Owenia fusiformis* and *Amphiura filiformis* in deep circalittoral sand or muddy sand (A5.272).

Characterisation of Unmitigated Effect

Increased SSC and deposition will result from seabed preparation and installation activities, details of which are provided in Section 9.6.2.4. As described in section 9.6.3.3.1, the excavated fine sediment entering suspension will disperse over a relatively wide area, leaving a very thin veneer of fine sediment on the seabed. Furthermore, the majority of sediment material will not enter suspension and will be deposited close to the ejection location, with the total area of 0.35 km^2 affected by deposition at a minimum burial depth of 0.2 m (see section 9.6.2.4.2). Increased SSC will be brief (i.e. up to 14 hours for CFE in the OECC), with return to background levels thereafter. It is considered that there is the potential that the sediment characteristics may be altered by this deposition, resulting in a change to the characterising fauna. The area of 0.35 km^2 affected by the associated deposition is relatively low when considered in the extent of sands and gravel habitats in the wider offshore area, to the south of the OAA and adjacent to the OEC. Additionally, it should be born in mind that the areas affected will be in close proximity and of similar composition to the deposited sediments, thus a fundamental change to sediment type is not expected. Increased SSC and associated deposition will occur occasionally during construction. Overall, the magnitude of effect is considered to be **low**.

All subtidal sands and gravels are considered to be not sensitive or have low sensitivity to changes in suspended solids, with medium to high resilience and resistance (De-Bastos, 2023; Tillin and Watson, 2023, 2024). With regards to smothering and siltation rate changes, no evidence is presented for the sediment biotope '*Protodorvillea kefersteini* and other polychaetes in impoverished circalittoral mixed gravelly sand' (Tillin and Watson, 2023); however, all other subtidal sands and gravels habitats have low to medium sensitivity, with medium to high resilience, and medium to low resistance. As described above the total area affected by deposition at a minimum burial depth of 0.2 m is 0.35 km^2. Of this area, approximately 0.1 km^2 will be buried to an average depth of 1.5 m which may take several years to clear. It is recognised that smothering to 1.5 m will result in the mortality in much of the benthic communities present; however, in the long term, given the relative similarity in sediment composition and recruitment from nearby areas, recovery of the associated sands and gravel benthic communities is likely, although full recovery may take several years due to slow growth of some characterising species (Tillin and Watson, 2023). Overall, offshore sands and gravels are assessed to be of **medium** sensitivity. It is worth noting that the 0.1 km^2 disposal areas within the OAA were specifically selected due to the presence of sands and gravels habitat which was considered less sensitive than depositing and smothering the reef substrata.

Assessment of Significance Prior to Mitigation

Given the assessment of sensitivity and magnitude as described above, the increased SSC and associated deposition during construction will have a **slight, negative** effect on subtidal sands and gravels which is Not Significant.

Mitigation

- Mitigation by design such that the deposition of dredged material will be confined to the defined disposal areas through the use of a down pipe for precision placement. As the disposal areas are sedimentary in nature, this will not represent a change in substrate type.

Residual Effect Following Mitigation

Given the mitigation by design and consideration of the **medium** sensitivity of subtidal sands and gravels, with the brief to short-term duration of the effect occurring occasionally, the residual effect will be a **likely, short-term, slight negative** effect which is Not Significant.

9.6.3.3.3 *Subtidal muds*

Description of Effect

The benthic survey found that subtidal muds were less prevalent throughout the Offshore Site as a whole, with the highest subtidal mud concentrations along the OECC and smaller proportions observed within the OAA. The subtidal muds habitats were classified as circalittoral sandy mud and deep circalittoral mud, with the biotope '*Myrtea spinifera* and polychaetes in offshore circalittoral sandy mud' (A5.377).

Characterisation of Unmitigated Effect

Increased SSC and deposition will have a likely, brief adverse effect on subtidal muds. Increased SSC and associated deposition will result from seabed preparation and installation activities. The majority of excavated sediment comprising of fines, will enter suspension and disperse over a relatively wide area, leaving a very thin veneer (< 1 mm) of fine sediment on the seabed. Furthermore, most of the excavated sediment material from CFE for cable burial will be deposited a relatively short distance (<3 m) from the ejection area with a maximum burial depth of 0.47 m covering an area of up to 0.05 km^2, assuming the ejection point is 1 m above the seabed (see Section 9.6.2.4). Increased SSC will be brief (i.e. up to 14 hours), with return to background levels thereafter; however, sediment deposition is considered short-term in nature (i.e. one to seven years in duration). The areas of muds affected will be those found along the OECC, characterised as silty/muddy sand as indicated in Figure 9-8. It should be considered that the material that is ejected by the trenching activity and redeposited to 0.2 m depth will cover an area of approximately 0.09 km^2 which is an extremely small proportion of the wider presence of this habitat across the region, indicated as a wider band of 'mud to sandy mud' as mapped in Figure 9-8 and EUNIS Habitat A5.37: Deep Circalittoral mud as shown in Figure 9-9. The mud habitats are generally low energy environments with restricted sediment movement, therefore the effects from deposition are considered to be medium term. Increased SSC on the other hand will be occasional and temporary in nature, being restricted to the construction phase of the project. Overall, the magnitude of effect is considered to be **low**.

The subtidal mud biotope '*Myrtea spinifera* and polychaetes in offshore circalittoral sandy mud' is considered to have high resilience and is not sensitive to changes in suspended solids but does have low resistance and medium sensitivity to smothering (up to 0.3 m) (De-Bastos, 2016); Furthermore, it is assessed to have a very low resilience to physical change to another sediment type which could occur to some degree through sediment deposition.

The sediments that will be deposited in the immediate area of the dredging location will be slightly coarser in nature to the muds present, thus may represent a slight change in the sediment composition, possibly affecting the vertical stratification of the infaunal benthic communities present (De-Bastos et al., 2023). Furthermore, the increased suspended sediments have the potential to incur abrasion and clogging of gills, causing impaired respiration and the clogging filter feeding mechanisms for species associated with this habitat. However, it should be considered that this change is not considered to be fundamental to the ecological functioning of the habitat as the dispersal distance is very short (< 2 m), and the redistributed sediments can be expected to have similar sediment properties and infauna, albeit with reduced levels of fines which will disperse wider. As such, it is reasonable to expect a good level of benthic recovery following construction activities as the sediments are recolonised from recruitment from adjacent undisturbed areas and reworked by the benthic fauna. Overall, subtidal muds are assessed to be of **medium** sensitivity to increased SSC and deposition.

Assessment of Significance Prior to Mitigation

Given the assessment of sensitivity and magnitude as described above, the increased SSC and deposition during construction will have a **slight, negative** effect on subtidal muds which is Not Significant.

Mitigation

- Mitigation by design such that the deposition of dredged material will be confined to the defined disposal areas through the use of a down pipe for precision placement; and
- Mitigation by avoidance as the disposal areas selected are those that are sedimentary in nature and will limit potential effects on subtidal muds by avoiding the habitat.

Residual Effect Following Mitigation

Given the mitigation by design and consideration of the medium sensitivity of subtidal muds, with the effect occurring occasionally, the residual effect will be a **likely, brief to short-term, slight negative** effect which is Not Significant.

9.6.3.3.4 *Maerl beds*

Description of Effect

Maerl beds were identified at two locations within the OAA and classified as the habitat complexes A5.51 'Maerl beds' and A5.511 '*Phymatolithon calcareum* maerl beds in infralittoral clean gravel or coarse sand', located ~ 6.5 km from the closest known maerl beds occurring at the Kilkieran Bay and Islands SAC. The maerl observed consisted of pink encrusting algae, hedgehog maerl, maerl nodules and maerl gravel (Ocean Ecology Limited, 2024; see Appendix 9-1). Maerl is listed as an Annex V species under the EU Habitats Directive.

Characterisation of Unmitigated Effect

Increased SSC and associated deposition during the construction phase will have a potential, slight indirect adverse effect on maerl beds given that there is potential for localised sediment resuspension across the OAA; however, there are a number of factors which will reduce the exposure of maerl beds to any indirect effects. As discussed in Chapter 7: Marine Physical and Coastal Processes, due to the coarse nature of the seabed (especially in the OAA), sedimentation associated with the disturbance (in relation to the construction works) would be within tens of metres from the disturbance site, with the largest deposition thickness being in proximity to the disturbance site. The distance from the smallest and largest maerl beds to the nearest sediment disposal areas are 2.01 km and 2.5 km to the west, respectively. Similarly, the nearest distance to the CFE cable trenching activities in the OAA will be in the vicinity of the OSS, which is approximately ~2.5 km to the southeast SE (see Figure 9-10). The suspended sediments which that contain very low fines content and are not predicted to result in high levels of sediments in suspension that may affect maerl habitat. Any residual settlement of fine sediment on maerl beds (which is expected to be a very low proportion) is expected to be negligible (<1mm depth) and therefore minimal. As the nature of the disturbed material is comprised of mostly coarse sands and gravels which are not likely to enter into suspension (and remain localised); and given the relatively localised extent and temporary (i.e. less than one year) duration of site preparation and construction activities, the magnitude of effect is considered to be **low,** when considering that the CFE may still be used for clearance in the OAA.

Maerl is considered to be of very high (international) importance or rarity as listed on the OSPAR List of Threatened and/or Declining Species and Habitats and as an Annex V species under the EU Habitats Directive. Maerl is considered to have a high sensitivity to smothering and siltation rate changes (light and heavy) and medium sensitivity to changes in suspended solids (water clarity) (Perry *et al.,* 2024) and therefore maerl is considered to be of **high** sensitivity overall to this impact pathway.

Assessment of Significance Prior to Mitigation

Given the assessment of sensitivity and magnitude as described above, increased SSC and associated deposition during the construction phase will **moderate, negative** effect on maerl which is Not Significant.

Mitigation

- Mitigation by design as environment survey data has been used to inform the location and spatial extent of Project activities (including disposal areas) such that there will be no direct effects to maerl beds.
- Mitigation by avoidance such that the deposition of dredged material will be confined to the defined disposal areas through the use of a down pipe for precision placement (i.e. TSHD selected for dredging activity to enable controlled deposition in disposal area).
- The defined disposal areas are considerable distance from the known location of maerl beds (>2 km away) and therefore reduce further the magnitude of any associated effect
- The installed cables (IAC) within the array area closest to the maerl beds will not be buried but will be located within rocky substrata and rock protected, which will limit the potential to suspend sediments in the vicinity of the Maerl beds.
- The nearest cable burial where potential localised sediment plumes may be incurred will take place >2 km to the SE on the OEC.

Residual Effect Following Mitigation

Given the mitigation by design results in a reduction in the magnitude of effect from low to **negligible**, with consideration of the high sensitivity of maerl beds, the residual effect is considered to be a **not significant, negative** effect which is Not Significant.

9.6.3.3.5 *Effects on Designated Sites*

Description of effect

As described in section 9.5.2.3.1, the Offshore Site does not directly overlap any designated site; however, there are a number of designated sites in the wider region with protected benthic features which overlap with the 15 km buffer. Specifically, as listed in Table 9-12 the nearest SACs are Kilkieran Bay and Islands SAC, Inishmaan Island SAC, Inishmore Island SAC and the Carrowmore Point to Spanish Point and Islands SAC. These sites all have qualifying features relevant to benthic ecology which are predominantly coastal, and include Annex I reefs, intertidal mudflats and sandflats, coastal lagoons and sea caves.

The pathways for impacts to these sites are all as a result of indirect effects relating to increases in Suspended sediment concentration and deposition as a result of seabed preparation and trenching across the OAA and OECC that propagates beyond the Offshore Site. The Qualifying Interests support benthic ecological features which have varying degrees of sensitivity to suspended sediment concentrations and are listed in Table 9-12. A summary of these sensitivities to suspended sediments and deposition

Characterisation of unmitigated effect

The Qualifying Interest Annex I Reef include epibenthic intertidal and subtidal rock communities, and in particular kelp (Laminaria) dominated community complexes. These habitats occur in, high or moderate energy wave exposed habitats which are resilient to temporary disturbances such as increases in suspended solids. For instance, Laminaria dominated rocky reef habitats are considered to have high resilience and **low sensitivity** to an increase in suspended solids and are **not sensitive** to light smothering (to 5 cm depth) (Hill *et al*., 2023). In deeper water the rocky reefs support faunal crusts and sponge communities and include the pink sea fan (*Eunicella verrucosa*), the latter of which is also considered to have high resilience and is **not sensitive** to changes in suspended solids or light smothering (Readman and Hiscock, 2017).

Shallow Inlets and Bays and Coastal Lagoons and may support a variety of subtidal benthic receptors including sensitive seagrass (Zostera) and maerl community complexes which are often co-located and specifically found in areas of the Kilkieran Bay and Islands SAC and (NWPS, 2014d). The seagrass habitat complexes are known to have low resilience and **high sensitivity** to suspended solids and medium resilience and **medium sensitivity** to light smothering (to 5 cm depth) (d'Avack *et al*., 2024). Similarly, as discussed in Section 9.6.3.3.4, Maerl beds are considered to have **medium sensitivity** to changes in suspended solids and a **high sensitivity** to light smothering (Perry *et al.,* 2024).

Intertidal Mudflats and Sandflats are typically dominated by infaunal benthic communities and are generally considered have high resilience and are **not sensitive** to increases in changes to suspended solids and light smothering (Budd *et al*., 2024; McQuillan *et al*., 2024).

As described above, impact pathways resulting from SSC and associated deposition are limited for the majority of the interest features within the designated sites which either have low or no sensitivity to the pressure. The only exception is in relation to the seagrass and maerl habitats found mainly within the Kilkieran Bay and Islands SAC which is situated only 1.5 km from the OAA and 2.9 km from the OECC.   It is worth noting that the most prominent maerl and seagrass dominated habitats are found at the Shallow waters of the inner part of the Kilkieran Bay and eastern most section of the SAC (east of the Gorumna Island) at an estimated distance of approximately 15 km from the OAA (NWPS, 2014d). There is another notable area of known maerl habitat complex found in the outer bay between Ardmore Point and Lettermore Island as well as other smaller patches of the mixed seagrass/maerl habitat between the small islets close to shore in the west of the SAC, approximately >5 km from the OAA.

The sediment plumes will primarily be associated with the seabed clearance activities in the OAA as well as trenching activities within the OECC. This will result in a temporary increase in suspended sediment concentrations and subsequent deposition. A detailed analysis of the distribution and fate of the suspended material from the various construction activities is presented in Chapter 7: Marine Physical and Coastal Processes and are assessed for the dredging using TSHD and trenching using CFE. It is considered that the instantaneous increase in SSC which could result in a plume (mainly from CFE trenching) would only occur in the immediate vicinity of disturbance activity, although much smaller and reduced sediment concentrations could advect over larger distances. However, based on the coarse nature of the sediment within the OAA the majority of the sediment bulk is expected to quickly resettle back to the seabed with limited development into a plume. Similarly, OEC results show that based on trenching, only about 0.1 m of very coarse sand could be deposited up to only 2.9 m from the disturbance site based on a flow speed of 0.4 m/s.

Based on an estimated sediment disturbance height of 1 m above the seabed, it would take up three-hours for fine sediment to resettle out, at which point the material could travel up to a distance of around

4 km (based on a spatially representative depth average flow speed of 0.4 m/s, however, flow speeds are spatially variable (particularly across the OAA), with areas of slower and faster speeds within the Offshore Site). However, SSC would reduce with increasing distance from the disturbance site, returning to background levels of <5 mg/l before the estimated 4 km extent. For fine sand, although material could travel up to a distance of tens (i.e. 80 m) to hundreds (i.e. 400 m) of metres from the disturbance site, based on the disturbance height and prevailing flow speed, the associated sediment deposition would only be a few millimetres in thickness. Therefore, based on the large proportion of coarse sediment fraction that occurs along the OECC (i.e. approximately 88%), the majority of sedimentation will occur in close proximity to the disturbance event and within the OECC.

Overall, the suspension of the fine sediment components theoretically has the potential to extend several kilometres from the ejection point. While this may result in an increase in SSC, the concentrations will rapidly disperse to low levels (thousands of mg/l from the release point) and remain in suspension for a relatively short duration (< 14 hours). Sedimentation effects as a result of construction activities within the OAA and along the OECC will largely remain within the Offshore Site boundary, as sedimentation of the thickest deposits, at less than 0.5 m, will be within metres of the disturbance event. Based on the distances of the location of the most sensitive habitats supported by the Qualifying Interest feature within the designated site which are approximately >5 km from the OAA or OECC boundary at the closest point (i.e. seagrass and maerl habitat complexes within the Kilkieran Bay and Islands SAC) respectively from the Offshore Site, any sedimentation will be on the order of a few millimetres and indiscernible from the seabed. The only material still in suspension at the distances involved would be fine sediment (i.e. silt) with the coarser sediment (i.e. fine sand and coarser sediment fraction) all deposited within 1 km of the disturbance. It should also be noted that at a distance of ~4 km any resettlement is unlikely to be a change in seabed sediment properties and furthermore the predominant current in the region is from a northwest- southeast orientation which means that any sediments in suspension are likely to be diverted away from the sensitive features of the Kilkieran bay and islands SAC making any interaction even less likely. Given the short lived, transient nature of the suspended sediment, the relatively low suspended sediment concentrations and the very low predicted deposition levels at distance from the disturbance location, any the magnitude of any effects on the Qualifying Interest of designated sites including sensitive habitat complexes such as maerl and seagrass are assessed as **negligible**.

Assessment of Significance Prior to Mitigation

Overall, when taking account of the **high** sensitivity to certain components of Qualifying Interests of designated sites from a benthic ecology perspective (i.e. seagrass and maerl habitat complexes) and the negligible magnitude of effect, the residual effect is a **not significant, negative** and assessed as Not Significant.

Mitigation

- Mitigation by design such that the deposition of dredged material will be confined to the defined disposal areas through the use of a down pipe for precision placement.

Residual Effect Following Mitigation

The residual effect following mitigation is the same and is therefore a **not significant, negative** effect and is assessed to be Not Significant.

9.6.3.4 Increased risk of introduction and spread of invasive non-native species

There is potential for the increased risk of introduction and spread of INNS as a result of seabed preparation and construction activities. Marine INNS may be introduced or transferred by vessels, such as through biofouling (e.g. attachment of organisms to boat hulls) or discharge of ballast water. INNS may also be introduced through towing of infrastructure to the site, such as with the temporary anchorage.

INNS can have a detrimental effect on benthic ecology through predation on existing wildlife or outcompeting for prey and habitat. This can result in biodiversity changes in the existing habitats present in the benthic ecology study area. Depending on the INNS species introduced, this could potentially lead to complete loss of certain species and may result in new habitats forming (e.g. reef-forming species).

As described in section 9.5.2.2.3, two non-native taxa were identified during the benthic survey: the polychaete *Goniadella gracilis* and the amphipod *Monocorophium sextonae*. The polychaete *G. gracilis* was observed 42 times in low abundance (≤ 3 individuals) in ~45% of the grab samples across 17 stations in the OAA. Both *G. gracilis* (one station, nine individuals) and *M. sextonae* (three stations, six individuals) were observed along the OECC. Additional taxa recorded within the sediment eDNA samples include two INNS Japanese seaweeds: *Fibrocapsa japonica*, and *Dasysiphonia japonica*.

The vessel requirements will be determined by the installation contractor post-consent, and this will depend on vessel availability. The anticipated number of vessels is 21. The construction vessels will include vessels such as construction support vessels, rock dump vessels, installation jack-up rigs, heavy lift vessels, cable laying vessels, and supply vessels. All vessels are required to adhere to international guidelines (e.g. International Maritime Organization (IMO) International Convention for the Control and Management of Ships' Ballast Water and Sediments ('BWM Convention')). This is captured in the production and implementation of the EMP. Another vector for the transportation of INNS to the offshore site is from the GBS which will have been temporarily anchored in a floating configuration, potentially in the Shannon Estuary prior to being wet-towed to site. As harbours are known to potentially be prone to invasive species there is a residual risk that such species may attach to the GBS and thus be relocated to the offshore site.

9.6.3.4.1 *Stony and bedrock reef*

Description of Effect

Kelly *et al.*, (2013) provided a risk analysis for INNS in Ireland and Northern Ireland, in which the authors identified high risk species based on recorded species and potential species. The high-risk marine INNS which have been recorded in Ireland include the carpet sea squirt (*Didemnum vexillum*), the slipper limpet (*Crepidula fornicate*), the leathery sea squirt (*Styela clava*). As per the benthic survey results, these species have not been identified as present within the survey area. The carpet sea squirt and leathery sea squirt are a species of colonial sea squirt, which are native to Asia and can outcompete and smother native biological communities on rocky substrates. This species can form extensive mats over the substrata it colonises, binding boulders and cobbles and altering the host habitat (Griffith *et al.,* 2009). Therefore, the carpet sea squirt and leathery sea squirt are expected to pose the greatest threat to reef biodiversity. In contrast, the non-native taxa identified within the Offshore Site (*G. gracilis* and *M. sextonae*) do not pose a threat to reef biodiversity.

Characterisation of Unmitigated Effect

Increased risk of introduction and spread of INNS through construction activities will have a potential adverse effect on stony and bedrock reef. Increased risk of introduction and spread of INNS will result from construction activities throughout the Offshore Site, including through vessels (biofouling and discharge of ballast water) as well as towing infrastructure to the site. Activities will be short-term in duration (i.e. four months pre-construction activities and 18-months construction activities). The potential increased risk of introduction and spread of INNS will significantly reduce following the completion of construction activities. Nevertheless, given the potential consequences and inherent risk from the introduction of INNS, the magnitude of effect is therefore **medium** prior to mitigation.

The stony and bedrock reef biotopes identified in the survey have been assessed against the Marie Evidence based Sensitivity Assessment (MarESA) sensitivity review for the 'Introduction or spread of invasive non-indigenous species' biological pressure (Tyler-Walters *et al.,* 2023). The biotopes 'Foliose red seaweeds with dense *Dictyota dichotoma* and/or *Dictyopteris membranacea* on exposed lower infralittoral rock' (A3.1161) and 'Coralline crusts in surge gullies and scoured infralittoral rock' (A3.716) are considered to be 'Not sensitive' to the effect. All other biotopes have been assessed as having 'Insufficient evidence', although it is noted that the circalittoral rock characterising these biotopes are likely to be unsuitable for the colonisation by the high-risk INNS (i.e. carpet and leathery sea squirt described above), due to the extreme wave exposed conditions (Readman et al., 2023). Overall, stony and bedrock reef are considered to be of **medium** sensitivity.

Assessment of Significance Prior to Mitigation

Given the assessment of sensitivity and magnitude as described above, the increased risk of introduction and spread of INNS during construction will have a **moderate, negative** effect on stony and bedrock reef and is Not Significant.

Mitigation

- There will be mitigation by reduction through the implementation of the OEMP which includes measures for pollution prevention, biosecurity assessment and waste management; A MPCP and a Marine INNS management plan (MINNSMP) are included as part of the OEMP. These management plans detail the measures being taken to avoid the introduction and spread of INNS, including adherence to the BWM Convention and other applicable international regulations, as well as containment procedures in the unlikely event that INNS are found;
- Standard mitigation will be undertaken, including for swapping out ballast water, cleaning hulls, floating structures, etc.

Specific measures outlined in the Sceirde Rocks MINNSMP include:

- All vessels to be used for construction, operation and maintenance, and decommissioning activities will follow guidance as directed by the 'Guidelines for the control and management of ships biofouling to minimize the transfer of invasive aquatic species' (IMO, 2023);
- Where applicable, all vessels will comply with the 'International Convention for the Control and Management of Ships' Ballast Water and Sediments' (IMO, 2021).
- Risk of INNS via the wet towing of GBS will be reduced with the treatment with anti-fouling paint. All anti-fouling paint will be compliant with The International Convention on the Control of Harmful Anti-fouling Systems on Ships (AFS Convention), and the Sea Pollution (Control of Anti-Fouling Systems on Ships) Regulations 2008 (S.I. No. 82/2008);
- Contractors will be required to submit a Biosecurity Risk Assessment to the Environmental Manager at least six weeks prior to operations;
- The contractors must ensure that all equipment, materials, machinery, PPE and vessels used are in a clean condition prior to their arrival on site to minimise the risk of INNS introduction into the marine environment;
- Awareness of INNS, including identification guidance on the key risk species. If uncertainty arises, follow the contingency plan;
- Collaborate with the relevant Port Authority and other users of the offshore wind farm area to raise INNS awareness;
- Assess INNS risk of any slow moving or inactive craft and take steps;
- Ensure a Check, Clean and Dry message is sent to any new (sub) contractors;
- Confirm origin of material used in constructing of infrastructure;
- Ensure 'tool box' talks on INNS prevention and monitoring;

- Collaborate with the relevant Port Authority and other users of the offshore wind farm area to raise INNS awareness;
- Liaison with Environmental Protection Agency (EPA) and National Parks and Wildlife Service (NWPS) to identify any new INNS risks and thus potential mitigation requirements are well understood and enacted as soon as possible; and
- If required, a Contingency plan protocol will be followed as outlined in project specific MINNSMP which outlines key actions and responsibilities.

Residual Effect Following Mitigation

Given that the mitigation by design, with consideration of the implementation of the OEMP plan which will include measures to eliminate the potential for INNS through management and monitoring plans (e.g. INNS management plan), the magnitude of effect can be considered to be reduced from medium to low and therefore the residual effect will be a **likely, short-term, slight negative** effect and is assessed to be Not Significant.

9.6.3.4.2 *Subtidal sands and gravels*

Description of Effect

As described in section 9.6.3.1.2, there are a variety of subtidal sands and gravels present within the Offshore Site including circalittoral coarse sediment, deep circalittoral coarse sediment, circalittoral fine sand, circalittoral muddy sand, deep circalittoral sand, circalittoral mixed sediments and deep circalittoral mixed sediments. The biotope complexes associated with subtidal sands and gravels include:

- *Protodorvillea kefersteini* and other polychaetes in impoverished circalittoral mixed gravelly sand (A5.143);
- Echinocyamus pusillus, Ophelia borealis and Abra prismatica in circalittoral fine sand (A5.251);
- Medium to very fine sand, 100-120 m, with polychaetes *Spiophanes kroyeri*, *Amphipectene auricoma*, *Myriochele sp.*, *Aricidea wassi* and amphipods *Harpinia antennaria* (A5.253); and
- *Owenia fusiformis* and *Amphiura filiformis* in deep circalittoral sand or muddy sand (A5.272).

As described above, the two non-native taxa identified in the benthic survey are considered to be low risk.

Characterisation of Unmitigated Effect

Increased risk of introduction and spread of INNS will have a likely, short-term adverse effect on sands and gravel habitats. Increased risk of introduction and spread of INNS will result from construction activities throughout the Offshore Site, including through vessels (biofouling and discharge of ballast water) as well as towing infrastructure to the site. Activities will be short-term in duration (i.e. four months pre-construction activities and 18-months construction activities). The potential increased risk of introduction and spread of INNS will significantly reduce following the completion of construction activities. Nevertheless, given the potential consequences and inherent risk from the introduction of INNS, the magnitude of effect is therefore **medium** prior to mitigation.

There are two INNS that may be of concern including the slipper limpet which has been recorded to smother bivalves and alter seabed habitat and the colonial ascidian carpet sea squirt which may have the potential to colonize and smother offshore gravel habitat and alter habitat and outcompete other species for space (Tillin and Watson, 2024). Therefore, the introduction and establishment of INNS to the Offshore Site could result in long-term changes to the native biotopes. As such, biotopes associated with subtidal sands and gravels, such as *Echinocyamus pusillus*, *Ophelia borealis* and *Abra prismatica* in circalittoral fine sand, are considered to have **high** sensitivity (Tillin and Watson, 2024).

Assessment of Significance Prior to Mitigation

Given the assessment of sensitivity and magnitude as described above, the increased risk of introduction and spread of INNS during construction will have a **significant, negative** effect on subtidal sands and gravels which is Significant.

Mitigation

- There will be mitigation by reduction through the implementation of the OEMP which includes measures for pollution prevention, biosecurity assessment and waste management;
- A MPCP and INNS management plan are included as part of the OEMP. These management plans detail the measures being taken to avoid the introduction and spread of INNS, including adherence to the BWM Convention and other applicable international regulations, as well as containment procedures in the unlikely event that INNS are found;
- Standard mitigation is to be undertaken, including for swapping out ballast water, cleaning hulls, floating structures, etc.

Specific measures outlined in the Sceirde Rocks MINNSMP include:

- All vessels to be used for construction, operation and maintenance, and decommissioning activities will follow guidance as directed by the 'Guidelines for the control and management of ships biofouling to minimize the transfer of invasive aquatic species' (IMO, 2023).
- Where applicable, all vessels will comply with the 'International Convention for the Control and Management of Ships' Ballast Water and Sediments' (IMO, 2021).
- Risk of INNS via the wet towing of GBS will be reduced with the treatment with anti-fouling paint. All anti-fouling paint will be compliant with The International Convention on the Control of Harmful Anti-fouling Systems on Ships (AFS Convention), and the Sea Pollution (Control of Anti-Fouling Systems on Ships) Regulations 2008 (S.I. No. 82/2008).
- Contractors will be required to submit a Biosecurity Risk Assessment to the Environmental Manager at least six weeks prior to operations;
- The contractors must ensure that all equipment, materials, machinery, PPE and vessels used are in a clean condition prior to their arrival on site to minimise the risk of INNS introduction into the marine environment.
- Awareness of INNS, including identification guidance on the key risk species. If uncertainty arises, follow the contingency plan.
- Collaborate with the relevant Port Authority and other users of the offshore wind farm area to raise INNS awareness.
- Assess INNS risk of any slow moving or inactive craft and take steps.
- Ensure a Check, Clean and Dry message is sent to any new (sub) contractors.
- Confirm origin of material used in constructing of infrastructure.
- Ensure 'tool box' talks on INNS prevention and monitoring.
- Collaborate with the relevant Port Authority and other users of the offshore wind farm area to raise INNS awareness.
- Liaison with EPA NWPS to identify any new INNS risks and thus potential mitigation requirements are well understood and enacted as soon as possible.
- Contingency plan protocol will be followed as outlined in project specific MINNSMP which outlines key Actions and responsibilities.

Residual Effect Following Mitigation

Given that the mitigation by design, with consideration of the implementation of the OEMP plan which includes measures to eliminate the potential for INNS through management and monitoring plans (e.g. INNS management plan), the residual effect will be a likely, short-term, **slight negative** effect which is Not Significant.

9.6.3.4.3 *Subtidal muds*

Description of Effect

The benthic survey found that subtidal muds were less prevalent throughout the Offshore Site as a whole, with the highest subtidal mud concentrations along the OECC and smaller proportions observed within the OAA. The subtidal muds habitats were classified as circalittoral sandy mud and deep circalittoral mud, with the biotope '*Myrtea spinifera* and polychaetes in offshore circalittoral sandy mud' (A5.377).

As established for stony and bedrock reef above, the high-risk marine INNS which have been recorded in Ireland include the carpet sea squirt, slipper limpet and leathery sea squirt (Kelly *et al.*, 2013). However, these species are more associated with rocky substrates and coarse sediments. Therefore, it is expected that the mud habitats are less susceptible to these problematic invasive species.

Characterisation of Unmitigated Effect

Increased risk of introduction and spread of INNS will have a likely, short-term adverse effect on subtidal muds. Increased risk of introduction and spread of INNS will result from construction activities throughout the Offshore Site, including through vessels (biofouling and discharge of ballast water) as well as towing infrastructure to the site. Activities will be short-term in duration (i.e. four months pre-construction activities and 18-months construction activities). The potential increased risk of introduction and spread of INNS will significantly reduce following the completion of construction activities. Nevertheless, given the potential consequences and inherent risk from of the introduction of INNS, the magnitude of effect is therefore **medium** prior to mitigation.

No evidence suggests that the subtidal mud biotope '*Myrtea spinifera* and polychaetes in offshore circalittoral sandy mud' is particularly sensitive to the introduction of INNS (De-Bastos, 2016)); although it is acknowledged that the slipper limpet can be found in soft sediments. Therefore, subtidal muds are assessed as **medium** sensitivity to INNS.

Assessment of Significance Prior to Mitigation

Given the assessment of sensitivity and magnitude as described above, the increased risk of introduction and spread of INNS during construction will have a **moderate, negative** effect on subtidal muds and is Not Significant.

Mitigation

- There will be mitigation by reduction through the implementation of the OEMP which includes measures for pollution prevention, biosecurity assessment and waste management;
- A MPCP and INNS management plan are included as part of the OEMP. These management plans detail the measures being taken to avoid the introduction and spread of INNS, including adherence to the BWM Convention and other applicable international regulations, as well as containment procedures in the unlikely event that INNS are found;

- Standard mitigation will be undertaken, including for swapping out ballast water, cleaning hulls, floating structures, etc.

Specific measures outlined in the Sceirde Rocks MINNSMP include:

- All vessels to be used for construction, operation and maintenance, and decommissioning activities will follow guidance as directed by the 'Guidelines for the control and management of ships biofouling to minimize the transfer of invasive aquatic species' (IMO, 2023).
- Where applicable, all vessels will comply with the 'International Convention for the Control and Management of Ships' Ballast Water and Sediments' (IMO, 2021).
- Risk of INNS via the wet towing of GBS will be reduced with the treatment with anti-fouling paint. All anti-fouling paint will be compliant with The International Convention on the Control of Harmful Anti-fouling Systems on Ships (AFS Convention), and the Sea Pollution (Control of Anti-Fouling Systems on Ships) Regulations 2008 (S.I. No. 82/2008).
- Contractors will be required to submit a Biosecurity Risk Assessment to the Environmental Manager at least six weeks prior to operations;
- The contractors must ensure that all equipment, materials, machinery, PPE and vessels used are in a clean condition prior to their arrival on site to minimise the risk of INNS introduction into the marine environment.
- Awareness of INNS, including identification guidance on the key risk species. If uncertainty arises, follow the contingency plan.
- Collaborate with the relevant Port Authority and other users of the offshore wind farm area to raise INNS awareness.
- Assess INNS risk of any slow moving or inactive craft and take steps.
- Ensure a Check, Clean and Dry message is sent to any new (sub) contractors.
- Confirm origin of material used in constructing of infrastructure.
- Ensure 'tool box' talks on INNS prevention and monitoring.
- Collaborate with the relevant Port Authority and other users of the offshore wind farm area to raise INNS awareness.
- Liaison with (EPA) and (NWPS) to identify any new INNS risks and thus potential mitigation requirements are well understood and enacted as soon as possible.
- Contingency plan protocol will be followed as outlined in project specific MINNSMP which outlines key Actions and responsibilities.

Residual Effect Following Mitigation

Given that the mitigation by design, with consideration of the implementation of the OEMP plan which includes measures to eliminate the potential for INNS through management and monitoring plans (e.g. INNS management plan), the residual effect will be a **likely, short-term, slight negative** effect and is assessed to be Not Significant.

9.6.3.4.4 *Maerl beds*

Following the identification of maerl beds in the environmental survey data, the Project has taken measures to design around the maerl to avoid direct disturbance. However, there remains a potential ecological risk to maerl beds from the introduction of INNS.

Description of Effect

Maerl beds were identified at two locations within the OAA and classified as the habitat complexes A5.51 'Maerl beds' and A5.511 '*Phymatolithon calcareum* maerl beds in infralittoral clean gravel or coarse sand', located ~ 6.5km from the closest known maerl beds occurring at the Kilkieran Bay and

Islands SAC. The maerl observed consisted of pink encrusting algae, hedgehog maerl, maerl nodules and maerl gravel (Ocean Ecology Limited, 2024; see Appendix 9-1).

As established for other receptors described above, the high-risk marine INNS which have been recorded in Ireland include the carpet sea squirt, slipper limpet and leathery sea squirt (Kelly *et al.*, 2013) which are more associated with rocky substrates and coarse sediments and therefore may present a considerable risk to maerl habitat, even when considering that activities will not directly take place in the immediate vicinity of the maerl beds.

Characterisation of Unmitigated Effect

Increased risk of introduction and spread of INNS will result from construction activities throughout the Offshore Site, including through vessels (biofouling and discharge of ballast water) as well as towing infrastructure to the site. Activities will be short-term in duration (i.e. four months pre-construction activities and 18-months construction activities). The potential increased risk of introduction and spread of INNS will significantly following the completion of construction activities. Nevertheless, given the potential consequences and inherent risk from the introduction of INNS, the magnitude of effect is therefore **medium** prior to mitigation.

Maerl is considered to be of very high (international) importance or rarity as listed on the OSPAR List of Threatened and/or Declining Species and Habitats and as an Annex V species under the EU Habitats Directive and is therefore considered to be of **high sensitivity**. Maerl are particularly sensitive to invasive species which smother the seabed such as slipper limpet (*Crepidula fornicata)* and/or cause shading effects from invasive seaweed species such as *Sargassum muticum* (Perry *et al.*, 2024)

Assessment of Significance Prior to Mitigation

Given the assessment of sensitivity and magnitude as described above, the increased risk of introduction and spread of INNS during construction may have a **significant, negative** effect on maerl beds which is Significant.

Mitigation

- There will be mitigation by reduction through the implementation of the OEMP which includes measures for pollution prevention, biosecurity assessment and waste management;
- A MPCP and INNS management plan are included as part of the OEMP. These management plans detail the measures being taken to avoid the introduction and spread of INNS, including adherence to the BWM Convention and other applicable international regulations, as well as containment procedures in the unlikely event that INNS are found;
- Standard mitigation is to be undertaken, including for swapping out ballast water, cleaning hulls, floating structures, etc.

Specific measures outlined in the Sceirde Rocks MINNSMP include:

- All vessels to be used for construction, operation and maintenance, and decommissioning activities will follow guidance as directed by the 'Guidelines for the control and management of ships biofouling to minimize the transfer of invasive aquatic species' (IMO, 2023).
- Where applicable, all vessels will comply with the 'International Convention for the Control and Management of Ships' Ballast Water and Sediments' (IMO, 2021).
- Risk of INNS via the wet towing of GBS will be reduced with the treatment with anti-fouling paint. All anti-fouling paint will be compliant with The International Convention on the Control of Harmful Anti-fouling Systems on Ships (AFS

Convention), and the Sea Pollution (Control of Anti-Fouling Systems on Ships) Regulations 2008 (S.I. No. 82/2008).

- Contractors will be required to submit a Biosecurity Risk Assessment to the Environmental Manager at least six weeks prior to operations;
- The contractors must ensure that all equipment, materials, machinery, PPE and vessels used are in a clean condition prior to their arrival on site to minimise the risk of INNS introduction into the marine environment.
- Awareness of INNS, including identification guidance on the key risk species. If uncertainty arises, follow the contingency plan.
- Collaborate with the relevant Port Authority and other users of the offshore wind farm area to raise INNS awareness.
- Assess INNS risk of any slow moving or inactive craft and take steps.
- Ensure a Check, Clean and Dry message is sent to any new (sub) contractors.
- Confirm origin of material used in constructing of infrastructure.
- Ensure 'tool box' talks on INNS prevention and monitoring.
- Collaborate with the relevant Port Authority and other users of the offshore wind farm area to raise INNS awareness.
- Liaison with EPA and NWPS to identify any new INNS risks and thus potential mitigation requirements are well understood and enacted as soon as possible.
- Contingency plan protocol will be followed as outlined in project specific MINNSMP which outlines key Actions and responsibilities.

Residual Effect Following Mitigation

Given that the mitigation by design, with consideration of the implementation of the OEMP plan which includes measures to eliminate the potential for INNS through management and monitoring plans (e.g. INNS management plan), the residual effect will be a **likely, short-term, slight negative** effect which is Not Significant.

9.6.4 Operational and maintenance phase

9.6.4.1 Long term loss or damage to benthic habitats and species

The effect of long-term loss or damage to benthic habitats and species is captured within the construction phase assessment in Section 9.6.3.2. The construction phase assessment assesses the long-term effects extending through the operational and maintenance phase. It is noteworthy that during the operational and maintenance phase, there may be the need to top up jack-up pads with additional rock for irregular maintenance activities, but these will be on the same footprint as the original so will not have any additional impact with regard to the area affected. Similarly, there may need to be top-up of rock around foundations and/or cable but will be within the same protection footprint already assessed within construction. Cable repair may require the localised disturbance of recolonising sediment communities, but this will be highly localised, limited in extent and duration and occur within the project footprint already assessed under construction. As such, there will be no additional increase to the seabed footprint resulting from the operation and maintenance activities.

9.6.4.2 Hydrodynamic changes leading to scour around subsea infrastructure

Description of Effect

Based on the applied water depths, the assumed rock size for cable protection and the representative spring and neap flow speeds that occur across the Offshore Site, the assessment within Chapter 7: Marine Physical and Coastal Processes concludes there will be little to no development of edge scour. The potential for edge scour around the infrastructure such as supporting rock foundations and GBS are expected to be in the magnitude of centimetres and indiscernible from the natural variation of the Offshore Site which is characterised predominantly by rock outcrops and stony material.

Characterisation of Unmitigated Effect

Hydrodynamic changes leading to scour around subsea infrastructure is considered to be of **negligible** magnitude, given that the assessment within Chapter 7: Marine Physical and Coastal Processes concludes there will be little to no development of edge scour. Hydrodynamic changes leading to scour around subsea infrastructure has the potential to occur throughout the operational and maintenance phase (but the effect is considered very unlikely to occur; if it does, it will occur at a very low frequency or intensity). All benthic ecology receptors are considered to have some tolerance to accommodate this effect and will be able to recover or adapt, and therefore all benthic ecology receptors are considered to have **negligible** sensitivity.

Assessment of Significance Prior to Mitigation

Given the assessment of sensitivity and magnitude as described above, the hydrodynamic changes leading to scour around subsea infrastructure during operation will have an **imperceptible, negative** effect on benthic ecology receptors and is Not Significant.

Mitigation

- No further mitigation beyond the mitigation by design previously stated will be deployed.

Residual Effect Following Mitigation

The residual effect following mitigation is the same as the assessment of significance prior to mitigation. Therefore, given the **negligible** sensitivity of benthic ecology receptors, with the long-term nature of the effect, occurring at a very low frequency or intensity, the residual effect will be a likely, **imperceptible negative** effect and therefore is assessed to be Not Significant.

9.6.4.3 Temporary habitat or species loss / disturbance

Description of Effect

Temporary habitat disturbance to benthic habitats and species will occur during the operational and maintenance phase as a result of seabed disturbance associated with maintenance activities and cable repair or replacement activities. This temporary disturbance would occur intermittently over the operational life of the Project. However, the spatial extent would be highly localised and significantly less than the effects assessed for the construction phase. For instance, the most significant temporary disturbance from the construction phase was associated with the trenching of the cables, especially OEC which is a one-off occurrence. Any subsequent dredging or trenching would be in relation to the maintenance of discrete areas of the cable therefore affecting a significantly smaller area than during the construction phase and within the footprint already assessed under construction. As the benthic ecology receptors are the same as those assessed for the construction phase, the same sensitivity of receptors is applicable, namely:

- Stony and bedrock reef- Medium Sensitivity;
- Subtidal sands and gravels Medium Sensitivity;
- Subtidal Muds - Medium Sensitivity
- Maerl Beds – No sensitivity (due to avoidance).

Characterisation of Unmitigated Effect

The magnitude of effect will be significantly less, both in terms of duration and area extent than that of the construction phase and is therefore **negligible** given the temporary duration (i.e. lasting less than a year) with maintenance activities occurring at a low frequency throughout the Project life. Stony and bedrock reef and subtidal sands and gravels are considered to have **medium** sensitivity, while subtidal muds will have **low** sensitivity.

Assessment of Significance Prior to Mitigation

Given the assessment of sensitivity and magnitude as described above, the temporary habitat or species loss / disturbance during operation will have a **not significant, negative** effect on stony and bedrock reef and subtidal sands and gravels and an **imperceptible, negative** effect on subtidal muds and is Not Significant.

Mitigation

- Mitigation by design and mitigation by avoidance has been incorporated as the footprint during the operational and maintenance phase will significantly less than that of the construction phase. The use of environmental survey data to inform cable routeing and placement of gravity-based foundations and other infrastructure on the seabed during construction, with an emphasis on avoiding the most sensitive features will ensure that key sensitivities will be avoided during the operational and maintenance phase of the windfarm.

Residual Effect Following Mitigation

Given the mitigation by design and consideration of the **medium** to **low** sensitivity of benthic ecology receptors, with the temporary nature of the effect occurring at a low frequency, the residual effect will be a **likely, temporary, imperceptible negative effect** and therefore is assessed to be Not Significant.

9.6.4.4 Increased suspended sediment concentrations and associated deposition

Sediment disturbance will occur during the operational and maintenance phase as a result of seabed disturbance associated with maintenance activities and cable repair or replacement activities. This temporary disturbance would occur intermittently over the operational life of the Project.

9.6.4.4.1 *Stony and bedrock reef*

Description of Effect

As described in section 9.6.3.1.1, habitat resembling Annex I stony and bedrock reef is present across 30.3 km^2 (21.1 km^2 within the OAA and 9.2 km^2 along the OECC. The biotope complexes prevalent vary between seaweed and faunal dominated habitats on wave-exposed circalittoral rock. Increased SSCs have the potential to result in clogging of feeding and respiratory structures, especially for filter feeding species as suspended sediments re-settle to the seabed. The deposition of sediment has the potential to replace stony reef habitat, smothering the existing epifauna and modifying the substrate from rock to sand thus preventing any recovery and loss of the biotope in the immediate area.

Characterisation of Unmitigated Effect

Increased SSC and associated deposition during the operational and maintenance phase have the potential to cause a light smothering effect on stony and bedrock reef. Increased SSC and associated deposition will occur during the operational and maintenance phase as a result of seabed disturbance associated with maintenance activities and cable repair or replacement activities and will be therefore highly localised and infrequent events.

Increased SSC will be brief (i.e. less than a day) with sediment deposition is considered temporary in nature (i.e. less than a year). Overall, the magnitude of effect is likely to be **negligible**.

The epifaunal communities of the reef habitats are predicted to have a low intolerance, high resistance and high resilience to suspended sediments, (Stamp *et al.,* 2023), and therefore are not considered as sensitive to suspended sediments. Similarly, stony and bedrock reef are also assessed to have high resilience and resistance and not sensitive to light smothering (Readman and Hiscock, 2017; Readman *et al.*, 2023a, 2023b) which is what could be expected from the disturbance associated with sediment resuspension for repair and maintenance activities during construction. Overall, stony and bedrock reef are assessed to be of **low** sensitivity.

Assessment of Significance Prior to Mitigation

Given the assessment of sensitivity and magnitude as described above, the increased SSC and deposition during operation will have an **imperceptible, negative** effect on stony and bedrock reef which is Not Significant.

Mitigation

No further mitigation beyond the mitigation by design previously stated will be deployed.

Residual Effect Following Mitigation

The residual effect following mitigation is the same as the assessment of significance prior to mitigation. Therefore, the residual effect will be a **likely, temporary**, **imperceptible negative** effect which is Not Significant.

9.6.4.4.2 *Subtidal sands and gravels*

Description of Effect

As described in section 9.6.3.1.2, there are a variety of subtidal sands and gravels present within the Offshore Site including circalittoral coarse sediment, deep circalittoral coarse sediment, circalittoral fine sand, circalittoral muddy sand, deep circalittoral sand, circalittoral mixed sediments and deep circalittoral mixed sediments. The biotope complexes associated with subtidal sands and gravels include:

- *Protodorvillea kefersteini* and other polychaetes in impoverished circalittoral mixed gravelly sand (A5.143);
- Echinocyamus pusillus, Ophelia borealis and Abra prismatica in circalittoral fine sand (A5.251);
- Medium to very fine sand, 100-120 m, with polychaetes *Spiophanes kroyeri*, *Amphipectene auricoma*, *Myriochele sp.*, *Aricidea wassi* and amphipods *Harpinia antennaria* (A5.253); and
- *Owenia fusiformis* and *Amphiura filiformis* in deep circalittoral sand or muddy sand (A5.272).

Characterisation of Unmitigated Effect

Increased SSC and associated deposition will occur during the operational and maintenance phase as a result of seabed disturbance associated with maintenance activities and cable repair or replacement activities. The associated increased SSC and deposition during the operational and maintenance phase has the potential to cause a light smothering effect on subtidal sands and gravels.

Increased SSC will be brief (i.e. less than a day) with sediment deposition is considered temporary (i.e. less than a year) in duration. Overall, the magnitude of effect is likely to be **negligible**.

All subtidal sands and gravels are considered to be not sensitive or have low sensitivity to changes in suspended solids, with medium to high resilience and resistance (De-Bastos, 2023; Tillin and Watson, 2023, 2024). With regards to smothering and siltation rate changes, no evidence is presented for the sediment biotope '*Protodorvillea kefersteini* and other polychaetes in impoverished circalittoral mixed gravelly sand' (Tillin and Watson, 2023); however, other subtidal sands and gravels habitats have high resilience and low sensitivity to light smothering which may be experienced through the operational and maintenance phase. Overall, offshore sands and gravels are assessed to be of **low** sensitivity.

Assessment of Significance Prior to Mitigation

Given the assessment of sensitivity and magnitude as described above, the increased SSC and associated deposition during operation will have an **imperceptible, negative** effect on subtidal sands and gravels which is Not Significant.

Mitigation

No further mitigation beyond the mitigation by design previously stated will be deployed.

Residual Effect Following Mitigation

The residual effect following mitigation is the same as the assessment of significance prior to mitigation. Therefore, the residual effect will be a **likely, temporary**, **imperceptible negative** effect which is Not Significant.

9.6.4.4.3 *Subtidal muds*

Description of Effect

The benthic survey found that subtidal muds were less prevalent throughout the Offshore Site as a whole, with the highest subtidal mud concentrations along the OECC and smaller proportions observed within the OAA. The subtidal muds habitats were classified as circalittoral sandy mud and deep circalittoral mud, with the biotope '*Myrtea spinifera* and polychaetes in offshore circalittoral sandy mud' (A5.377).

Characterisation of Unmitigated Effect

Increased SSC and associated deposition will occur during the operational and maintenance phase as a result of seabed disturbance associated with maintenance activities and cable repair or replacement activities. The associated increased SSC and deposition during the operational and maintenance phase has the potential to cause a light smothering effect on subtidal mud habitats.

Increased SSC during operations will be highly localised and brief (i.e. less than a day) with any sediment deposition considered temporary (i.e. less than a year) in duration. Overall, the magnitude of effect is likely to be **negligible**.

The subtidal mud biotope '*Myrtea spinifera* and polychaetes in offshore circalittoral sandy mud' is considered to have high resilience and resistance to changes in suspended solids and light smothering and is generally not sensitive to such disturbances (De-Bastos, 2016). As such, subtidal muds are assessed to be of **low** sensitivity.

Assessment of Significance Prior to Mitigation

Given the assessment of sensitivity and magnitude as described above, the increased SSC and associated deposition during operation will have an **imperceptible**, **negative** effect on subtidal muds which is Not Significant.

Mitigation

- No further mitigation beyond the mitigation by design previously stated will be deployed.

Residual Effect Following Mitigation

The residual effect following mitigation is the same as the assessment of significance prior to mitigation. Therefore, the residual effect will be a **likely, temporary**, **imperceptible negative** effect which is Not Significant.

9.6.4.4.4 *Maerl beds*

Description of Effect

Maerl beds were identified at two locations within the OAA and classified as the habitat complexes A5.51 'Maerl beds' and A5.511 '*Phymatolithon calcareum* maerl beds in infralittoral clean gravel or coarse sand', located ~ 6.5km from the closest known maerl beds occurring at the Kilkieran Bay and Islands SAC. The maerl observed consisted of pink encrusting algae, hedgehog maerl, maerl nodules and maerl gravel (Ocean Ecology Limited, 2024; see Appendix 9-1). Maerl is listed as an Annex V species under the EU Habitats Directive.

Characterisation of Unmitigated Effect

Increased SSC and associated deposition during the operational and maintenance phase will have a likely, indirect adverse effect on maerl beds given that there is potential for localised sediment resuspension across the OAA; however, there are a number of factors which will reduce the exposure of maerl beds to any indirect effects, including: the distance between the Project activities from maerl beds; the nature of the disturbed material being comprised of coarse sands and gravels which are not likely to enter into suspension (and remain localised); and the relatively localised extent and temporary (i.e. less than one year) duration of maintenance activities. Therefore, the magnitude of effect is considered to be **negligible**.

Maerl is considered to be of very high (international) importance or rarity as listed on the OSPAR List of Threatened and/or Declining Species and Habitats and as an Annex V species under the EU Habitats Directive. Maerl is considered to have a high sensitivity to smothering and siltation rate changes (light and heavy) and medium sensitivity to changes in suspended solids (water clarity) (Perry *et al.,* 2024) and therefore maerl is considered to be of **high** sensitivity overall.

Assessment of Significance Prior to Mitigation

Given the assessment of sensitivity and magnitude as described above, increased SSC and associated deposition during the operational and maintenance phase will be **not significant**, **negative** effect on maerl which is Not Significant.

Mitigation

- Mitigation by design as environment survey data has been used to inform the location and spatial extent of Project activities (including disposal areas) such that there will be no direct effects to maerl beds.
- The installed cables (IAC) within the array area closest to the maerl beds will not be buried but will be located within rocky substrata and rock protected, which will limit the potential to suspend sediments in the vicinity of the Maerl beds.
- The nearest cable burial where potential localised sediment plumes may be incurred will take place ~2.5 km to the SE on the OEC.

Residual Effect Following Mitigation

The residual effect following mitigation is the same as the assessment of significance prior to mitigation. Therefore, the residual effect will be a **not significant, negative** effect which is Not Significant.

9.6.4.5 Colonisation of hard structures

Description of Effect

Subsea infrastructure from offshore wind farms can provide potential new novel hard structures for colonisation by epilithic species. The introduction of hard infrastructure will alter previously soft sediment habitat areas which can attract new species with a preference for colonising hard substrates.

The long-term footprint of the Offshore Site is 1.674 km^2, with up to 2,545,582 m^3 of habitat creation associated with the volume of the rock for GBS foundations stonebeds, the rock for the WTIV stonebeds, the hard substrate for the IAC and OEC cable protection. The presence of the above infrastructure will introduce new hard structures, with the potential for encrusting epifauna typical of local bedrock and stony epifauna and flora including hydroids, bryozoans, sponges and seaweeds to colonise. As these will extend to the sea surface, a zonation of encrusting flora and fauna are expected to colonise the vertical extent of the structures in the water column from the sublittoral to the littoral. However, the lack of structural complexity on the WTG and OSS structures makes it unlikely that highly diverse communities will develop, however, all colonisation represents additional productivity and food supply within the local ecosystem. It is not anticipated that the long-term provision of novel hard substrate will result in the effect propagating up the food chain. To reduce the footprint of the cable protection, the cables associated with the Offshore Site will be buried where possible and cable protection will only be required where sufficient burial depth is not achieved or where there are cable crossings. This assessment assumes 100% of the IACs will require rock protection (e.g. rock berm) resulting in a footprint of 1.282 km^2. For the OEC, it is assumed that 21.5% of the OEC will be surface laid requiring cable protection resulting in a footprint of 0.164 km^2. The Offshore Site is comprised of a variety of course, sandy and mixed sediments (~42.5 km^2), particularly along the OECC (34.4 km^2); however, there are also large regions of mud habitat along the OECC (20.2 km^2). Additionally, there are large areas of rocky substrate classified as reef habitat (30.3 km^2), notably within the OAA (21.2 km^2).

Langhamer (2012) explained that the new benthic habitats resulting from the introduction of renewable structures including scour protection, can compensate for habitat loss. It can be expected that introduced protective rock will be colonised with similar species associated with the existing stony and bedrock reef habitats, with recruitment from nearby unaffected sites. However, it should be considered that the uniform rock deposits that will be placed on the seabed will not have the same level of structural complexity as the existing substrates, especially when considering that this will replace mainly bedrock habitats in the OAA and sediment habitats across the cable route and given the aforementioned cable burial. The introduced rock can be considered to provide surrogate substrate and ecosystem complexity that may influence productivity and diversity through colonising organisms as well as providing shelter from predation. It is recognised that there is some uncertainty about how much of a positive effect on biodiversity (if any) there may be. The ScotMER working group considered that new infrastructure such as WTG may be associated with increased biodiversity (Scottish Government, 2024). Bearing in mind that the infrastructure will provide a higher relief substrate (in the areas where sediment habitats were previously) with potentially lowered sediment scouring, there may be potentially a net increase in faunal biodiversity and biomass in the vicinity of the installed infrastructure. It should also be mentioned that there is a potential that ecological effects of the increase in marine growth on the structures may add to the enrichment of organic material in the surrounding seabed sediments which may have a localised effect on the infauna communities present. However, this effect is expected to be a very localised with low consequence to the overall ecological function of the surrounding habitats.

Characterisation of Unmitigated Effect

The benthic receptors across the Offshore Site are broadly considered to be of **medium** to **high** sensitivity, with sands and mud substrates in particular being particularly sensitive given that introduced structures in these areas will represent a fundamental long-term change from a benthic infaunal sediment community to one which is characterised by hard substrata (see Section 9.6.3.2). Therefore, it is assumed that the introduction of hard structures represents a long-term shift away from the existing baseline conditions in some areas, with a long-term duration) occurring once.

However, it should be noted that almost all of the hard structures that will be introduced will be placed within the OAA, including all of the rock foundations for the WTGs and jack-up activities and protection material for the inter array cables, as well as up to 20% of the OECC, where more coarse substrates and rock may be encountered. The OAA is predominantly characterised as stony and bedrock reef and it is therefore considered that introduced rock and structures within the OAA will present an opportunity for the colonisation of epifaunal communities found in adjacent areas, especially the robust species such as bryozoans, soft corals such as *Alcyonium digitatum* and red seaweeds (where water depths are sufficiently shallow). Based on this and given the relatively small footprint compared with the unaffected wider communities which are prevalent across an extensive area, the effect is defined as being of **low** magnitude.

Assessment of Significance Prior to Mitigation

The colonisation of hard structures during operation will have a **not significant to moderate, negative** effect on benthic ecology receptors which is Not Significant.

Mitigation

Cable burial will be the first choice of protection along the OECC where sediment habitats are more prominent.

Residual Effect Following Mitigation

The residual effect following mitigation is the same as prior and therefore the residual effect is a **not significant to moderate, negative** effect which is Not Significant.

9.6.4.6 Effect of cable thermal load or EMF on benthic ecology

9.6.4.6.1 *EMF*

Description of Effect

The quantification of EMF within the benthic ecology study area is detailed in section 9.6.2 above. EMF B-field strength associated with the IACs and OEC are presented in Table 9-20. As background geomagnetism at the Offshore Site is ca. 50 µT, it is likely that EMF levels are not detectable above background geomagnetism beyond the immediate proximity of the cable.

Characterisation of Unmitigated Effect

There will be installation of 73 km of HVAC IACs (132 kV) and 63.5 km of HVAC OEC (220 kV). All cables will be buried to a target burial depth of 1.0 m where possible or secured through additional cable protection (e.g. cast-iron shells). The cast iron shells will result in EMF less than background levels. There will be a cable protection footprint of 1,282,082 m^2 for the IACs, and 164,473 m^2 for the OEC. The cables will be present and actively emitting EMF and thermal emissions or a long-term duration (i.e. the operational life of 38 years). The burial of cables and other protective measures such as cable protection separates the most sensitive species from the source of the emissions, thereby reducing the field strength likely to be encountered (e.g. at the seabed) (Copping *et al.,* 2020). In addition, design parameters and installation methods will conform to industry standard specifications which includes shielding technology to reduce the direct emission of EMFs. Given that the EMF levels will not be detectable above background geomagnetism beyond the immediate proximity of the cable, the magnitude of effect is **negligible**.

Although the effects of EMF on benthic communities are not well understood, recent scientific studies suggest that benthic communities growing along cables route are similar to those in nearby baseline areas, and where species are not found this is likely due to the physical presence of the cable and surface properties, rather than an EMF effect (Copping and Hemery, 2020). Therefore, in the absence of any clear indication of receptor sensitivity, all benthic receptors are assessed as having **medium** sensitivity.

Assessment of Significance Prior to Mitigation

Given the low magnitude of effect and medium sensitivity, it is assessed that EMF during operation will have a **not significant, negative** effect on benthic ecology receptors and is Not Significant.

Mitigation

- There will be mitigation by reduction in the form of reducing exposure to the effect as cables will be buried as the first choice of protection to a target depth of 1.0 m, acting as a barrier between benthic habitats and species and the source of effects; and
- Cast iron shells will be used on surface cable in which EMF will be within background levels.

Residual Effect Following Mitigation

Given the mitigation by design and consideration of the **medium** sensitivity of benthic ecology receptors, with the long-term nature of the effect occurring frequently, the residual effect will be a likely, **not significant, negative** effect and therefore is assessed to be Not Significant.

9.6.4.6.2 *Thermal Load*

Description of Effect

Heat is emitted from submarine cables as the electrical current loses energy leading to cable surface heating and subsequent warming of the surrounding environment in a process called resistive heating. Buried cables can heat up the soil around them but it is unclear the effects they may have on the biota surrounding them. An ecological report carried out for the Viking Link Interconnector, proposed to link the electricity transmission systems between Great Britain and Denmark indicated only deep burrowing invertebrates had the potential to be exposed to 'trivial heating' (Viking Link, 2017). As the project is using HVAC cables it is anticipated that there will be higher heat loss compared to using HVDC cables as high voltages reduces environmental effects caused by heat loss (OSPAR, 2009).

Characterisation of Unmitigated Effect

There will be installation of 73 km of HVAC IACs (132 kV) and 63.5 km of HVAC export cable (220 kV). All cables will either be buried to a minimum target burial depth of 1.0 m or secured through additional cable protection.

A substantial increase in sediment temperature can potentially alter the physical and chemical properties of the substratum such as the oxygen concentration. These changes can have knock on effects (or indirect effects) that lead to alterations in the microorganism communities (Rhoads and Boyer, 1982; OSPAR Commission, 2008).

In the absence of any clear indication of receptor sensitivity, all benthic receptors are assessed as having **medium** sensitivity. When considering the relatively limited extent of the possible thermal effect of the buried or protected cables, the effect is defined as being of **low** magnitude. Any effects are therefore unlikely to affect the long-term functioning of the other benthic receptors within the benthic ecology study area.

Assessment of Significance Prior to Mitigation

Thermal load during the operational and maintenance phase will have a **slight, negative effect** on benthic ecology receptors which is Not Significant.

Mitigation

- There will be mitigation by reduction in the form of reducing exposure to the effect as cables will be buried up to 1.0 m as the first choice of protection, acting as a barrier between benthic habitats and species and the source of effects; and
- Cast iron shells will be used on surface cable in which EMF will be within background levels.

Residual Effect Following Mitigation

Given the mitigation by design and consideration of the **medium** sensitivity of benthic ecology receptors, with the long-term nature of the effect occurring at a **low** magnitude the residual effect will be a likely, **slight, negative** effect which is Not Significant.

9.6.4.7 Increased risk of introduction and spread of INNS

Description of Effect

As described in section 9.5.2.2.3, two non-native taxa were identified during the benthic survey: the polychaete *Goniadella gracilis* and the amphipod *Monocorophium sextonae*. The polychaete *G. gracilis* was observed 42 times in low abundance (≤ 3 individuals) in ~45% of the grab samples across 17 stations in the OAA. Both *G. gracilis* (one station, nine individuals) and *M. sextonae* (three stations, six individuals) were observed along the OECC. Additional taxa recorded within the sediment eDNA samples include two INNS Japanese seaweeds: *Fibrocapsa japonica*, and *Dasysiphonia japonica*.

INNS can have a detrimental effect on benthic ecology through predation on existing wildlife or outcompeting for prey and habitat. This can result in biodiversity changes in the existing habitats present in the benthic ecology study area. Depending on the INNS species introduced, this could potentially lead to complete loss of certain species and may result in new habitats forming (e.g. reef-forming species).

Characterisation of Unmitigated Effect

As described in Section 9.6.3.4, marine INNS may be introduced or transferred by vessels, such as through biofouling (e.g. attachment of organisms to boat hulls) or discharge of ballast water. Furthermore, the presence of infrastructure and introduced rock throughout the operational life may provide colonising surfaces for INNS. There is potential for the increased risk of introduction and spread of INNS as a result of operational activities (e.g. vessel transit for maintenance activities); however, it is anticipated that the risk associated with the introduction and spread of INNS during operation will be much less than that described for the construction phase. During operation, there will be up to three maintenance vessels utilised, with four daily return movements for the two crew-transfer vessels. It is anticipated that there will be up to five (unscheduled) interventions for cable repair over the Project life. Additionally, a cable survey will be conducted annually for the first five years and once every five years after that. All vessels are required to adhere to international guidelines (e.g. BWM Convention). Given that the risk associated with the introduction and spread of INNS during operation will be of a lesser extent than that described for the construction phase, the magnitude is of change is **considered low**.

The benthic receptors across the Offshore Site are broadly considered to be of **medium** sensitivity (stony and bedrock reef, subtidal muds) to **high** sensitivity for subtidal sands and gravels, given that biotopes associated with subtidal sands and gravels, such as *Echinocyamus pusillus*, *Ophelia borealis* and *Abra prismatica* in circalittoral fine sand, are considered to have high sensitivity (Tillin and Watson, 2024), and for maerl beds.

Assessment of Significance Prior to Mitigation

Given the assessment of sensitivity and magnitude as described above, the increased risk of introduction and spread of INNS during operation will have a **not significant, negative** effect on stony and bedrock reef and is Not Significant.

Mitigation

- A MINNSMP are included as part of the OEMP. These management plans detail the measures being taken to avoid the introduction and spread of INNS, including adherence to the BWM Convention and other applicable international regulations, as well as containment procedures in the unlikely event that INNS are found; and
- Standard mitigation will be undertaken, including for swapping out ballast water, cleaning hulls, floating structures, etc.

Specific measures outlined in the Sceirde Rocks MINNSMP include:

- All vessels to be used for construction, operation and maintenance, and decommissioning activities will follow guidance as directed by the 'Guidelines for the control and management of ships biofouling to minimize the transfer of invasive aquatic species' (IMO, 2023);
- Where applicable, all vessels will comply with the 'International Convention for the Control and Management of Ships' Ballast Water and Sediments' (IMO, 2021).

- Risk of INNS via the wet towing of GBS will be reduced with the treatment with anti-fouling paint. All anti-fouling paint will be compliant with The International Convention on the Control of Harmful Anti-fouling Systems on Ships (AFS Convention), and the Sea Pollution (Control of Anti-Fouling Systems on Ships) Regulations 2008 (S.I. No. 82/2008);
- Contractors will be required to submit a Biosecurity Risk Assessment to the Environmental Manager at least six weeks prior to operations;
- The contractors must ensure that all equipment, materials, machinery, PPE and vessels used are in a clean condition prior to their arrival on site to minimise the risk of INNS introduction into the marine environment;
- Awareness of INNS, including identification guidance on the key risk species. If uncertainty arises, follow the contingency plan;
- Collaborate with the relevant Port Authority and other users of the offshore wind farm area to raise INNS awareness;
- Assess INNS risk of any slow moving or inactive craft and take steps;
- Ensure a Check, Clean and Dry message is sent to any new (sub) contractors;
- Confirm origin of material used in constructing of infrastructure;
- Ensure ‘tool box’ talks on INNS prevention and monitoring;
- Collaborate with the relevant Port Authority and other users of the offshore wind farm area to raise INNS awareness;
- Liaison with Environmental Protection Agency (EPA) and National Parks and Wildlife Service (NWPS) to identify any new INNS risks and thus potential mitigation requirements are well understood and enacted as soon as possible; and
- If required, a Contingency plan protocol will be followed as outlined in project specific MINNSMP which outlines key actions and responsibilities.

Residual Effect Following Mitigation

Given that the mitigation by design, with consideration of the measures included as part of the MINNSMP, the residual effect will be a **likely, long-term to permanent, imperceptible negative** effect and is assessed to be Not Significant.

9.6.5 Decommissioning Phase

The decommissioning activities will largely resemble the reverse of the installation and therefore the likely effects associated with the decommissioning phase are considered to be analogous or likely less than that of the construction phase. Decommissioning will span two summer seasons. The decommissioning base locations will be out of Foynes, Cork and/or Belfast. Up to three vessels will be used for WTG removal and up to four tugs for foundation removal unless otherwise required. For infrastructure removal the installation process is reversed using vessels to remove the WTGs and then to de-ballast the seawater for the foundations and wet tow them from the site. Rock dump and/or seabed preparation material is assumed to be left in situ. Decommissioning of the cables will involve removal of any exposed or unburied and accessible cable. All rock berms will remain undisturbed. This method has the lowest environmental effect. Further information on the decommissioning process is detailed within the Rehabilitation Plan (see Appendix 5-18 of Chapter 5: Project Description). Taking this into consideration, along with the mitigation by design which will also be applicable to decommissioning, the effects associated with the Decommissioning Phase are Not Significant for all benthic ecology receptors.

9.6.5.1 Removal of hard substrate during decommissioning

Description of Effect

Decommissioning will be the reverse of the installation process, with WTGs and OSS removed and the ballast material removed from foundations. Structures used for seabed preparation, including stonebeds, will likely be decommissioned *in situ*. IACs will likely be decommissioned *in situ* where buried; unburied IACs would be cut and removed. Rock berms will likely remain undisturbed, as this method is likely to result in the lowest environmental effect.

Characterisation of Unmitigated Effect

The removal of hard substrate during decommissioning will have a likely, short-term adverse effect on benthic ecology receptors. The decommissioning activities will be short-term in nature (i.e. spanning up to two summer seasons), occurring once. Where hard structures are removed, there is potential for the associated loss of colonisation by sessile epifauna on these artificial structures; however, structures used for seabed preparation, including stonebeds, will likely be decommissioned *in situ* and rock berms will likely remain undisturbed, as this method is likely to result in the lowest environmental effect. A detailed description of decommissioning is provided within the Decommissioning Plan (see Chapter 5: Project Description). As assessed for the operational and maintenance phase above, the residual effect associated with the colonisation of hard structures is considered to be not significant. Any removal of hard structures will result in a reduction in the long-term footprint, with the surrounding benthic habitats remaining intact, allowing for the potential of recruitment and recolonisation of the seabed left behind from the undisturbed areas. It is noted that this recovery period will follow the temporary disturbance associated with the physical removal of the infrastructure. Therefore, the potential effect is not expected to exceed that assessed for construction and operational and maintenance phases and rather is considered to be of a lesser extent. All benthic receptors are considered to be of medium to high sensitivity to direct disturbance, however, the sensitivity of the colonisation of introduced hard structures was assessed as medium sensitivity. The receptor sensitivity is expected to be similar or lower for the removal of these structures and therefore considered to be of **medium** sensitivity. Given the short-term duration with the highly localised nature of decommissioning activities which will result in less disturbance than construction and operation, the magnitude of effect is **negligible**.

Assessment of Significance Prior to Mitigation

Given the assessment of sensitivity of medium sensitivity magnitude as described above, the removal of hard substrate during decommissioning will have a **not significant, negative** effect on benthic ecology receptors which is Not Significant.

Mitigation

- Structures used for seabed preparation, including stonebeds, will be decommissioned *in situ*. IACs will be decommissioned *in situ* where buried; unburied and accessible IACs will be cut and removed. Rock berms will remain undisturbed, as this method is likely to result in the lowest environmental effect; and
- Rehabilitation Plan (see Appendix 5-18 of Chapter 5: Project Description).

Residual Effect Following Mitigation

Given the mitigation by design and consideration of the medium sensitivity of benthic ecology receptors from the removal of hard surfaces, with the nature of the effect occurring at a **negligible** magnitude, the residual effect is a **not significant**, negative effect which is Not Significant.

9.7 Residual Effects

9.7.1 Construction Phase

9.7.1.1 Temporary habitat or species loss / disturbance

Table 9-25 Summary of the residual effect for temporary habitat or species loss / disturbance during construction

Receptor	Sensitivity	Magnitude	Assessment of Significance Prior to Mitigation	Mitigation	Residual Effect
Stony and bedrock reef	Medium	Low	Slight, negative; Not Significant.	As per the mitigation by design in section 9.4.3.4.	Not significant, negative; Not Significant.
Subtidal sands and gravels	Low	Low	Slight, negative; Not Significant.		Slight, negative; Not Significant.
Subtidal muds	Medium	Low	Slight, negative; Not Significant.		Slight, negative; Not Significant.
Maerl beds	High	Negligible	Not Significant; Not Significant		Not Significant; Not Significant.

9.7.1.2 Long term loss / damage to benthic habitats and species

Table 9-26 Summary of the residual effect for long term loss / damage to benthic habitats and species during construction

Receptor	Sensitivity	Magnitude	Assessment of Significance Prior to Mitigation	Mitigation	Residual Effect
Stony and bedrock reef	High	Low	Moderate, negative; Not Significant.	As per the mitigation by design in section 9.4.3.4.	Slight, negative; Not Significant.
Subtidal sands and gravels	High	Low	Moderate, negative; Not Significant.		Moderate, negative; Not Significant.
Subtidal muds	High	Negligible	Not significant; Not Significant.		Not Significant; Not Significant.
Maerl beds	High	Negligible	Not significant; Not Significant.		Not Significant; Not Significant.

9.7.1.3 Increased SSC and associated deposition

Table 9-27 Summary of the residual effect for increased SSC and associated deposition during construction

Receptor	Sensitivity	Magnitude	Assessment of Significance Prior to Mitigation	Mitigation	Residual Effect
Stony and bedrock reef	High	Low	Moderate, negative; Not Significant.	As per the mitigation by design in section 9.4.3.4.	Not significant, negative; Not Significant.
Subtidal sands and gravels	Medium	Low	Slight, negative; Not Significant.		Slight, negative; Not Significant.
Subtidal muds	Medium	Low	Slight, negative; Not Significant.		Slight, negative; Not Significant.
Maerl beds	High	Low	Moderate, negative; Not Significant.		Not significant, negative; Not Significant.
Designated Sites/ protected features	High	Negligible	Not significant, negative; Not Significant.		Not significant, negative; Not Significant.

9.7.1.4 Increased risk of introduction and spread of INNS

Table 9-28 Summary of the residual effect for increased risk of introduction and spread of INNS during construction

Receptor	Sensitivity	Magnitude	Assessment of Significance Prior to Mitigation	Mitigation	Residual Effect
Stony and bedrock reef	Medium	Medium	Moderate, negative; Not Significant.	As per the mitigation by design in section 9.4.3.4.	Slight, negative; Not Significant.
Subtidal sands and gravels	High	Medium	Significant, negative; **Significant**.		Slight, negative; Not Significant.
Subtidal muds	Medium	Medium	Moderate, negative; Not Significant.		Slight, negative; Not Significant.
Maerl beds	High	Medium	Significant, negative; **Significant**.		Slight, negative; Not Significant.

9.7.2 Operational and maintenance phase

9.7.2.1 Hydrodynamic changes leasing to scour around subsea infrastructure

Table 9-29 Summary of the residual effect of hydrodynamic changes leading to scour around subsea infrastructure during the operational and maintenance phase

Receptor	Sensitivity	Magnitude	Assessment of Significance Prior to Mitigation	Mitigation	Residual Effect
All benthic ecology receptors	Negligible	Negligible	Imperceptible, negative; Not Significant.	As per the mitigation by design in section 9.4.3.4.	Imperceptible, negative; Not Significant.

9.7.2.2 Temporary habitat or species loss / disturbance

Table 9-30 Summary of the residual effect of temporary habitat or species loss / disturbance during the operational and maintenance phase

Receptor	Sensitivity	Magnitude	Assessment of Significance Prior to Mitigation	Mitigation	Residual Effect
Stony and bedrock reef	Medium	Negligible	Not significant, negative; Not Significant.	As per the mitigation by design in section 9.4.3.4.	Imperceptible, negative; Not Significant.
Subtidal sands and gravels	Medium		Not significant, negative; Not Significant.		
Subtidal muds	Low		Imperceptible, negative; Not Significant.		
Maerl beds	No Effect				No impact pathway; Not Significant.

9.7.2.3 Increased SSC and associated deposition

Table 9-31 Summary of the residual effect of increased SSC and associated deposition during the operational and maintenance phase

Receptor	Sensitivity	Magnitude	Assessment of Significance Prior to Mitigation	Mitigation	Residual Effect
Stony and bedrock reef	Low	Negligible	Imperceptible, negative; Not Significant.	As per the mitigation by design in section 9.4.3.4.	Imperceptible, negative; Not Significant
Subtidal sands and gravels	Low	Negligible	Imperceptible, negative; Not Significant.		Imperceptible, negative; Not Significant
Subtidal muds	Low	Negligible	Imperceptible, negative; Not Significant.		Imperceptible, negative; Not Significant
Maerl beds	High	Negligible	Not significant, negative; Not Significant		Not significant, negative; Not Significant

9.7.2.4 Colonisation of hard structures

Table 9-32 Summary of the residual effect of colonisation of hard structures during the operational and maintenance phase

Receptor	Sensitivity	Magnitude	Assessment of Significance Prior to Mitigation	Mitigation	Residual Effect
All benthic ecology receptors	Medium to High	Low	Not significant to moderate, negative; Not Significant.	As per the mitigation by design in section 9.4.3.4.	Not significant to moderate, negative; Not Significant.

9.7.2.5 Effect of cable thermal load or EMF on benthic ecology

9.7.2.5.1 *EMF*

Table 9-33 Summary of the residual effect of EMF on benthic ecology during the operational and maintenance phase

Receptor	Sensitivity	Magnitude	Assessment of Significance Prior to Mitigation	Mitigation	Residual Effect
All benthic ecology receptors	Medium	Negligible	Not significant, negative; Not Significant.	As per the mitigation by design in section 9.4.3.4.	Not significant, negative; Not Significant.

9.7.2.5.2 Thermal load

Table 9-34 Summary of the residual effect of cable thermal load on benthic ecology during the operational and maintenance phase

Receptor	Sensitivity	Magnitude	Assessment of Significance Prior to Mitigation	Mitigation	Residual Effect
All benthic ecology receptors	Medium	Low	Slight, negative; Not Significant.	As per the mitigation by design in section 9.4.3.4.	Slight, negative; Not Significant.

9.7.2.6 Increased risk of introduction and spread of INNS

Table 9-35 Summary of the residual effect of increased risk of introduction and spread of INNS during the operational and maintenance phase

Receptor	Sensitivity	Magnitude	Assessment of Significance Prior to Mitigation	Mitigation	Residual Effect
Stony and bedrock reef	Medium	Negligible	Not significant, negative; Not Significant.	As per the mitigation by design in section 9.4.3.4.	Not significant, negative; Not Significant.
Subtidal sands and gravels	High				
Subtidal muds	Medium				
Maerl beds	High				

9.7.3 Decommissioning Phase

9.7.3.1 Removal of hard substrate during decommissioning

Table 9-36 Summary of the residual effect of removal of hard substrate during decommissioning

Receptor	Sensitivity	Magnitude	Assessment of Significance Prior to Mitigation	Mitigation	Residual Effect
All benthic ecology receptors (excluding maerl beds as not directly impacted)	Medium	Negligible	Not significant, negative; Not Significant.	As per the mitigation by design in section 9.4.3.4.	Not significant, negative; Not Significant.

9.8 Cumulative Effects

Potential effects from the Project have the potential to interact with those from other projects (developments), plans and activities, resulting in cumulative effects on benthic ecology receptors. The general approach to the cumulative effects assessment is described in Chapter 4: EIA Methodology. An initial screening has been undertaken to produce a long list of developments for each EIA topic.

The cumulative study area for benthic ecology is defined as a 15 km buffer around the OAA and OECC plus the Shannon Estuary. The benthic ecology study area is consistent with that of Chapter 7: Marine Physical and Coastal Processes which covers the area over which effects on marine physical processes may occur. It is considered that this study area will encompass all cumulative projects and developments which have the potential for connectivity with benthic habitats and species within the Offshore Site and associated construction, operation and maintenance, and decommissioning activities occurring within the Offshore Site and adjacent waters. Additionally, the Shannon Estuary has been considered as part of the cumulative effects assessment in consideration of the potential temporary anchorage and movement of Project vessels within the estuary.

The developments within the cumulative study area for benthic ecology are summarised in Table 9-37 below. Table 9-37 assesses the long-list of developments to produce a short-list of developments 'screened-in' for the cumulative effects assessment for benthic ecology. It is important to note that there are no major infrastructure developments of an equivalent scale or type to the Project within the cumulative study area for benthic ecology. To date, there has been little large-scale construction on the west coast of Ireland generally. Therefore, the developments listed in Table 9-37 represent short-term, localised activities which are not generally associated with any long-term infrastructure presence.

A number of planned offshore renewable developments (at various levels of inception) were proposed to be developed off the western coast of Ireland before the State's policy changed to a plan-led regime. Current policy is such that none of these projects are permitted to seek a Maritime Area Consent (MAC) or make a planning application. However, whether any of them may progress in the future is entirely dependent on future policy decisions. Several foreshore licence applications have been made, primarily in relation to environmental surveys in support of these renewable developments. In this context, we do not have sufficient information to consider these renewables developments, or associated foreshore licences for survey works any further. Therefore, the Project is the only Relevant Project / Phase 1 offshore renewable development in the region with a MAC, the only offshore wind development in the region which was successful in Offshore Renewable Electricity Support Scheme (ORESS) 1 and the only offshore wind development in the region, which is permitted to make a planning application.

Table 9-37 List of developments considered for the benthic ecology cumulative effects assessment

Development Type	Status	Screened In / Screened Out	Justification
Foreshore Licenses	Concept / Early Planning	Screened Out	The Project is the only Relevant Project / Phase 1 offshore renewable development in the region with a Maritime Area Consent (MAC), the only offshore wind development in the region which was successful in Offshore Renewable Electricity Support Scheme (ORESS) 1 and the only offshore wind development in the region, which is permitted to make a planning application. A number of planned offshore renewable developments (at various levels of inception) were proposed to be developed off the western coast of Ireland before the State's policy changed to a plan-led regime. The current policy is such that none of these projects are permitted to seek a MAC or make a planning application. However, whether any of them may progress in the future is entirely dependent on future policy decisions. Several foreshore licence applications have been made, primarily in relation to environmental surveys in support of these renewable developments. In this context, we do not have sufficient information to consider these renewables developments, or associated foreshore licences for survey works any further.
Aquaculture	Operational	Screened Out	All aquaculture sites are operational and do not present a cumulative effect pathway on benthic ecology given they are highly localised and there are no activities being undertaken at these sites which would have potential for a temporal overlap with the Project activities. Furthermore, these sites undertake benthic monitoring and have control measures in place regarding INNS. Aquaculture is considered within Chapter 18: Other Sea Users.
Dumping at Sea	Active	Screened Out	The Shannon Foynes Port Company has an active permit (Permit No. S0009-03) for the Shannon Estuary and Foynes Harbour dumping at sea locations, located approximately 86 – 88 km from the OAA and 32 – 34 km from the OECC. The permit is valid through 31/12/2026 and therefore the activities at the dumping at sea locations will not have a temporal overlap with the construction phase of the Project.
Discharge Points	Operational	Screened Out	All discharge points are operational and do not present a cumulative effect pathway on benthic ecology receptors given they are highly localised and there are no activities being undertaken at these sites which would have potential for a temporal overlap with the Project activities.
Urban Wastewater Treatment	Operational	Screened Out	All urban wastewater treatment locations are operational and located onshore. The potential runoff from these sites into the marine environment is not considered within the benthic ecology assessment, and therefore there is no cumulative effects pathway associated with benthic ecology receptors.
Ferry Port	Operational	Screened Out	Operational ports do not present a cumulative effects pathway for benthic ecological receptors.

Development Type	Status	Screened In / Screened Out	Justification
Planning Applications	Application Stage	Screened Out	Onshore planning applications for residential and agricultural developments do not present a cumulative effects pathway for benthic ecology receptors at the Offshore Site.
An Bord Pleanála Cases	Application Stage	Screened Out	As per planning applications.
EIA Points	Application Stage	Screened Out	As per planning applications.
Licensed Waste Facility	Operational	Screened Out	The presence of licensed waste facilities onshore does not present a cumulative effects pathway for benthic ecology receptors.

9.8.1 Cumulative construction effects

No other developments were considered to have cumulative effects with the construction phase of the Offshore Site, and therefore cumulative effects are Not Significant.

9.8.2 Cumulative operational effects

No other developments were considered to have cumulative effects with the operation and maintenance phase of the Offshore Site, and therefore cumulative effects are Not Significant.

9.8.3 Cumulative decommissioning effects

No other developments were considered to have cumulative effects with the decommissioning phase of the Offshore Site, and therefore cumulative effects are Not Significant.

9.9 Conclusion

In conclusion, the benthic ecology impact assessment has assessed potential effects likely to be incurred from construction, operational and maintenance, and decommissioning phases including:

- Temporary habitat or species loss / disturbance;
- Long term loss / damage to benthic habitats and species;
- Increased SSC and associated deposition (including impacts to designated sites);
- Increased risk of INNS;
- Hydrodynamic changes leading to scour around subsea infrastructure;
- Colonisation of hard structures;
- Effect of cable thermal load or EMF on benthic ecology; and
- Removal of hard substrate during decommissioning.

The following benthic ecology receptors have been assessed:

- Stony and bedrock reef;
- Subtidal sands and gravels;
- Subtidal muds;
- Maerl beds; and
- Designated sites (indirect effects only).

Mitigation by design has been factored into the assessment, including cables being sufficiently buried to a target depth where possible, the production of a OEMP including measures to reduce the introduction of INNS, etc. Furthermore, the Project has undertaken environmental surveys and designed the layout of infrastructure on the seabed to minimise impacts on the most sensitive habitats and species (i.e. locating infrastructure on sediment areas to minimise effects on reefs, avoiding maerl beds and sea fan). The impact assessment has concluded that given the mitigation by design, the residual effect for all impact pathways is Not Significant for all the benthic ecology receptors.

No additional monitoring is proposed. Additionally, a cumulative effects assessment has been undertaken and concluded that all developments are screened out resulting in no cumulative effects during construction, operation and maintenance, or decommissioning and is therefore Not Significant.

Acronyms and Units

Acronym/Abbreviation	Definition
Al	Aluminium
BEIS	Department of Business, Energy and Industrial Strategy
Cefas	Centre for Environment, Fisheries and Aquaculture Science
CIEEM	Chartered Institute of Ecology and Environmental Management
DBT	Dibutyltin
DDC	Drop-Down Camera
DECC	Department of the Environment, Climate and Communications
DHLGH	Department of Housing, Local Government and Heritage
E	Electric
EC	Export Cable
ECC	Export Cable Corridor
eDNA	Environmental DNA
EEA	European Environment Agency
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EMF	Electromagnetic Field
EMP	Environmental Management Plan
EPA	Environmental Protection Agency
EU	European Union
EUNIS	European Nature Information System
FST	Fuinneamh Sceirde Teoranta
GBS	Gravity-base Structures
HDD	Horizontal Directional Drilling
HVAC	High Voltage Alternating Current

Acronym/Abbreviation	Definition
IAC	Inter-Array Cable
iE	Induced Electrical field
INNS	Invasive Non-Native Species
IUCN	International Union for the Conservation of Nature
JNCC	Joint Nature Conservation Committee
km	Kilometre
kV	Kilovolt
Li	Lithium
m	Metre
MFE	Mass Flow Excavator
mg	Milligram
µg	Microgram
µT	Microtesla
MBES	Multibeam Echosounder
MSFD	Marine Strategy Framework Directive
NIS	Natura Impact Statement
NOAA	National Oceanic and Atmospheric Administration
NPWS	National Parks and Wildlife Service
OAA	Offshore Array Area
OCP	Organochlorine Pesticide
OREDP / OREDPII	Offshore Renewable Energy Development Plan
OSPAR	Oslo-Paris Convention
OSS	Offshore Substation
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyls
PLGR	Pre-Lay Grapnel Run
PSD	Particle Size Distribution

Acronym/Abbreviation	Definition
SAC	Special Area of Conservation
SE	Standard Error
SNH	Scottish Natural Heritage
SSC	Suspended Sediment Concentrations
SSS	Side-Scan Sonar
T	Tesla
TBT	Tributyltin
THC	Total Hydrocarbon Content
TOC	Total Organic Carbon
UK	United Kingdom
UXO	Unexploded Ordnance
WTG	Wind Turbine Generator

Glossary

Term	Definition
Circalittoral	The region of the seabed that is below the depth at which marine plants/algae are typically found and is dominated by animals (i.e. below the photic zone).
Colonial	A collective life form which comprises associations of individual organisms. Marine Colonial animals are typically attached to the seabed and include corals and bryozoans
Invasive	An introduced organism that can become overpopulated, outcompete and/or prey upon native species causing adverse ecological effects.
Phylum	A principal taxonomic category that ranks above class and below kingdom.
Polychaete	Taxonomic class of (mainly) marine segmented worms from the Phylum Annelida.
Substratum	The layer of layer of rock or sediment beneath the sea surface of sea (i.e. the seabed surface).

Suspended sediment	Sediment transported by a fluid that it is fine enough for turbulent eddies to outweigh settling of the particles.