8. WATER AND SEDIMENT QUALITY

8.1 Introduction

This chapter of the EIA Report (EIAR) assesses the Water and Sediment Quality (WSQ) of relevance to the Project and the likely significant effects from the construction, operation and maintenance, and decommissioning of the Project on these receptors. Where required, mitigation is proposed, and the residual impacts and their significance are assessed. Likely cumulative effects and transboundary impacts are also considered.

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

- Chapter 7: Marine Physical and Coastal Processes – information in relation to marine processes which can result in sediment disturbance and dispersion throughout the Offshore Array Area (OAA) and Offshore Export Cable Corridor (OECC); and
- Chapter 9: Benthic Ecology – information in relation to the presence of marine invasive non-native species (INNS) which can be detrimental to water quality status.

Xodus Group Limited (Xodus) is the sole contributor to the WSQ assessment and has prepared this EIAR chapter.

8.1.1 Statement of Authority

The baseline characterisation for this chapter of the EIAR has been undertaken by Duncan Swanney of Xodus. Duncan is an Environmental Consultant with Xodus, having joined the company in January 2022. Duncan holds a BSc (Hons) Marine Biology from Heriot-Watt University and a MSc Marine Conservation from the University of Aberdeen. Duncan has supported on a variety of different marine renewable energy projects; this has included data interpretation of metocean data. Additionally, he has authored the environmental baseline for oil and gas projects which includes the WSQ sections and interpretation of site-specific data and has undertaken baseline characterisation across a number of offshore wind scopes including Morven offshore wind farm, Cenos offshore windfarm, West of Orkney Offshore Wind Farm and Culzean offshore wind development.

This Chapter of the EIAR has been overseen and reviewed by Ashleigh Fenton of Xodus. Ashleigh is a Senior Environmental Consultant with Xodus, having joined the company in November 2019. Ashleigh holds a BSc (Hons) Geology from the University of Aberdeen. Ashleigh has supported and managed a number of offshore EIAs for offshore wind (including the Pentland Floating Offshore Wind Farm and the West of Orkney Wind Farm), as well as several electrification and submarine cable scopes. Ashleigh also has key experience from previous roles as an environmental specialist working on WSQ scopes including regulatory reports within the nuclear industry from 2016 to 2019 under the Environmental Authorisations (Scotland) Regulations 2018 and Radioactive Substances Act 1993.

8.2 Legislation Policy and Guidance

In addition to the Project relevant policy and legislation described in Chapter 2: Legislative Context and Regulatory Requirements, the assessment of potential effects on WSQ have been undertaken in accordance with the legislation, policy and guidance listed below.

8.2.1 Legislation

The requirements of the following legislation have been considered whilst undertaking the assessment of WSQ:

- European Union (EU) Water Framework Directive (2000/60/EC)
- EU Marine Strategy Framework Directive (MSFD) (2008/56/EC)
- EU Bathing Waters Directive (2006/7/EC);
- EU Urban Waste Water Treatment Directive (91/271/EEC);
- EU Nitrates Directive (91/676/EEC);
- EU Environmental Quality Standards Directive (2008/105/EC);
- EU Directive 2013/39/EU (amending Directives 2000/60/EC and 2008/105/EC as regards priority substances in the field of water policy);
- EU Habitats Directive (92/43/EEC) (1992);
- EU Birds Directive (2009/147/EC) (2009);
- Environmental Protection Agency (EPA) Act 1992 (as amended);
- Waste Management Act 1996 (as amended);
- Local Government (Water Pollution) Act, 1977 (as amended);
- The Chemicals Act 2008 (as amended);
- European Communities Environmental Objectives (Surface Waters) Regulations 2009 (as amended);
- European Communities (Water Policy) Regulations 2003 (as amended); and
- Bathing Water Quality Regulations -1992 (as amended).

8.2.2 Policy & Guidance

The relevant policy and guidance applicable to the WSQ assessment are listed in Table 8-1 below.

Table 8-1 Policy and guidance relevant to WSQ

Policy/Guidance	Reference
Guidelines on the information to be contained in Environmental Impact Assessment Reports (EIAR)	EPA, 2022
River Basin Management Plan (RBMP) 2018 - 2021	Irish Government, 2022
River Basin Management Plan (RBMP) 2022 - 2027	Irish Government, 2024
The Offshore Renewable Energy Development Plan (OREDP) (Ireland)	Department of Communications, Energy and Natural Resources (DCENR), 2014
Marine Planning Policy Statement (Ireland)	DHLGH, 2019
National Marine Planning Framework (Ireland)	DHLGH, 2021a
Guidance on EIS and NIS Preparations for Offshore Renewable Energy Projects. (Ireland)	Department of Communications, Climate Action and Environment (DCCAE), 2017
Guidelines for the assessment of dredge material for disposal in Irish waters. (Ireland)	Cronin, M et al, 2006; 2019
Canadian Sediment Quality Guidelines for the Protection of Aquatic Life.	Canadian Council of Ministers of the Environment (CCME), 1999

Policy/Guidance	Reference
Review of Cabling Techniques and Environmental Effects applicable to the Offshore Windfarm Industry. (United Kingdom (UK) and Ireland)	Department of Business Enterprise and Regulatory Reform, 2008
Guidance on Best Practice for Marine and Coastal Physical Processes Baseline Survey and Monitoring Requirements to inform EIA of Major Development Projects. (UK and Ireland)	Brooks et al., 2018

8.3 Scoping and Consultation

Stakeholder consultation has been ongoing throughout the Environmental Impact Assessment (EIA) process and has played an important part in ensuring the scope of the baseline characterisation and impact assessment are appropriate with respect to the Project and the requirements of the regulators and their advisors.

The Sceirde Rocks Scoping Report was submitted to key stakeholders in September 2023. Scoping Opinion responses which are considered relevant to the assessment of effects to WSQ for the Offshore Site have been summarised in Table 8-2 below. A high-level response on how and where these comments have been addressed within the WSQ EIA chapter are also provided.

Table 8-2 Scoping opinion comments received of relevance to Offshore Site WSQ

Consultee	Comment	Where the comment has been addressed in the EIAR
Clare County Council – Environment Department	Advised that Scoping Report should be issued to the Planning Department. No further comment.	No action required.
Department of Communications, Climate and the Environment	Advised that the Department does not provide observations for individual projects and developments. No further comment.	No action required.
EPA	Advised that a Dumping at Sea permit is required in the event that any deliberate disposal of a substance or material in the maritime area, as defined in Section 1 of the Dumping at Sea Act 1996 as amended, is proposed.	The requirement for a Dumping at Sea permit has been considered by the Applicant and this has been used to define the extent of impact to water quality associated with deposition as a result of dredging activities, as per section 8.6.2.1.2.
Friends of the Irish Environment	No response.	No action required.
Galway County Council – Environment Department	No response.	No action required.
Marine Institute of Ireland	No response.	No action required.
Waterways Ireland	The project is not within any Zone of Influence of our waterways, so Waterways Ireland will not be commenting	No action required.

West Region Local Authority Waters Programme (LAWPRO)	Advised that LAWPRO are not a statutory authority and don't make comments on development projects. However, recommend that the EIAR ensures appropriate consideration of the draft River Basin Management Plan for Ireland 2022 – 2027, which is due to be finalised in Q4 of 2023.	The draft River Basin Management Plan for Ireland 2022-2027 has been used throughout this chapter to inform the assessment of WSQ.

8.4 Assessment Methodology

8.4.1 Data and Information Sources

The existing data sets and literature with relevant coverage to the Offshore Site, which have been used to inform the baseline characterisation for the EIAR, are outlined in Table 8-3.

Table 8-3 Available data and information sources for WSQ

Title	Description	Author	Date
Ireland's Marine Atlas	Various water quality and sediment data sets	Marine Institute	Various
Guidelines for the Assessment of Dredge Material for Disposal in Irish Waters	Sediment quality guidelines for dredged materials in Ireland	Cronin et al., 2006	2006
Addendum to 2006 Guidelines for the Assessment of Dredge Material for Disposal in Irish Waters	Updated sediment quality guidelines for arsenic (AS) and nickel (NI),	Cronin et al., 2019	2019
Canadian Sediment Quality Guidelines for the Protection of Aquatic Life.	Sediment quality guidelines	CCME	1999
Environmental Quality Standards Directive (2008/105/EC)	Environmental Quality Standards (EQS) for priority substances and priority hazardous substances for water and biota	The European Parliament and The Council of The EU	2008 (amended in 2013 by EU Directive 2013/39/EU)
Ireland's RBMP 2022 - 2027	The RBMP 2022-2027 sets out the actions that Ireland will take to improve water quality and achieve 'good' ecological status in water bodies by 2027	DHLGH	2024
Bathing Water Quality in Ireland	Bathing Water Quality in Ireland: A Report for the Year 2021	EPA	2022
EPA Water Maps	WFD Monitoring Geospatial Data	EPA	2024
Catchment Management in Ireland	WFD Catchment Monitoring data sets	DHLGH, EPA, and the LAWPRO	2024

Title	Description	Author	Date
Water Quality in Ireland 2013 -2018	Ecological status of waterbodies in Ireland	EPA	2019
Water Quality in Ireland 2016 -2022	Ecological status of waterbodies in Ireland	EPA	2023
Water Quality in Ireland 2023	Water Quality in 2023: An Indicators Report. The report provides an update of the key indicators of the quality of Ireland's rivers, lakes, estuaries, coastal and groundwaters using monitoring data collected in 2023.	EPA	2024
Harmful Algal Bloom (HAB) Shellfish Monitoring Programme	Data on health of shellfish production areas	Marine Institute	2024

8.4.2 Consideration of data sources and quality

The baseline description as detailed above has been established through an extensive review of the available project site-specific surveys (section 8.5.2) and data sources and literature detailed above (Table 8-3) and Project Specific Supporting Studies (see section 8.5.3). During site specific surveys carried out in October 2023, Total Suspended Sediment analysis was not able to be provided from deployed instrumentation. However, the understanding of baseline conditions with respect to suspended sediment concentrations (SSC) has been informed through published literature for the region and, thus the absence of the site-specific survey data here is not considered to be a key knowledge gap such that it prevents an assessment being undertaken and conclusion being made in respect of likely significant effects.

Overall, the wide variety of specific data sources used is considered to be adequate to inform a robust understanding of WSQ in the Study Area. Therefore, this information is considered sufficient to inform the impact assessment and there are no significant data gaps regarding WSQ.

8.4.3 Assessment Methodology

8.4.3.1 Effects requiring assessment

This assessment covers all effects identified during the scoping process, as well as any further potential effects that have been identified as the EIA process has progressed. Table 8-4 indicates all of the direct and indirect effects assessed with regard to WSQ and indicates the Project phases to which they relate. The assessment of effect on WSQ uses the data acquired from site-specific surveys (Section 8.5.2), publicly available data identified in Section 8.4.1, and any information gathered through consultation (Section 8.3). WSQ is heavily linked to Chapter 7: Marine Physical and Coastal Process and has utilised relevant information from that chapter.

Table 8-4 Potential effects requiring assessment

Potential effect	Description	Nature of effect
Construction/decommissioning		
Changes in water quality due to increased suspended sediment concentrations	Activities relating to the construction or decommissioning phases of the Project may result in an increase in suspended sediment concentrations which can affect WSQ.	Direct
Changes in WSQ due to accidental release of contaminated sediment	Trapped contaminated sediments may be disturbed, released and dispersed more into the environment through construction and decommissioning activities. This could result in an adverse effect to WSQ within the vicinity of the Offshore Site.	Direct
Changes in WSQ due to routine and accidental discharges from vessels during construction	In the absence of mitigation, routine vessel discharges (outwith 3 nautical miles[1]) or accidental discharges could result in pollution events within the vicinity of the Offshore Site. Pollution events can be persistent in the environment and could result in adverse effects on WSQ.	Direct
Impacts on water quality status of designated waterbodies due to increased suspended sediment and potential release of contaminants	The Project Areas is located in the vicinity of several designated waters under the WFD, Bathing Waters Directive, Habitats Directive and Birds Directive. Given this, any impacts on WSQ as a result of the aforementioned impacts during construction and decommissioning may result in adverse environmental effects to these designated waters.	Direct
Operation and maintenance		
Changes in water quality due to increased suspended sediment concentrations	Activities relating to the operation and maintenance phases of the Project may result in an increase in suspended sediment concentrations which can affect WSQ.	Direct
Changes in WSQ due to accidental release of contaminated sediment	Trapped contaminated sediments may be disturbed, released and dispersed more into the environment through operation and maintenance activities. This could result in an adverse effect to WSQ within the vicinity of the Offshore Site.	Direct
Changes in WSQ due to routine and accidental	In the absence of mitigation, routine vessel discharges[1] or accidental discharges could result in pollution events within the vicinity of the Offshore	Direct

[1] *As per MARPOL requirements, the discharge of sewage into the sea is prohibited, except when the ship has in operation an approved sewage treatment plant or when the ship is discharging comminuted and disinfected sewage using an approved system at a distance of more than three nautical miles from the nearest land. Sewage which is not comminuted or disinfected may be discharged at a distance of more than 12 nautical miles from the nearest land when the ship is enroute and proceeding at not less than 4 knots, and the rate of discharge of untreated sewage shall be approved by the Administration (see resolution MEPC.157(55))*

Potential effect	Description	Nature of effect
discharges from vessels and WTGs	Site. Additionally, the WTGs contain fluids which could be released should a leak occur. Pollution events can be persistent in the environment and could result in adverse effects on WSQ.	
Impacts on water quality status of designated waterbodies due to increased suspended sediment and potential release of contaminants	The Offshore Site is located in the vicinity of several designated waters under the WFD, Bathing Waters Directive, Habitats Directive and Birds Directive. Given this, any impacts on WSQ as a result of the aforementioned impacts during operation and maintenance may result in adverse environmental effects to these designated waters.	Direct

8.4.3.2 Characterisation of impacts and effects

An assessment of potential effects is provided for the construction (including pre-construction), operational and maintenance, and decommissioning phases of the Project. The assessment for WSQ is undertaken following the principles set out in Chapter 4: Environmental Impact Assessment Methodology in line with the EPA's EIAR Guidelines (EPA, 2022). Potential impacts 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 impact 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.

Topic-specific sensitivity and magnitude criteria are described in Table 8-5 and Table 8-6.

Table 8-5 Receptor sensitivity criteria

Sensitivity of Receptor	Definition
High	Receptor is of very high importance and is protected under national and international legislation (e.g., WFD); The receptor is recognised to be very sensitive to impacts and has no capacity to avoid or adapt to an effect, tolerate or absorb an effect, or recover to baseline conditions; and Impacts would result in a change to the status of the receptor.
Medium	Receptor is of high importance and is protected under national and international legislation (e.g., WFD); The receptor is recognised to be sensitive to impacts, with a very little capacity to avoid or adapt to an effect, tolerate or absorb an effect, or recover to baseline conditions; and Impacts could lead to a potential change in the status of the receptor.

Sensitivity of Receptor	Definition
Low	Receptor is of high importance and is protected under national and international legislation (e.g., WFD); The receptor has high capacity to avoid or adapt to an effect, tolerate or absorb an effect, or recover to baseline conditions; and Impacts unlikely to result in a change to the status of the receptor.
Negligible	Receptor of very low importance, with no associated designations. Receptor has full capacity to avoid or adapt to an effect, tolerate or absorb an effect, or recover to baseline conditions; and No change is expected to the status of the receptor.

Table 8-6 Receptor magnitude criteria

Magnitude criteria	Definition
High	The impact occurs over a large spatial extent resulting in widespread, long-term, or permanent changes in baseline conditions. The impact is very likely to occur and/or will occur at a high frequency or intensity.
Medium	The impact occurs over a local to medium extent with a short- to medium-term change to baseline conditions. The impact is likely to occur and/or will occur at a moderate frequency or intensity.
Low	The impact is localised and temporary or short-term, leading to a detectable change in baseline conditions. The impact is unlikely to occur or may occur but at low frequency or intensity.
Negligible	The impact is highly localised and short-term, with full rapid recovery expected to result in very slight or imperceptible changes to baseline conditions. The impact is very unlikely to occur; if it does, it will occur at a very low frequency or intensity.

8.4.3.3 Determining Significance of Effects

The EPA guidelines definitions for describing significance of effect have been used for the WSQ impact assessment (Table 8-7).

Table 8-7 Significance of effect

Magnitude 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; tolerable.
Significant Effects	An effect which, by its character, magnitude, duration, or intensity, alters a sensitive aspect of the environment.	Significant; not tolerable. Mitigation measures must be in place to prevent, reduce, or avoid

Magnitude criteria	Definition	Significance
Very Significant	An effect which, by its character, magnitude, duration, or intensity, significantly alters most of a sensitive aspect of the environment.	the impact, and if not possible then compensatory measures are proposed.
Profound Effects	An effect which obliterates sensitive characteristics.	

8.4.4 Project Design Parameters

As detailed in Chapter 4: Environmental Impact Assessment Methodology, this assessment considers the design of the Project (in particular, the Offshore Site) as part of the assessment of potential effects to WSQ receptors. The approach to impact assessment within this EIAR considers the design parameters proposed for the Project (as detailed in Chapter 5: Project Description). The key Offshore Site design parameters which are considered relevant to the assessment of WSQ are summarised below:

- 30 Wind Turbine Generators (WTG)s;
- One Offshore 220kV Electrical Substation (OSS);
- OAA of approximately 37.2 km^2;
- Inter-array cables of approximately 73 km in length; and
- An offshore export cable of approximately 63.5 km in length.

The Project design parameters identified above are considered to represent the greatest potential effects resulting in a change to existing baseline conditions. Table 8-8 below presents Project design parameters relevant to each potential impact scoped in for further assessment as part of this EIAR during the construction, operation and maintenance, and decommissioning phases of the Project. Please note that all durations are approximate and may vary depending on vessel availability, weather conditions, and other factors outwith the control of the Project.

Table 8-8 Project design scenario specific to WSQ impact assessment

Pathway to impact	Design Scenario	Justification
Construction/decommissioning		
Changes in water quality due to increased suspended sediment concentrations	Construction period is four years with works typically undertaken 24 hours a day, 7 days a week. Pre-construction seabed activities › WTG and OSS installation (14 months) ○ 30 WTG Gravity Base Structure (GBS) foundations and one OSS GBS. ○ Floating installation (no drilling etc). › Seabed preparation (4 months) ○ Total volume of seabed sediment required to be dredged: 150,000 m^3 ○ Boulder clearance, Controlled flow excavation (CFE) and Pre-lay Grapnel Run (PLGR) – 20 m wide disturbance corridor (no clearance activities required in OECC). ○ Two disposal sites in OAA (up to 15 disposal events): ○ Area of Disposal Site 1 = 25,842 m^2 & Volume of dredged material to be disposed of at Disposal Site 1: 37,500 m^3 ○ Area of Disposal Site 2 = 78,229 m^2 & Volume of dredged material to be disposed of at Disposal Site 2: 112,500 m^3 › Inter-array (16 months) and export cable (15 months) installation ○ Total length of the inter-array cables (IAC) = 73.0 km ○ Total length OEC = 63.5 km ○ Burial trench using jet trencher, mechanical cutting trencher and/or CFE, to a target depth of lowering of 1 m. ○ Total seabed temporary disturbed by cable installation: 996,950 m^2 › Landfall – trenchless technology install (3 months) ○ duct = 0.9 km length / volume of exit pit = 2000 m^3 ○ Area of disturbance due to side casting dredged materials = 1000m^3 › Sum total temporary seabed disturbance = 1,132,151 m^2	The dimensions, footprints and volumes represent the direct impact scenarios on the seabed which can result in the direct generation of increased suspended sediment concentration in the water column.
Changes in WSQ due to accidental release of contaminated sediment		The dimensions, footprints and volumes represent the impact scenarios on the seabed sediment which can result in the direct release of contaminated sediment to the seabed and water column.
Impacts on water quality status of designated waterbodies due to increased suspended sediment and potential release of contaminants		The dimensions, footprints and volumes represent the direct impact scenarios on the seabed sediment which can result in the direct generation of increased suspended sediment concentration and release of contaminated sediment into the water column.

<table>
<tr><th>Pathway to impact</th><th>Design Scenario</th><th>Justification</th></tr>
<tr><td>Changes in WSQ due to routine and accidental discharges from vessels during construction</td><td>Total of 23 vessels required for the construction phase, including:
Subsea preparation for GBS foundations:
2 vessels (1 fallpipe vessel and 1 Trailing suction hopper dredger (TSHD))
OSS Topside
3 vessels (Heavy load vessel (HLV), tug, barge or optional WTIV)
Inter-array cables
4 vessels (1 cable lay vessel (CLV), 1 Trenching support vessel, 1 service ops vessel, 1 rock placement vessel)
Export cable:
5 Vessels (1 CLV, 1 trenching support vessel, 1 service ops vessel, 1 rock placement vessel, 1 shallow water pull in vessel)
GBS foundation installation:
4 vessels (1 main tug, 2 assist tugs, 1 infield tug)
WTGs:
3 vessels (1 WTIV, 1 service ops vessel, 1 crew transfer vessel)
Other
2 Guard vessels
Total of 7 vessels required for decommissioning, including:
1 service ops vessel, 1 crew transfer vessel, 1 WTIV and 4 tugs.
Landfall (HDD install)

Drilling mud material is a 90% water / 10% bentonite clay suspension which pose little or no risk to the environment (PLONOR).</td><td>The vessels required for construction may result in routine or accidental discharges which may cause pollution to WSQ receptors.

HDD drilling operations also have the potential to release drilling fluid into the marine environment.</td></tr>
</table>

<table>
<tr><th>Pathway to impact</th><th>Design Scenario</th><th>Justification</th></tr>
<tr><td colspan="3">Operation and maintenance</td></tr>
<tr><td>Changes in water quality due to increased suspended sediment concentrations</td><td rowspan="3">

Operational life of up to 38 years.
Operation works will include the following relevant activities:

Up to 2 crew transfer vessels to operate within the Offshore Site per day;
1 service operations vessel per day;
4 daily return vessel movements (4 crew transfer vessels);
2 annual WTIV (jackup) intervention campaigns per year;
1 blade repair platform campaign per year;
5 unplanned cable repair vessel interventions over project life;
1 planned cable survey per year for first five years (1 every 5 years thereafter); and
Oil exchange vessel (1 every 10 years).

Cable maintenance and repairs may also be required during the lifetime of the Project.
Major repair works to WTG may be required throughout the operational phase.

</td><td>The dimensions, footprints and volumes represent the direct impact scenarios on the seabed which can result in the direct generation of increased suspended sediment concentration in the water column.</td></tr>
<tr><td>Changes in WSQ due to accidental release of contaminated sediment</td><td>The dimensions, footprints and volumes represent the impact scenarios on the seabed sediment which can result in the direct release of contaminated sediment to the seabed and water column.</td></tr>
<tr><td>Impacts on water quality status of designated waterbodies due to increased suspended sediment and potential release of contaminants</td><td>The dimensions, footprints and volumes represent the direct impact scenarios on the seabed sediment which can result in the direct generation of increased suspended sediment concentration and release of contaminated sediment into the water column.</td></tr>
</table>

Pathway to impact	Design Scenario	Justification
Changes in WSQ due to pollution from routine and accidental discharges from vessels or infrastructure during operation and maintenance		The vessels required for construction may result in routine or accidental discharges which may cause pollution to WSQ receptors. HDD drilling operations also have the potential to release drilling fluid into the marine environment.

8.4.5 Analytical Assessment of Marine Physical and Coastal Processes

The marine physical and coastal environment are intrinsically linked to WSQ. A semi-quantitative analytical tool has been used as part of the Marine Physical and Coastal Processes assessment (see Chapter 7: Marine Physical and Coastal Processes) to aid understanding of sediment dispersion extents from seabed preparation (clearance and trenching) by a Controlled Flow Excavator (CFE), dredging and disposal activities by trailer suction hopper dredger (TSHD) at a height of 5m above the seabed. The analytical tool was based on flow rates and sediment distribution throughout the OAA and OECC. The findings of the semi-quantitative analysis have been used throughout this assessment to characterise impacts.

8.4.6 Mitigation by Design

The Project has incorporated a number of mitigations by design and management plans as part of the design process. The mitigation measures and management plans proposed to reduce any potential effects on the WSQ have been summarised in Table 8-9 below. These measures are considered standard industry practice for this type of development.

Table 8-9 Embedded mitigation measures relevant to the WSQ

Mitigation Measures	Justification

Environmental Management Plan (EMP)	The Project will implement and adhere to the Offshore Environmental Management Plan (OEMP) (see Appendix 5-2). The OEMP references:
	› Appendix 5-3 - A Marine Pollution Contingency Plan (MPCP) that details pollution prevention measures such as:
	  › Storage of chemicals in secure designated areas in line with appropriate regulations and guidelines;
	  › Adherence to vessel regulations such as MARPOL to reduce potential for vessel pollution;
	  › Disposal of waste e.g. sewage, oil or litter at an authorised disposal facility.
	› Appendix 5-8 - A Marine Invasive Non-Native Species Management Plan (MINNSMP)which details control measures to safeguard biosecurity such as:
	  › 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')
	› Appendix 5-5 - A Waste Management Plan which details the provisions for waste management for project components in line with the waste management hierarchy.

Emergency Response and Coordination Plan	An Emergency Response and Coordination Plan (ERCoP) included as Appendix 5-4 has been developed as an annex to the

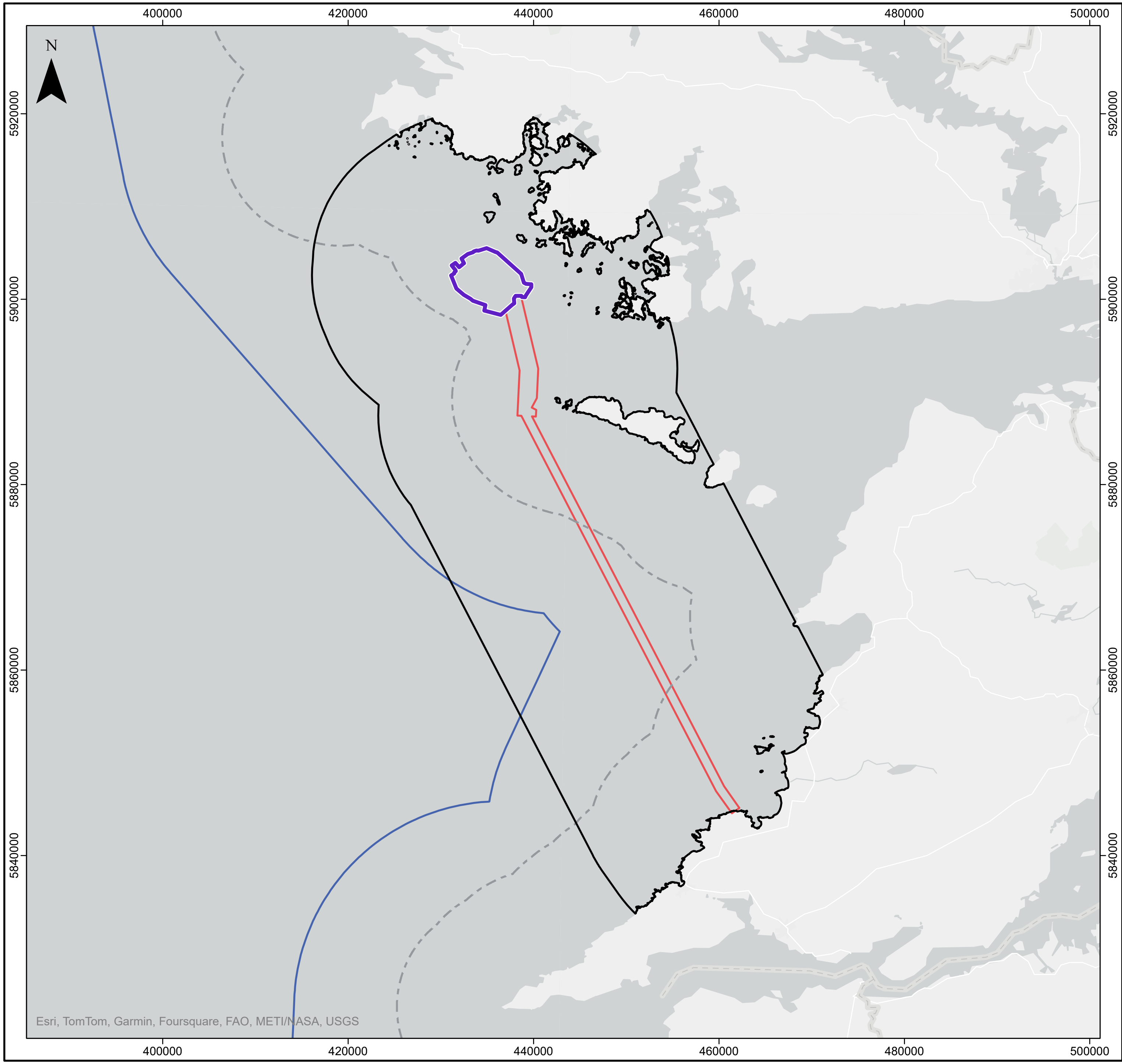
Mitigation Measures	Justification
	EMP. The emergency response plan will be complied with, in the unlikely event of an emergency such as a major pollution event (such as per the Sea Pollution Act 1991) and detail responsibilities and / or cooperation with the Irish Coastguard and other key authorities during the construction, operation and maintenance, and decommissioning of the Offshore Site.
WTG and OSS design	The WTG and OSS topsides are designed and constructed to contain leaks, thereby reducing the risk of spillage into the marine environment. Details on control measures for reducing the risk of accidental leaks and spills are detailed within MPCP.
Adherence to the International Convention for the Prevention of Pollution from Ships (MARPOL) and Ballast Water Management (BWM) Conventions.	The risk of marine pollution will be minimised through compliance with MARPOL and BWM convention requirements. Control measures and shipboard oil pollution emergency plans (SOPEP) (for oil tankers of 150 gross tonnage and above and all vessels of 400 gross tonnage and above) will be established and adhered to, as required under MARPOL Annex I for all Project and contractor vessels.
Dredge Disposal Method and Locations	The Project has committed to reducing SSCs through using a fall pipe located at 5 m above the seabed, instead of disposal from the sea surface, for disposal of dredged material. Disposal areas were selected on the basis of avoiding sensitive species and habitats and reducing the risk of sediment plume effects over a large area.
Dredge Disposal Licence	A Dumping at Sea permit will be obtained for the disposal of dredge material within the Offshore Site as required by the Dumping at Sea Act 1996, as amended.

8.5 Baseline Characterisation

The baseline characterisation provides a description of the WSQ in the marine environment which are expected to be influenced by activities associated with the Offshore Site within the Study Area defined below. The section summarises the key findings from the environmental surveys (Section 8.5.2), Offshore Site baseline (Section 8.5.6), and future baseline (Section 8.6.1).

8.5.1 Study Area

The WSQ (WSQ) Study Area is defined as the OAA and OECC, plus a 15 km buffer as illustrated in Figure 8-1. This area has been identified to cover an area within which effects on WSQ could occur as a result of activities at the Offshore Site. Furthermore, this buffer is considered appropriate in order to capture the effects that may extend beyond the boundary of Offshore Site. This includes effects associated with pathways for tidal advection of sediment plumes from seabed disturbance activities (e.g., cable trenching) and the extent of local waves due to flows and waves passing individual WTGs within the OAA. For this chapter, only impacts on WSQ within the 15 km Study Area have been discussed, however wider regional baseline context has been provided where appropriate in instances where site specific information is unavailable.



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

Water & Sediment Quality Study Area

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

DRAWING NO

Figure 8-1

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

8.5.2 Site-Specific Surveys

Site-specific surveys provide more detailed and up-to-date information across the OAA and OECC to complement the publicly available data referred to in Table 8-3. These surveys support both the enhanced baseline characterisation and preliminary engineering design. The following site-specific surveys relevant to the WSQ baseline characterisation are listed below:

- Geophysical survey in 2022 and 2024;
- Benthic and environmental surveys in 2023; and Geotechnical surveys in 2023 and 2024.

8.5.2.1 Geophysical survey

EGS International conducted the geophysical surveys using side-scan sonar (SSS) and multi-beam echosounder (MBES) during the 2022 campaign covering the OAA and OECC. An additional campaign was undertaken in 2024 of the OAA to survey additional turbine locations across the OAA. The information gathered from these campaigns was integrated with publicly available Integrated Mapping for the Sustainable Development of Ireland's Marine Resource (INFOMAR) data for comparison and further data coverage.

The geophysical information acquired for the Offshore Site is as follows:

- Multi-beam echo sounder (MBES), acquired as a surface, providing the seabed bathymetry across the OAA and OECC;
- Side-scan sonar (SSS), providing a surface relief map across the OAA and OECC, from which sediment characteristics, morphology and other seabed features can be determined;
- Magnetometer (MAG), which provided spot identification of seabed targets, such as boulders or outcropping bedrock;
- Single channel ultra-high resolution seismic (S-UHRS), acquired as transects, providing information on the shallow geology and substrate; and
- Sub-bottom profiler (SBP), acquired as transects, providing information on the deeper geological substrate, approximately up to 50 m below the seabed.

The findings of the geophysical survey are used within this chapter to characterise the sediment types and distribution of these sediments within the OAA and OECC to inform the baseline characterisation.

8.5.2.2 Benthic and Environmental Survey

A benthic and environmental survey was undertaken by Ocean Ecology Limited (OEL) between September and October 2023. In order to fully characterise the subtidal environment across the survey area a suite of sampling approaches was employed. This included grab sampling, drop-down camera (DDC), and water contaminant sampling. The survey assessed the OAA and the OECC.

Of the sample locations targeted, 65 combined DDC and grab sampling stations were identified, of which 35 were positioned in the OAA and 30 in the OECC.

Sediment samples were collected from within 25 m of the target sampling location using either a 0.1 m^2 Day grab sampler, or a larger 0.2 m^2 dual Van Veen (DVV) grab sampler. All grab stations were targeted for Particle Size Distribution (PSD) and Total Organic Carbon (TOC) analysis. A subset of 22 of the grab stations was also targeted for sediment chemistry analysis including analysis for metals, organics, organotins, hydrocarbons, polychlorinated biphenyls (PCBs), and pesticides.

Water sampling was conducted across the OAA and OECC areas at every other DDC/grab station to analysis water quality at a total of 33 stations across the survey area. Water samples were taken at 2 m above the seabed and 2 m below the surface using a five-litre Niskin bottle. Sampling depth was determined using the live depth measurements received from the ultra-short baseline (USBL) underwater positioning equipment. Analysis of dissolved inorganic nutrients (including nitrite, nitrate, ammoniacal nitrogen, chloride and phosphate), TOC, and total alkalinity was undertaken for each water sample. Water profiles were also collected at each water sampling stations to analyse temperature, salinity, conductivity, pH, Total Suspended Solids (TSS), Total Dissolved Solids (TDS) and turbidity.

A summary of the sampling strategy highlighting the target areas and sampling methods within the OAA and OECC is provided in Table 8-10. The number of sampling stations targeted for each type of sampling is provided in Table 8-11.

Figure 8-2 and Figure 8-3 highlight the sampling stations and the type of samples obtained at each station across the OAA and OECC, respectively.

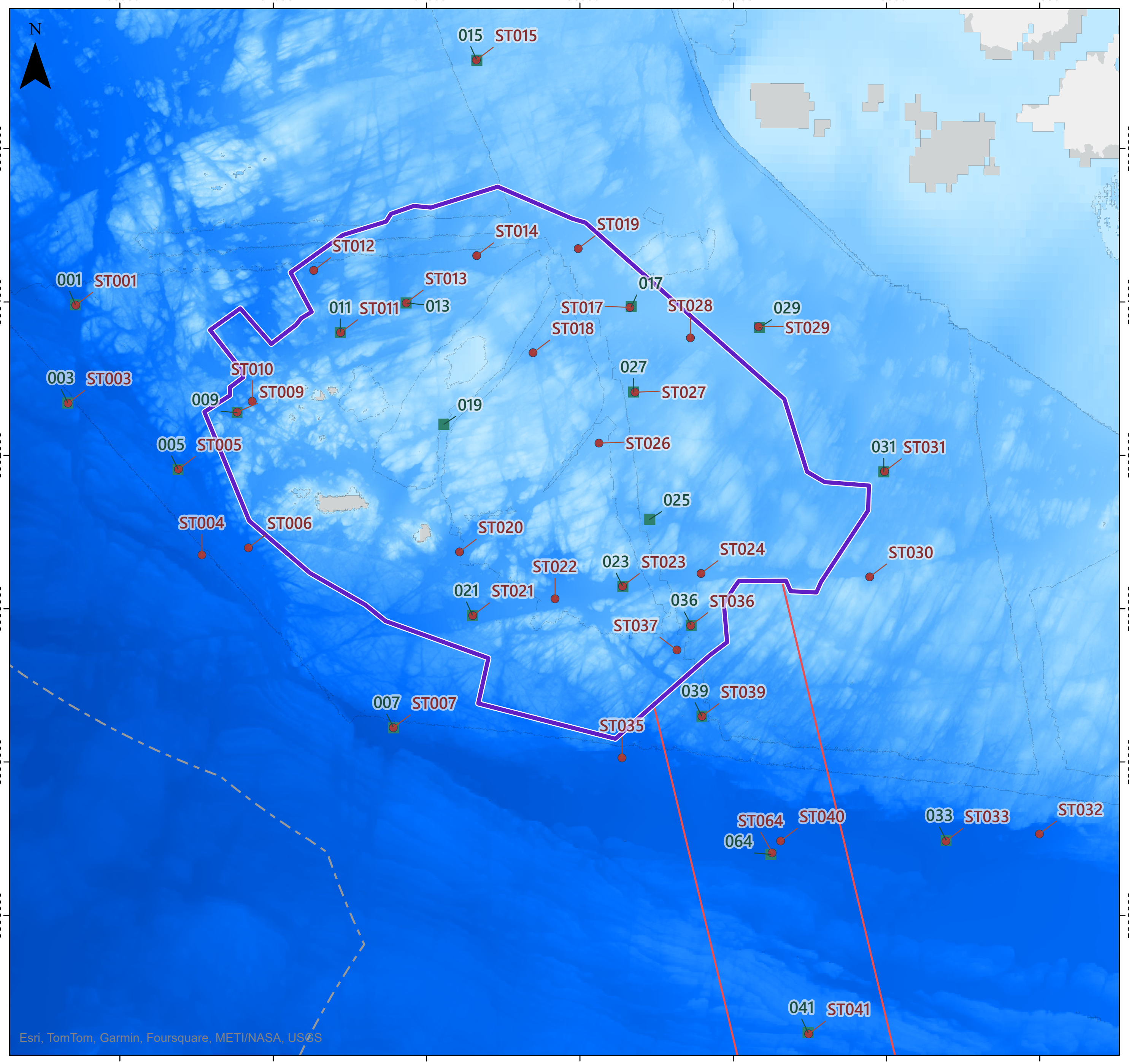
Table 8-10 Sampling Strategy

Area	No. of DDC/Grab stations	No of DDC Transects	No. of Water Sampling Stations
OAA	35	21	17
OECC	30	15	16
Total	65	36	33

Table 8-11 Sampling station breakdown

Type	Stations	Number of Repetitions	Total
Grabs (Total Organic Carbon (TOC), PSD)	65	1	65
Grabs (Full Sediment Chemistry)	22	1	22
Water Samples	33	2	66

The relevant information obtained from water and sediment sampling analysis has been interpreted in detail in Section 8.5.5.1 and 8.5.5.2 of the baseline. All samples gathered during the environmental survey were analysed using methods accredited by SOCOTEC.



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
- Sediment Sampling Locations
- Water Sampling Locations

Bathymetry (m)

0

-130

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. Corio Generation (2023). EMODnet Bathymetry Consortium (2020): EMODnet Digital Bathymetry (DTM). INFOMAR (2021 & 2022).

PROJECT TITLE

Sceirde Rocks

MAP TITLE

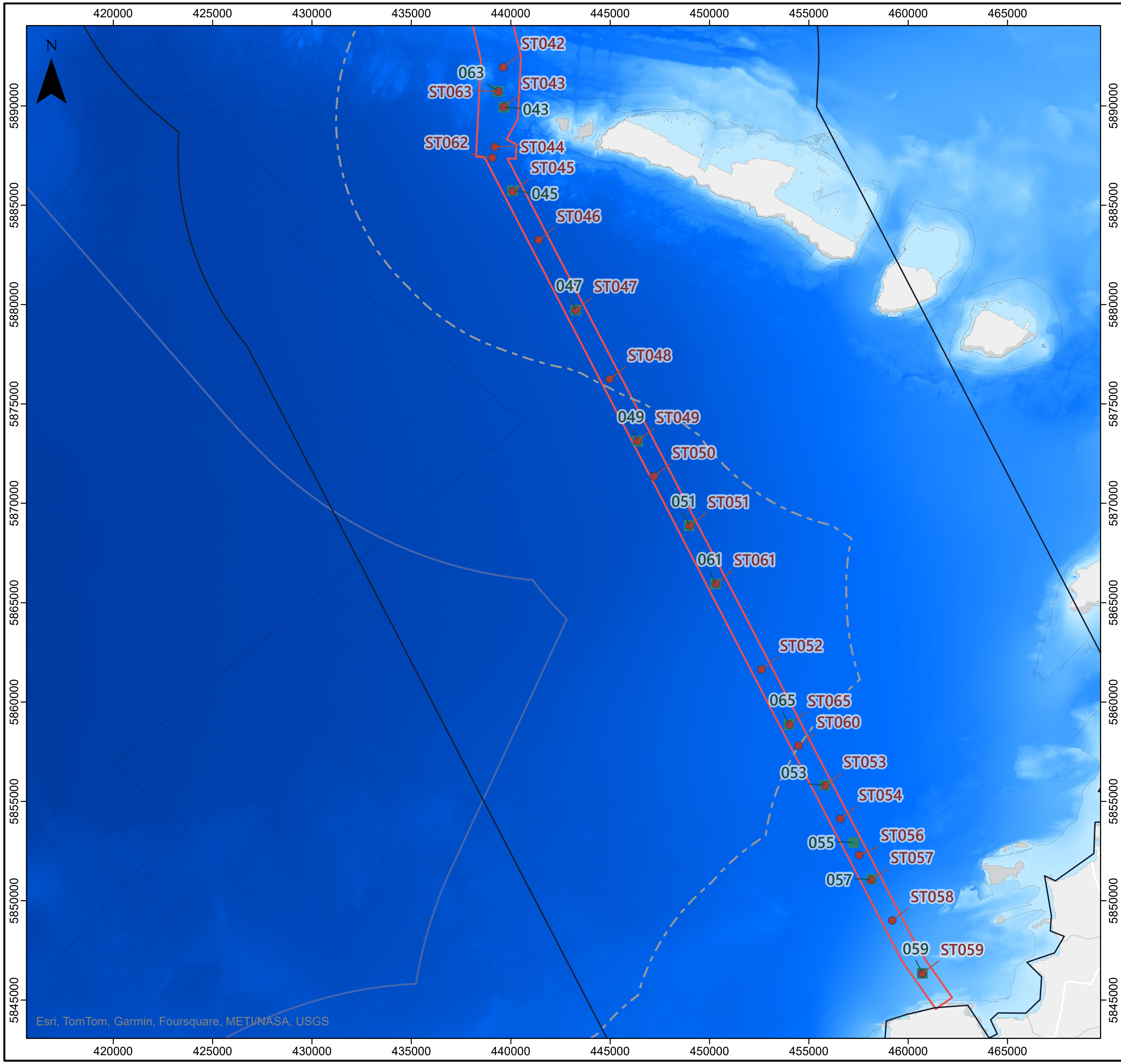
Environmental Sampling

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

DRAWING NO

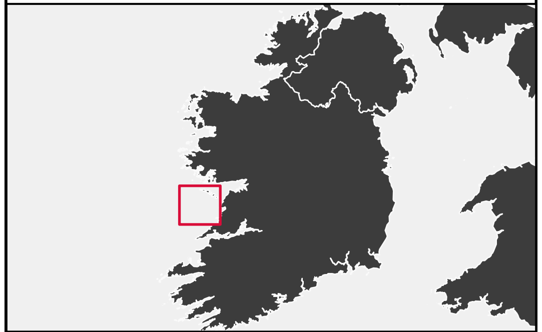
Figure 8-2

SCALE	PAPER SIZE	DATUM	PROJECTION
1:75,000	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
- Sediment Sampling Locations
- Water Sampling Locations

Bathymetry (m)

0

-130

0 1.5 3 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. Corio Generation (2023). EMODnet Bathymetry Consortium (2020): EMODnet Digital Bathymetry (DTM). INFOMAR (2021 & 2022).

PROJECT TITLE

Sceirde Rocks

MAP TITLE

Environmental Sampling

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

DRAWING NO

Figure 8-3

SCALE	PAPER SIZE	DATUM	PROJECTION
1:280,000	A4	WGS 84	UTM 29N

8.5.3 Assessment of Sediment Quality

Standards and guidance are applied to determine the potential impacts on WSQ receptors evaluating the influence contaminants have. The following sediment quality guidelines have been used to assess the data gathered from the site-specific surveys:

- Guidelines for the Assessment of Dredge Material for Disposal in Irish Waters; and
- Canadian Marine Sediment Quality Guidelines.

These guidelines, standards and information have been described below from section 8.5.3.1 and section 8.5.3.2.

8.5.3.1 Guidelines for the Assessment of Dredged material in Irish Waters

Irish Dredge Disposal (IDD) sediment quality guidelines (Cronin et al., 2006) are typically used to inform an approach for decision-making on the suitability of dredged material to be disposed at sea in Ireland. In 2006, upper and lower action levels for contaminants were set as part of guidelines for assessment of suitability of dredged material for disposal at sea. The guidelines were formulated as a transparent aid to the evaluation of dredged material for disposal at sea. The purpose of the lower action levels is to be able to categorise sediment as essentially "clean" and to allow the disposal at sea of such material considered not to pose a risk through contamination to the marine environment. The purpose of the upper actions is to identify material likely to cause biological or other effects and prevent such material from being disposed of at sea by conventional methods. An update to the lower levels was published for AS and NI (Cronin et al., 2019). The Lower and Upper Levels are detailed in Table 8-12.

Table 8-12 Irish Dredge Disposal Lower and Upper Levels (Cronin, et al., 2006; 2019)

Contaminant /Compound	Lower Level	Upper Level
	mg/kg Dry Weight (ppm)	mg/kg Dry Weight (ppm)
AS	20[2]	70
Mercury (HG)	0.2	0.7
Cadmium (CD)	0.7	4.2
Chromium (CR)	120	370
Copper (CU)	40	110
NI	40[1]	60
Lead (PB)	60	218
Zinc (ZN)	160	410
Σ TBT & DBT	0.1	0.5
γ – HCH (Lindane) (µg kg^{-1})	0.3	1
HCB (µg kg^{-1})	0.3	1

[2] *Revised lower limit guidelines for assessment of dredged materials in Irish waters* https://www.epa.ie/publications/licensing--permitting/freshwater--marine/Addendum-to-2006-Guidelines-(Marine-Insitute-2019).pdf

Contaminant /Compound	Lower Level	Upper Level
	mg/kg Dry Weight (ppm)	mg/kg Dry Weight (ppm)
PCB (individual congeners of ICES 7) (μg kg^{-1})	1	180
PCBs (Σ ICES 7) (μg kg^{-1})	7	1260
PAH (Σ 16) (μg kg^{-1})	4000	-
Total extractable hydrocarbons (g kg^{-1})	1	-

8.5.3.2 Canadian Marine sediment quality guidelines

The Canadian Marine Sediment Quality Guidelines have been developed and used to maintain and support healthy marine ecosystems (CCME), 1999). The CCME guidelines have been developed based on field research programmes based on North American data that have demonstrated associations between chemical and biological reactions of certain organisms. This means they provide a measure of environmental toxicity compared to the other reference levels which instead provide information on the degree of contamination of the sediments. For these reasons these guidelines are presented here as reference values despite being based on North American data.

The CCME guidelines look at two set values for different substances; the Interim Sediment Quality Guidelines (ISQG) or Threshold Effect Level (TEL) and Probable Effect Level (PEL). Using these different levels potential adverse conditions can be determined as follows:

- Below ISQG/TEL: The minimal effect range within which adverse effects rarely occur;
- Between TEL and PEL: Possible effect range within which adverse effects occasionally occur; and
- Above PEL: Probable effect range within which adverse effects frequently occur.

Table 8-13 lists the existing sediment quality guidelines for some of the parameters that have been monitored. This shows the ISQG/TELs and PELs (dry weights).

Table 8-13 Canadian sediment quality guidelines (Environment C.C., 2001)

Substance	Units	ISQG/TEL	PEL
Metals			
AS	$mg.kg^{-1}$	7.24	41.6
CD	$mg.kg^{-1}$	0.7	4.2
CR	$mg.kg^{-1}$	52.3	160
CU	$mg.kg^{-1}$	18.7	108
PB	$mg.kg^{-1}$	30.2	112
HG	$mg.kg^{-1}$	0.13	0.7
ZN	$mg.kg^{-1}$	124	271
PCB			
PCBs: total PCBs	$mg.kg^{-1}$	21.5	189
Polyaromatic hydrocarbons (PAH)			
Acenaphthene	$\mu g.kg^{-1}$	6.71	88.9

Substance	Units	ISQG/TEL	PEL
Acenaphthylene	$\mu g.kg^{-1}$	5.87	128
Anthracene	$\mu g.kg^{-1}$	46.9	245
Benz(a)anthracene	$\mu g.kg^{-1}$	74.8	693
Benzo(a)pyrene	$\mu g.kg^{-1}$	88.8	763
Chrysene	$\mu g.kg^{-1}$	108	846
Dibenz(a,h)anthracene	$\mu g.kg^{-1}$	6.22	135
Fluoranthene	$\mu g.kg^{-1}$	113	1494
Fluorene	$\mu g.kg^{-1}$	21.2	144
2-Methylnaphthalene	$\mu g.kg^{-1}$	20.2	201
Naphthalene	$\mu g.kg^{-1}$	34.6	391
Phenanthrene	$\mu g.kg^{-1}$	86.7	544
Pyrene	$mg.kg^{-1}$	153	1398

8.5.4 Assessment of Water Quality

The EU Environmental Objectives (Surface Waters) (Amendment) Regulations 2019 (S.I. No. 77 of 2019) sets out the physico-chemical conditions and EQS for priority hazardous substances for surface waters for which classifications of waterbodies in EU Member States must be monitored against and reported on under the WFD.

8.5.4.1 Physico-chemical Criteria

For transitional waterbodies and coastal water bodies, as relevant to the WSQ Study Area, Table 8-14 below summarises and presents the physico-chemical condition thresholds as detailed in the EU Environmental Objectives (Surface Waters) (Amendment) Regulations 2019, which are used to assess status.

Table 8-14 Physico-chemical criteria

Conditions	Transitional Water Body	Coastal Water Body
Thermal Conditions		
Temperature	Not greater than a 1.5°C rise in ambient temperature outside the mixing zone	
Oxygenation Conditions (Biochemical Oxygen Demand)		
Biochemical Oxygen Demand (BOD) (mg O_2/l)	High status ≤ 3.0 (95%ile) Good status ≤ 4.0 (95%ile)	N/A
Oxygenation Conditions Continued (Dissolved Oxygen (DO))		
DO lower limit (summer conditions)	High status (0-17 Practical Salinity Units (psu)) 95%ile >80% saturation Good status (0-17 psu) 95%ile >70% saturation	High status (>17-35 psu) 95%ile >80-85% saturation Good status (>17-35 psu) 95%ile >70-80% saturation

<table>
<tr><th>Conditions</th><th colspan="2">Transitional Water Body</th><th colspan="2">Coastal Water Body</th></tr>
<tr><td>DO upper limit (summer conditions)</td><td colspan="2">High status (0 – 17 psu)
95%ile <120% saturation
Good status (0 - 17psu)
95%ile <130% saturation</td><td colspan="2">High status (>17-35 psu)
95%ile <115-120% saturation
Good status (>17-35 psu)
95%ile <120-130% saturation</td></tr>
<tr><td colspan="5">Nutrient conditions</td></tr>
<tr><td>Dissolved Inorganic Nitrogen (mg N/l)* (DIN)</td><td colspan="2">N/A</td><td>Winter:
High status (0 psu)
≤ 1.0
High status (34.5 psu)
≤ 0.17</td><td>Summer:
Good status (0 psu)
≤ 2.6
Good status (34.5 psu)
≤ 0.25</td></tr>
<tr><td>Molybdate Reactive Phosphorus (MRP) (mg P/l)*</td><td>Winter:

High Status (0-17 psu)
≤ 0.030 (median)

(>17-35psu)
≤ 0.030-0.025 (median)</td><td>Summer:

Good Status (0-17 psu)
≤ 0.060 (median)

(>17-35psu)
≤ 0.060-0.040 (median)</td><td colspan="2">N/A</td></tr>
<tr><td colspan="5">* Linear interpolation to be used to establish the limit value for water bodies between these salinity levels based on the median salinity of the water body being assessed. As such, for dissolved inorganic nutrients in saline waters, such as nitrogen and phosphate, salinity related thresholds have been defined for assessment under the WFD based on Trophic Status Assessment Criteria (TSAS) (EPA, 2023b; Appendix 2) derived from monitoring set up under the Nitrates Directive (91/676EEC) (a subset under the WFD monitoring).</td></tr>
</table>

8.5.4.2 EQS

The EQS Directive (2008/105/EC) establishes limits on concentrations of 33 priority substances presenting a significant risk to, or via, the aquatic environment at EU level, and eight other pollutants in surface waters. In the 2013 review, 12 new substances were added to the existing list as amended through Directive 2013/39/EU [3]. These substances include metals, organotins, PAHs, PCBs and DDT. The EQS aims to protect the most sensitive species from direct toxicity as well as predators and humans that may be exposed to the substance. The EQS thresholds have been incorporated into the relevant legislation in Ireland and are now monitored as part of the WFD compliance monitoring programme and used to aid classification of status for waterbodies assessed (see section 8.5.5.1.4)

[3] *It should be noted that in 2023, 23 critical substances were added to the list of priority substances for surface waters, including pesticides such as glyphosate, some pharmaceuticals (painkillers, anti-inflammatory drugs and antibiotics), Bisphenol A and a group of 24 per-and polyfluoroalkyl substances. The proposal the European Parliament amending Directive 2008/105/EC (and Directives (2000/60/EC) and (2006/118/EC)) was presented on 19th June 2024 and the Council agreed its negotiating mandate. Following the implementation of these amendments into the Directives, member states will have 2 years to transpose these amendments into law (see https://data.consilium.europa.eu/doc/document/ST-11383-2024-INIT/en/pdf/).*

8.5.5 Baseline Description

The baseline description of the WSQ Study Area has been informed by the data sources identified in Table 8-3, Project specific surveys detailed in Section 8.5.2, Project specific supporting studies and guidelines detailed in Section 8.5.3, and consultation. The following sections detail the information on the WSQ properties within the WSQ Study Area (Figure 8-1). Additionally, the baseline details the likely future baseline for WSQ conditions expected to prevail without any development taking place. The baseline considers a timescale that covers the construction, operation and maintenance and decommissioning phases.

8.5.5.1 Water Quality

8.5.5.1.1 *Chemical Analysis*

Water samples for chemical analysis were collected from 33 stations, 17 within the array and 16 along the OECC with samples taken from the top and bottom of the water column resulting in 66 samples for analysis.

Dissolved inorganic nutrients

The ecology of estuaries and coastal waters is particularly sensitive to nitrogen. Increased nitrogen concentration in waters is an indicator of human activities in the upstream catchments affecting water quality. Salinity related TSAS thresholds have been defined for DIN[4] in Ireland's estuaries and coastal waters (as discussed in section 8.5.4). The TSAS thresholds range from 2.6 mg/l N in freshwater to 0.25 mg/l N in fully saline waters. DIN concentrations above these thresholds can indicate pollution (EPA, 2024).

Increased phosphate (P) concentrations in estuaries can affect the ecology and functioning of ecosystems. Phosphate is important in estuarine systems as it can control the growth of algae and aquatic plants. If present in sufficient concentration it can cause eutrophication. Salinity related TSAS thresholds have been defined for phosphate[5] in estuaries and coastal waters (as discussed in section 8.5.4). The TSAS thresholds range from 0.060 mg/l P for fresh and intermediate salinity waters to 0.040 mg/l P for fully saline waters. Phosphate concentrations above these thresholds can indicate pollution (EPA, 2024).

The 2023 EPA assessment highlights that 20 of the 117 (17%) estuarine and coastal water bodies are in unsatisfactory condition for DIN in 2023. These were located primarily along the eastern, south eastern and southern coastlines. This is an apparent improvement from the previous assessment in 2022 (20% were in unsatisfactory condition for DIN) however this is more likely a result of the inclusion of an increased number of coastal water bodies which generally are less impacted (EPA, 2024). Nonetheless, monitoring stations within the WSQ area show that all stations exhibit <-50% winter DIN concentrations above threshold criteria (EPA, 2024).

Additionally, 98 % of all estuaries and coastal waters were assessed as in satisfactory condition for phosphate, with the largest contributions of phosphorus from catchments that drain from the south east of the country. This reflected a small (1%) improvement overall compared to the 2022 assessment. Furthermore, all EPA stations in the Study Area assessed as <-50% above threshold values for winter molybate reactive phosphorous (EPA, 2024).

Findings of the site-specific water quality analysis within the OAA show that Nitrate as NO3 was below the limit of detection (< LoD) at all stations except two, ST009 bottom and ST021top, with the bottom of ST009 showing the highest concentration of 8.70 mg/l. Ammoniacal Nitrogen as N was above the LoD (0.01 mg/l) for all samples collected in the OAA, with a maximum of 0.5 mg/l recorded across five stations (ST007 bottom, ST009 bottom, ST023 top, ST027 top, ST029 bottom). Nitrite as NO2 was < LOD (0.04 mg/l) at all stations in the OAA. Orthophosphate as P was < LoD in all but two samples, ST027 bottom and ST031 bottom, with concentrations of 0.01 mg/l and 0.05 mg/l respectively. Chloride as Cl ranged from 8,770 mg/l at the bottom of station ST033 to 17,300 mgl-1 at the bottom of ST007. Nitrite as NO2 was < LoD at all stations, as shown in Table 8-15.

---

[4] *DIN is the sum of nitrite, nitrate and ammonia.*
[5] *Measured as molybdate reactive phosphate.*

Findings of the site-specific water quality analysis within the OECC show that Nitrite as NO2 was < LoD at all stations as was Nitrate as NO3. However, Ammoniacal Nitrogen as N was above the LoD (0.01 mg/l) for all samples collected in the OAA, with a maximum of 0.5 mg/l recorded across nine stations. Orthophosphate as P was < LoD in 29 samples, with the highest concentration of 0.02 mg/l recorded at both the top of ST036 and bottom of ST045. Chloride as Cl was between 8,630 mg/l (ST043 top) and 18,200 mg/l (ST041 top), as shown in Table 8-15.

The results from the site-specific analysis are not directly comparable to the TSAS criteria (see section 8.5.4.1). Nonetheless, an estimate of DIN from site specific samples as a sum of Nitrate, Nitrite and Ammonia based on the median salinity of 30.3 spu (as per Table 8-15), gives a threshold criterion of 0.57 mg/l DIN (EPA, 2023). As such, two samples in the OAA (ST009 and ST021) highlighted elevated DIN levels above this threshold)[6]. For phosphate based on the median salinity of 30.3 spu, a threshold of 0.046 mg/l for phosphate is provided based on the TSAS criteria. Only one sample within the OAA (ST031 bottom) was in exceedance of this threshold at 0.05 mg/l. Given the limited occurrences of exceedances against the TSAS criteria and the limitations in applying this criterion, it is considered that DIN and phosphate levels within the Offshore Site are not representative of a eutrophic environment.

Total Organic Carbon

Within the OAA, TOC in water samples ranged from < LoD to 1.47 mg/l (recorded at the bottom of station ST015). TOC at stations along the OECC was < LoD in 15 of the 32 samples analysed, with a maximum concentration of 1.24 mg/l at the top of station ST059.

[6] It is noted that the LoD for Nitrate (0.9 mg/l) is higher than the TSAS threshold, however as the majority of samples are <LoD it is not considered to present a significant risk.

Table 8-15 Water Chemistry

Sampling Location ID	Ammoniacal Nitrogen as N (mg/l)	Chloride as Cl (mg/l)	Nitrate as NO_3 (mg/l)	Nitrite as NO_2 (mg/l)	Orthophosphate as P (mg/l)	Conductivity at 25°C (µS/cm)	Salinity (ppm)	Total Organic Carbon (mg/l)	Total Alkalinity (mg/l)
LoD	0.01	1	0.9	0.04	0.01	100	2	0.4	2
OAA									
ST001 BOT	0.40	13400	<0.9	<0.04	<0.01	49400	32.3	1.19	133
ST001 TOP	0.40	15700	<0.9	<0.04	<0.01	48900	31.9	1.10	130
ST003 BOT	0.40	14700	<0.9	<0.04	<0.01	48200	31.4	0.91	136
ST003 TOP	0.40	15500	<0.9	<0.04	<0.01	48600	31.7	1.09	132
ST005 BOT	0.40	15400	<0.9	<0.04	<0.01	48700	31.8	0.93	135
ST005 TOP	0.40	15500	<0.9	<0.04	<0.01	48900	31.9	1.00	139
ST007 BOT	0.50	17300	<0.9	<0.04	<0.01	49000	32.0	1.07	133
ST007 TOP	0.40	13400	<0.9	<0.04	<0.01	48600	31.7	1.12	133
ST009 BOT	0.50	15200	8.70	<0.04	<0.01	49100	32.1	0.87	135
ST009 TOP	0.40	15800	<0.9	<0.04	<0.01	48700	31.8	1.03	135
ST011 BOT	0.40	16200	<0.9	<0.04	<0.01	49000	32.0	0.87	130

Sampling Location ID	Ammoniacal Nitrogen as N (mg/l)	Chloride as Cl (mg/l)	Nitrate as NO_3 (mg/l)	Nitrite as NO_2 (mg/l)	Orthophosphate as P (mg/l)	Conductivity at 25°C (µS/cm)	Salinity (ppm)	Total Organic Carbon (mg/l)	Total Alkalinity (mg/l)
LoD	0.01	1	0.9	0.04	0.01	100	2	0.4	2
ST011 TOP	0.40	15000	<0.9	<0.04	<0.01	48500	31.6	1.03	132
ST013 TOP	0.40	12900	<0.9	<0.04	<0.01	49600	32.4	1.23	111
ST013 BOT	0.40	16200	<0.9	<0.04	<0.01	50100	32.8	1.27	113
ST015 BOT	0.40	15000	<0.9	<0.04	<0.01	48300	31.5	1.47	132
ST015 TOP	0.40	14200	<0.9	<0.04	<0.01	48400	31.6	1.05	137
ST017 BOT	0.42	14500	<0.9	<0.04	<0.01	48500	31.6	0.97	132
ST017 TOP	0.30	12800	<0.9	<0.04	<0.01	48300	31.5	1.08	134
ST019 BOT	0.40	14500	<0.9	<0.04	<0.01	46900	30.5	1.01	129
ST019 TOP	0.40	14500	<0.9	<0.04	<0.01	46200	30.0	0.98	136
ST021 BOT	0.40	15300	<0.9	<0.04	<0.01	46500	30.2	0.85	107
ST021 TOP	0.30	15600	1.00	<0.04	<0.01	44900	29.0	<4.00	127
ST023 BOT	0.40	12200	<0.9	<0.04	<0.01	46300	30.0	<4.00	136

Sampling Location ID	Ammoniacal Nitrogen as N (mg/l)	Chloride as Cl (mg/l)	Nitrate as NO_3 (mg/l)	Nitrite as NO_2 (mg/l)	Orthophosphate as P (mg/l)	Conductivity at 25°C (µS/cm)	Salinity (ppm)	Total Organic Carbon (mg/l)	Total Alkalinity (mg/l)
LoD	0.01	1	0.9	0.04	0.01	100	2	0.4	2
ST023 TOP	0.50	13900	<0.9	<0.04	<0.01	46100	29.9	<4.00	141
ST025 BOT	0.40	14800	<0.9	<0.04	<0.01	45800	29.7	<4.00	130
ST025 TOP	0.40	9520	<0.9	<0.04	<0.01	45700	29.6	<4.00	131
ST027 BOT	0.40	10400	<0.9	<0.04	0.01	47600	31.0	0.90	129
ST027 TOP	0.50	11400	<0.9	<0.04	<0.01	47200	30.7	1.03	131
ST029 BOT	0.50	13700	<0.9	<0.04	<0.01	47200	30.7	0.95	129
ST029 TOP	0.40	14400	<0.9	<0.04	<0.01	46800	30.4	1.00	131
ST031 BOT	0.40	16700	<0.9	<0.04	0.05	46900	30.5	0.96	133
ST031 TOP	0.40	15100	<0.9	<0.04	<0.01	46400	30.1	1.00	129
ST033 BOT	0.30	8770	<0.9	<0.04	<0.01	45000	29.1	0.90	133
ST033 TOP	0.40	11500	<0.9	<0.04	<0.01	46300	30.0	1.03	135
OECC									
ST036 BOT	0.40	9780	<0.9	<0.04	<0.01	46600	30.3	0.90	134

Sampling Location ID	Ammoniacal Nitrogen as N (mg/l)	Chloride as Cl (mg/l)	Nitrate as NO_3 (mg/l)	Nitrite as NO_2 (mg/l)	Orthophosphate as P (mg/l)	Conductivity at 25°C (µS/cm)	Salinity (ppm)	Total Organic Carbon (mg/l)	Total Alkalinity (mg/l)
LoD	0.01	1	0.9	0.04	0.01	100	2	0.4	2
ST036 TOP	0.40	12200	<0.9	<0.04	0.02	45400	29.4	0.98	131
ST039 BOT	0.40	16800	<0.9	<0.04	0.01	46200	30.0	0.87	134
ST039 TOP	0.40	18000	<0.9	<0.04	<0.01	46000	29.8	1.15	136
ST041 BOT	0.40	16600	<0.9	<0.04	<0.01	46200	30.0	0.88	136
ST041 TOP	0.40	18200	<0.9	<0.04	<0.01	46100	29.9	0.86	130
ST043 BOT	0.40	17600	<0.9	<0.04	<0.01	45900	29.7	0.78	133
ST043 TOP	0.40	8630	<0.9	<0.04	<0.01	45400	29.4	1.11	133
ST045 BOT	0.50	12400	<0.9	<0.04	0.02	46300	30.0	0.79	148
ST045 BOT	0.50	9150	<0.9	<0.04	<0.01	45700	29.6	1.07	143
ST047 BOT	0.50	12000	<0.9	<0.04	0.02	46700	30.3	0.74	144
ST047 TOP	0.50	15000	<0.9	<0.04	<0.01	45900	29.7	0.93	139
ST049 BOT	0.50	15900	<0.9	<0.04	<0.01	46400	30.1	<4.00	144

Sampling Location ID	Ammoniacal Nitrogen as N (mg/l)	Chloride as Cl (mg/l)	Nitrate as NO_3 (mg/l)	Nitrite as NO_2 (mg/l)	Orthophosphate as P (mg/l)	Conductivity at 25°C (µS/cm)	Salinity (ppm)	Total Organic Carbon (mg/l)	Total Alkalinity (mg/l)
LoD	0.01	1	0.9	0.04	0.01	100	2	0.4	2
ST049 TOP	0.50	15800	<0.9	<0.04	<0.01	46300	30.0	<4.00	144
ST051 BOT	0.50	16000	<0.9	<0.04	<0.01	46300	30.0	<4.00	140
ST051 TOP	0.40	12300	<0.9	<0.04	<0.01	45800	29.7	<4.00	139
ST053 BOT	0.40	14900	<0.9	<0.04	<0.01	50900	33.4	<4.00	142
ST053 TOP	0.30	13800	<0.9	<0.04	<0.01	48800	31.9	<4.00	137
ST055 BOT	0.40	14100	<0.9	<0.04	<0.01	50300	33.0	<4.00	141
ST055 TOP	0.40	12700	<0.9	<0.04	<0.01	50100	32.8	1.00	147
ST057 BOT	0.40	12500	<0.9	<0.04	<0.01	50200	32.9	0.84	144
ST057 TOP	0.40	11800	<0.9	<0.04	<0.01	49700	32.5	0.95	144
ST059 BOT	0.40	14300	<0.9	<0.04	<0.01	50100	32.8	1.09	139
ST059 TOP	0.30	16600	<0.9	<0.04	<0.01	47300	30.8	1.24	135
ST061 BOT	0.40	16400	<0.9	<0.04	<0.01	45700	29.6	<4.00	142

Sampling Location ID	Ammoniacal Nitrogen as N (mg/l)	Chloride as Cl (mg/l)	Nitrate as NO_3 (mg/l)	Nitrite as NO_2 (mg/l)	Orthophosphate as P (mg/l)	Conductivity at 25°C (µS/cm)	Salinity (ppm)	Total Organic Carbon (mg/l)	Total Alkalinity (mg/l)
LoD	0.01	1	0.9	0.04	0.01	100	2	0.4	2
ST061 TOP	0.40	13900	<0.9	<0.04	<0.01	45300	29.3	<4.00	137
ST063 BOT	0.40	16900	<0.9	<0.04	<0.01	45600	29.5	<4.00	136
ST063 TOP	0.40	16000	<0.9	<0.04	<0.01	45400	29.4	<4.00	139
ST064 BOT	0.40	16900	<0.9	<0.04	<0.01	45800	29.7	<4.00	108
ST064 TOP	0.40	17000	<0.9	<0.04	<0.01	45300	29.3	<4.00	109
ST065 BOT	0.50	15700	<0.9	<0.04	<0.01	46100	29.9	<4.00	107
ST065 TOP	0.50	13100	<0.9	<0.04	<0.01	45700	29.6	<4.00	111
ST013 TOP	0.4	12900	<0.9	<0.04	<0.01	49600	32.4	1.23	111
ST013 BOT	0.4	16200	<0.9	<0.04	<0.01	50100	32.8	1.27	113
Min	0.30	8630	1.00	<0.04	<0.01	44900	29.00	0.74	107
Max	0.50	18200	8.70	<0.04	0.02	50900	33.40	1.47	148
Median	0.40	14750	<0.9	<0.04	<0.01	46650	30.30	1.00	134

8.5.5.1.2 Temperature and salinity

The west coast of Ireland is highly influenced by the presence of the Atlantic Meridional Overturning Circulation (AMOC) (i.e., the Gulf Stream System), the European Slope Current[7], and closer to the coast, the Irish Coastal Current[8] and Irish Shelf Front (ISF). Sea Temperature (2023) records annual average temperatures in inner Galway Bay at approximately 10°C in the earlier part of the year in March and April, then gradually increasing to 16°C in August, before gradually decreasing again over the winter months (Irish Data Buoy Network, 2023; Sea Temperature 2023).

Although Irish waters warmed rapidly from the mid-1980s until mid-2000s, in recent years the sea surface temperature (SST) has decreased by approximately -0.3°C per decade (McCarthy *et al.,* 2023). SSTs in Irish waters are 0.4°C warmer in the 21st century compared to study periods between 1960 – 1990 (Nolan and Lyons, 2006). Salinity off the west coast of Ireland reflects the competing influence of influence of salty Atlantic waters and less dense and salty shelf waters, influenced by freshwater input from fluvial systems. Data is available for salinity in Galway Bay and further offshore in Rockall Trough off the Irish continental shelf. Upper ocean salinity in the North Rockall Trough ranges from 35.3 PSU to 35.4 PSU between 1975 and 2010, decreasing to 35.27 PSU by 2018, while deep ocean salinity decreases generally from 35.02 PSU to 34.99 PSU (Walther *et al.*, 2020). The Connemara Oceanographic 3D outputs daily Conductivity, Temperature, and Depth (CTD) data sets for Galway Bay with salinity falling in the range of 34 PSU to 35 PSU, consistent with offshore measurements (Marine Institute Data Catalogue).

Water column profiles of temperature and salinity have been acquired for a number of environmental sampling locations as introduced in Section 8.5.2. Graph outputs of temperature and salinity across the OAA (and surrounding area) and ECC are presented in Figure 8-4 and Figure 8-5.

The measurements demonstrate that across the OAA (Figure 8-4, top left), surface waters are warmer at around 14.5°C. The temperature is relatively consistent with depth until a water depth of about 40 m, where the temperature quickly reduced by up to several degrees, with the lowest temperature of around 12.25 °C occurring at water depths of 70 m. A similar pattern occurs across the ECC (Figure 8-4, top right), with temperature again being consistent up to water depth of about 40 m, before quickly reducing to the lowest temperature of around 11.25 °C occurring at water depths of between 80 m and 90 m.

With respect to the salinity across the Offshore Site (Figure 8-4, bottom panels), salinity ranges between 34.40 PSU and 34.85 PSU at the sea surface, to between 35.10 PSU and 35.20 PSU at the deepest depth of around 75 m within the OAA and surrounding area (Figure 8-4, bottom left). Along the ECC, surface water is less saline, ranging approximately between 34.30 PSU and 34.80 PSU, while water at depth similar to that within the OAA at around 35.2 PSU. There is a bigger range in salinity through the water column along the ECC, for example ST064 demonstrates a variation from around 34.4 PSU at the surface to around 35.10 PSU at a water depth of 75 m (Figure 8-4, bottom right). The larger range in salinity along the ECC and the less saline surface water is also likely to be as a result of freshwater influence that exist across the region.

Both the temperature and salinity measurements across the Offshore Site, demonstrate the presence of stratification through the water column in line with the general understanding of the water column

[7] *The European Slope Current marks the separation of Irish shelf waters from the open ocean a narrow (20 km – 50 km) current along the continental shelf edge (in water depths of 500 m – 1000 m), with its origins traceable to the Iberian Peninsula and extending all the way around the European shelf towards Scandinavia. The current has notable seasonality, being stronger in winter than summer, with the strong winter flow being associated with bringing heat and material to higher latitudes (Nolan et al., 2023).*

[8] *The Irish Coastal Current is closer to the Irish coast and is influenced by wind, tides, and thermohaline factors, which can each dominate at different times (Nolan et al., 2023). In summer, thermohaline driven circulation is influenced by warm or salty bottom currents in addition to regular tidal mixing patterns.*

structure of Western Irish Shelf. More prominent stratification is found within the OECC than then OAA due to increased water depths in the ECC. However, the outcropping rock formations, shallower bathymetry and wave action means that the stratification is largely broken down across the OAA and is more representative of a well-mixed water column. This is illustrated in the results for the sampling locations across the OECC and OAA and surrounding areas in Figure 8-4 and Figure 8-5, with respect to the water sample locations as set out in Figure 8-2 and Figure 8-3. Further information on stratification within the Offshore Site is provided in Chapter 7: Marine Physical and Coastal Processes.

OAA and surrounding area | OECC

Temperature

Salinity

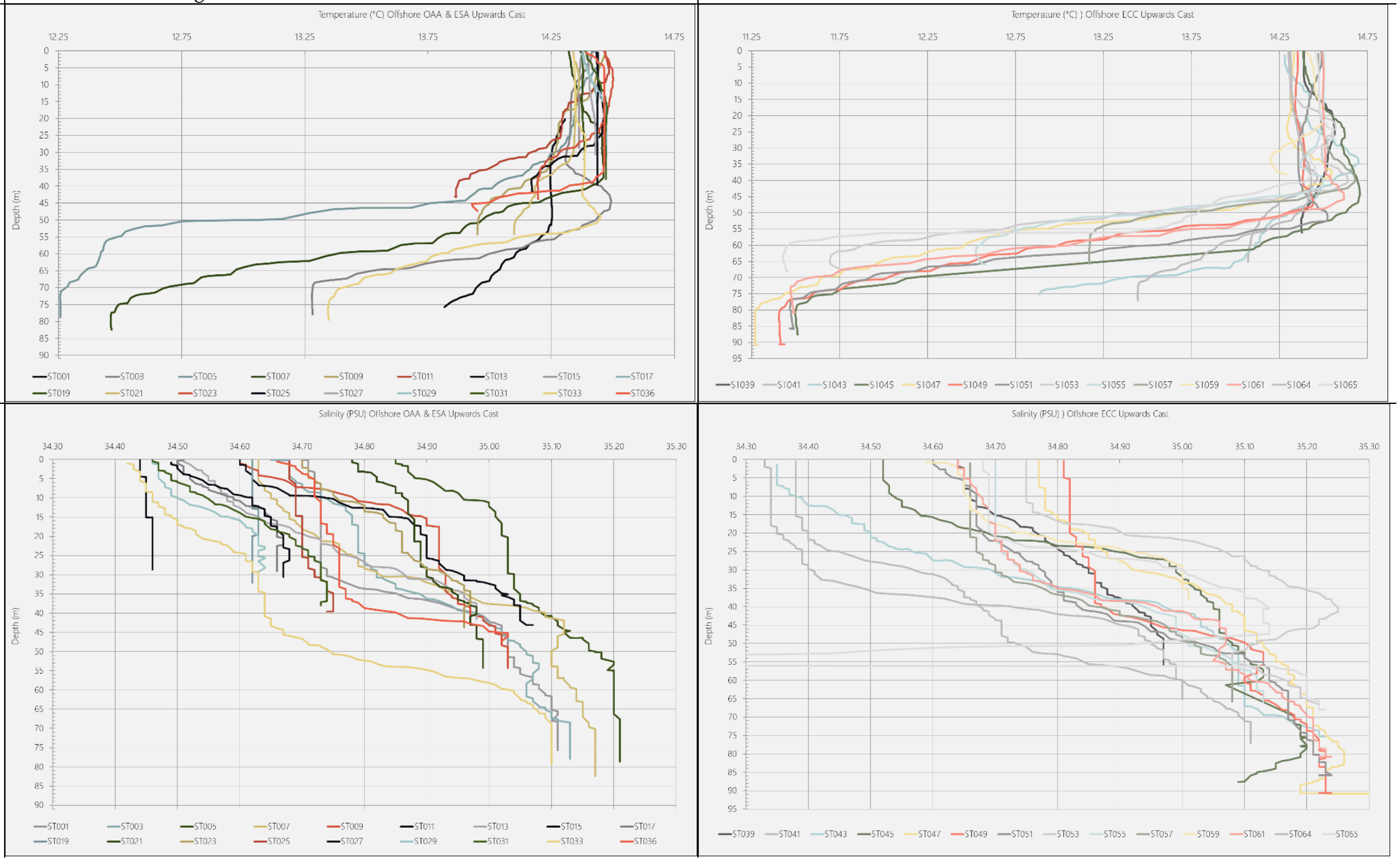


Figure 8-4 Water column profiles of temperature and salinity across the Offshore Site. Results for the OAA and surrounding area is on the left, with the ECC on the right. Temperature (oC) results are at the top, with salinity PSU at the bottom.

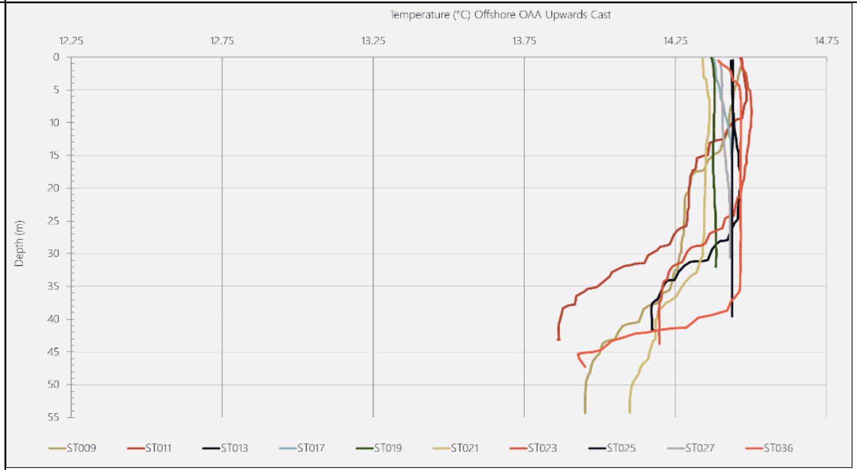
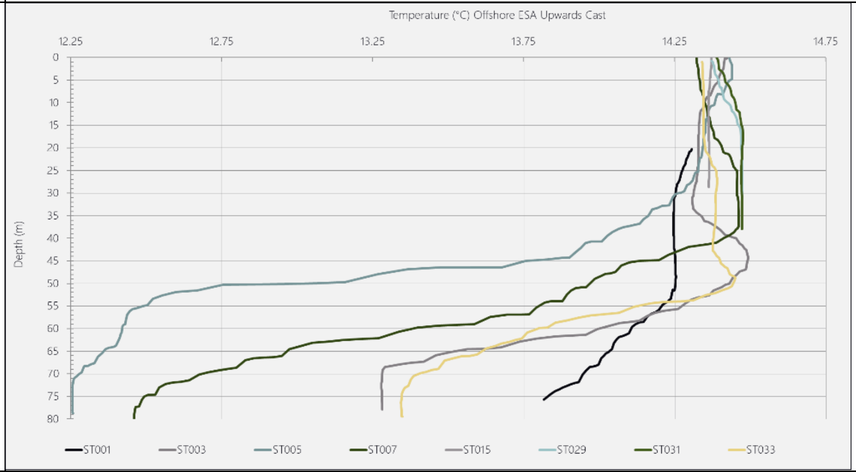
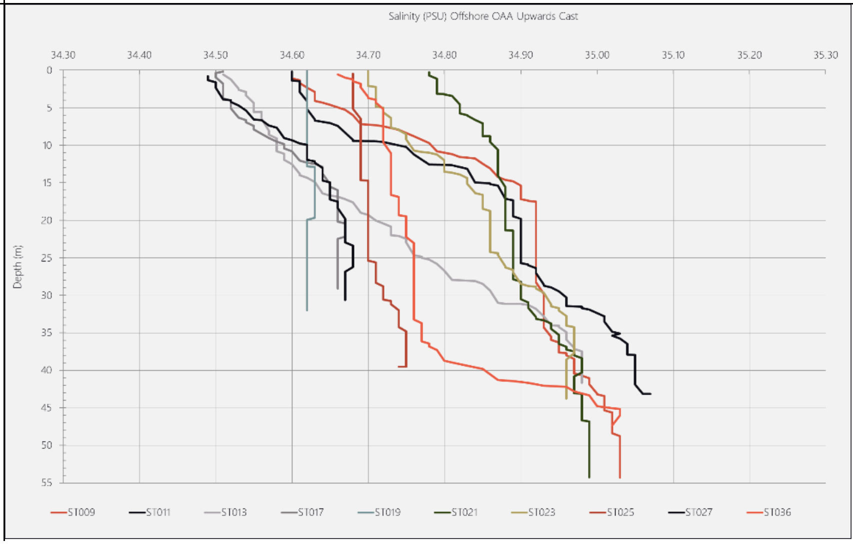
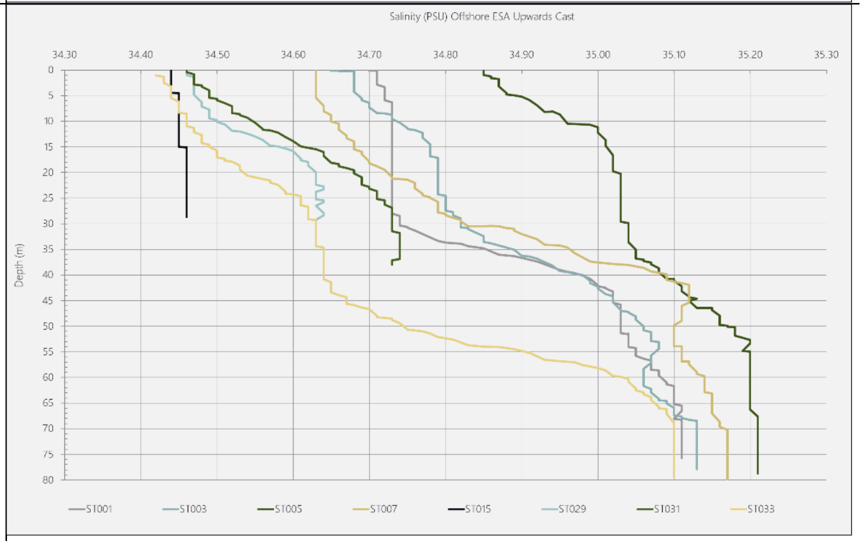
	OAA	Area surrounding the OAA
Temperature		
Salinity		

Figure 8-5 Water column profiles of temperature and salinity across the OAA and surrounding area. Information for the OAA is on the left, with the surrounding area on the right. Temperature (oC) results are at the top, with salinity PSU at the bottom. Note that there is a difference in the depth scale applied between the OAA and surrounding area, while the parameter scale is consistent by the environmental variable

8.5.5.1.3 DO and TSS

DO was recorded throughout the water column for the 33 locations across the Offshore Site (section 8.5.2.2, Figure 8-2, Figure 8-3). As a result, measured DO concentrations are available as profiles through the water column as illustrated in Figure 8-6, with a statistical summary for each sampled location presented in Table 8-16. In the Oslo-Paris Convention (OSPAR) Intermediate Assessment (2017), a DO concentration of >6 mg/l near the seafloor is used as an indicator of a healthy marine environment. DO concentrations were >6 mg/l throughout the water column for each sampled location within the Offshore Site, based on the minimum and maximum levels (Table 8-16) and water column profiles (Figure 8-6). Additionally, water analysis of the sampling stations highlights that the mean optical DO % saturation across the OAA and OECC is 95% and 93%, respectively, which is indicative of a high-quality status for coastal waterbodies for the DO upper limits (see Table 8-15).

Stratification was also observed from the DO samples noting the extent of stratification is more pronounced in the OECC than the OAA, as shown through upward cast data (Figure 8-6). The range of DO concentration within the OECC and OAA, ranged between 6.3 mg/l and 10.31 mg/l and 6.8 mg/l to 10.84 mg/l, respectively, as shown in Table 8-16.

The interaction of the seabed with wave and tidal processes determines how often unconsolidated surficial sediments become mobilised and the way they are transported (i.e., bed load transport and/or suspended load transport). Coarser sediments (i.e., sands and gravels) typically move as bedload transport in response to waves and tides. When finer sediments (i.e., silts and muds) are mobilised they are typically carried in suspension, contributing to higher suspended sediment concentration (SSC) of suspended particulate matter (SPM), increasing the turbidity of the water column until the material settles out and is deposited. Rivers, estuaries and coastal erosion can also provide local sources of increased turbidity.

The site-specific surveys in 2023 did not generate any useable TSS data. The turbidity sensor malfunctioned in the field and provided no useable turbidity readings. As such, the recorded data could not be processed to obtain measurements of total suspended solids. Nonetheless, in the absence of site-specific data, publicly available information from the WFD water quality monitoring for the Shannon Plume (HAs 27;28) coastal waterbody, which overlaps the OECC, shows a median result of 8.2 mg/L for TSS between 2020 to 2023[9]. Additionally, monitoring of the Kilkieran Bay coastal waterbody, east of the OAA, shows a median of 5.3 mg/l between 2016 to 2023[10]. These results are expected, based on the location in relation to the Atlantic and the low fine sediment fraction present along the Offshore Site (as discussed further in section 8.5.5.2.1). Therefore, SSC characteristic to the Offshore Site is low and likely to be typically <10 mg/l.

Table 8-16 DO concentrations throughout the water column within the WSQ Study Area

Sample Point	Mean Water Depth (mLAT)	Mean Optical DO % sat	Mean Optical DO % CB	Min Optical DO (mg/L)	Max Optical DO (mg/L)	Mean Optical DO (mg/L)	Standard Deviation (SD) DO (mg/L)
OAA							
ST001	36.49	94.80	95.07	7.45	10.12	7.87	0.28
ST003	39.00	95.76	96.04	7.39	8.37	7.92	0.27
ST005	63.91	83.63	83.88	6.80	8.30	7.10	0.47

[9] https://www.catchments.ie/data/#/waterbody/IE_SH_070_0000?_k=ktnbek
[10] https://www.catchments.ie/data/#/waterbody/IE_WE_200_0000?_k=vdhsb0

Sample Point	Mean Water Depth (mLAT)	Mean Optical DO % sat	Mean Optical DO % CB	Min Optical DO (mg/L)	Max Optical DO (mg/L)	Mean Optical DO (mg/L)	Standard Deviation (SD) DO (mg/L)
ST007	42.94	92.30	92.57	6.88	10.71	7.68	0.56
ST009	28.77	94.27	94.54	7.54	10.35	7.80	0.25
ST011	25.66	92.03	92.31	7.40	8.07	7.62	0.19
ST013	22.75	95.54	95.83	7.67	8.41	7.88	0.23
ST015	12.40	96.70	96.99	7.95	8.09	8.00	0.04
ST017	15.07	97.86	98.15	7.97	10.84	8.10	0.29
ST019	15.52	97.77	98.04	8.00	8.42	8.07	0.09
ST021	30.88	95.43	95.70	7.61	8.32	7.88	0.19
ST023	22.68	96.57	96.84	7.63	8.50	7.96	0.26
ST025	21.45	98.21	98.50	8.02	10.31	8.11	0.19
ST027	18.14	97.44	97.73	8.00	8.19	8.04	0.04
ST029	17.86	96.79	97.07	7.91	8.27	7.98	0.09
ST031	20.54	96.75	97.04	7.82	10.44	7.99	0.24
ST033	37.74	96.40	96.68	7.18	8.36	7.99	0.40
ST036	24.99	97.44	97.72	7.65	8.47	8.03	0.16
OECC							
ST039	29.14	97.85	98.13	7.71	10.28	8.07	0.28
ST041	33.67	95.97	96.25	7.54	10.12	7.95	0.25
ST043	39.53	93.06	93.33	7.05	10.31	7.70	0.41
ST045	42.96	91.84	92.11	6.55	8.07	7.62	0.49
ST047	68.10	81.83	82.07	6.52	8.08	7.00	0.61
ST049	52.99	86.95	87.20	6.40	8.10	7.32	0.70
ST051	46.42	90.01	90.27	6.44	8.12	7.52	0.63
ST053	34.29	90.77	91.03	6.30	8.08	7.53	0.53
ST055	35.41	92.19	92.46	6.73	8.09	7.64	0.48
ST057	33.64	92.82	93.09	6.93	8.04	7.67	0.41
ST059	19.48	94.51	94.79	7.28	8.05	7.79	0.28
ST061	44.47	89.51	89.77	6.40	9.65	7.47	0.65
ST064	34.49	89.82	90.08	6.38	9.90	7.47	0.57
ST065	29.14	97.85	98.13	7.71	10.28	8.07	0.28

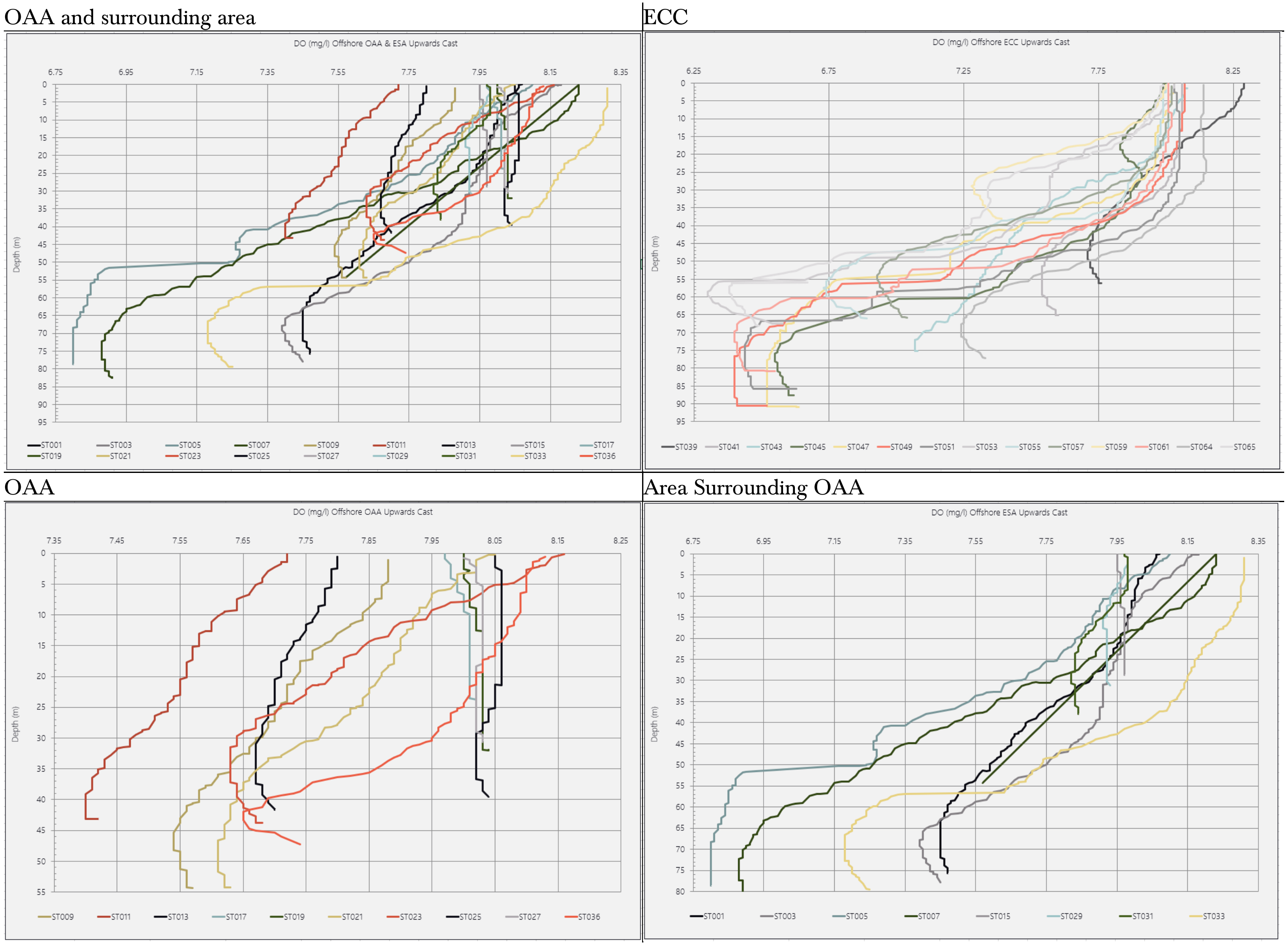


Figure 8-6 Water column profiles of DO (mg/l) across the Offshore Site

8.5.5.1.4 *Designated waters*

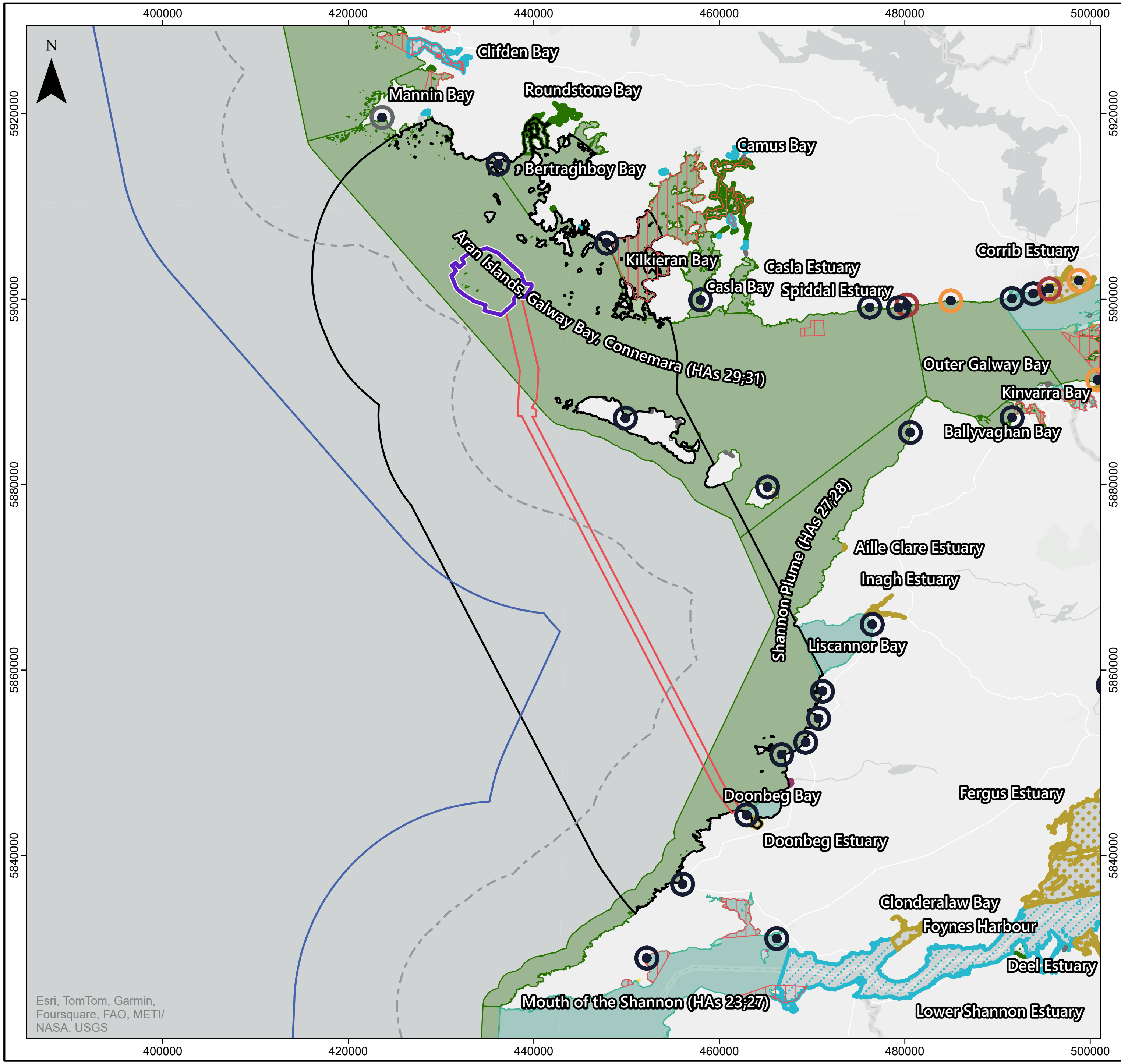
The EU Water Framework Directive (2000/60/EC) requires all Member States to protect and improve water quality in all waters so that a good ecological status is achieved at the latest, by 2027. It was given legal effect in Ireland by the European Communities (Water Policy) Regulations 2003-10 and Surface Water Regulations 2009 (as amended). It applies to rivers, lakes, groundwater, and transitional coastal waters. The WFD is implemented through River Basin Management Plans (RBMPs) in three six-year cycles. Each cycle providing an opportunity to assess water conditions at different stages and set out actions to achieve water quality objectives. The Minister for Housing, Local Government and Heritage is responsible for the implementation of the WFD in Ireland.

Currently the RBMP 2018 -2021 is the latest fully commissioned report, however a draft of the RBMP 2022-2027 is available (Irish Government, 2024). Proposed developments must adhere to the legal WFD objectives of surface waterbodies to obtain 'Good Status' or not deteriorate in status if already good or higher. The EPA highlights the next River Basin Management Plan (2022-2027) must be published with a firm commitment to address the main pressures on water quality (agriculture, hydromorphology, wastewater and forestry). In terms of the Offshore Site, only the coastal and transitional waterbodies designated under the WFD are considered as these are within the WSQ Study Area. Nonetheless, terrestrial waterbodies (such as rivers) under the WFD are considered within Chapter 23 – Water and Appendix 23-2 – WFD.

Furthermore, additional protected areas that have been designated due to their importance have also been considered, these protected areas include:

- Bathing waters – Designated under the EU Bathing Water Directive (2006/7/EC) and assessed under the Bathing Water Quality Regulations 2008 as amended;
- Shellfish Waters – initially designated under the Shellfish Waters Directive, however this directive has been repealed. Nonetheless, these areas are also protected under the WFD as 'areas designated for the protection of economically significant aquatic species'. The requirement from a WFD perspective is to ensure that water quality does not impact on the quality of shellfish produced for human consumption.
- Nutrient Sensitive Areas – Designated under the Urban Waste Water Treatment Directive (91/271/EEC). These are defined as *"natural freshwater lakes, other freshwater bodies, estuaries and coastal waters which are found to be eutrophic or which in the near future may become eutrophic if protective action is not taken."*
- Natura 2000 sites - The Habitats Directive has clear links to the WFD through the Register of Protected Areas, which includes Special Areas of Conservation (SAC) designated under the Habitats Directive and Special Protection Areas (SPAs) designated under the Conservation of Wild Birds Directive (Directive 79/409/EEC as codified by Directive 2009/147/EC). These sites which have WSQ dependent qualifying interests have been considered.
- Natural Heritage Areas (NHAs) are designated for the conservation of plants, animals and wildlife habitats of Irish importance. First entered into European Law under the 1976 Wildlife Act, transposed into Irish law with the 1997 Natural Habitats Regulations (S.I. No. 94 of 1997), gaining full statutory backing in Ireland with the passing of the Wildlife (Amendment) Act 2000. Additionally, there are 630 proposed NHAs (pNHAs), which were published on a non-statutory basis in 1995 but have not since been statutorily proposed or designated. These sites are of significance for wildlife and habitats and are given due consideration by planning authorities. The NHAs and pNHAs in proximity to the Offshore Site are show in Figure 8-9.

The following sub-sections characterise the designated waterbodies, designated bathing waters, designated shellfish waters, nutrient sensitive areas (as shown in Figure 8-7), and Natura 2000 sites with water dependant features (as shown in Figure 8-8) and NHAs/pNHAs (as shown in Figure 8-9) within the WSQ Study Area.



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
- Designated Shellfish Areas
- Designated Bathing Water Locations

Bathing Water Quality 2021

- Excellent
- Good
- Sufficient
- Not classified

Coastal Waterbody WFD Status 2016 - 2021

- High
- Good
- Moderate
- Poor
- Unassigned

Transitional Waterbody WFD Status 2016 - 2021

- High
- Good
- Moderate
- Poor
- Unassigned

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. Ireland's Marine Atlas at http://atlas.marine.ie/

PROJECT TITLE

Sceirde Rocks

MAP TITLE

Coastal, Transitional and Bathing Water Quality

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

DRAWING NO

Figure 8-7

SCALE	PAPER SIZE	DATUM	PROJECTION
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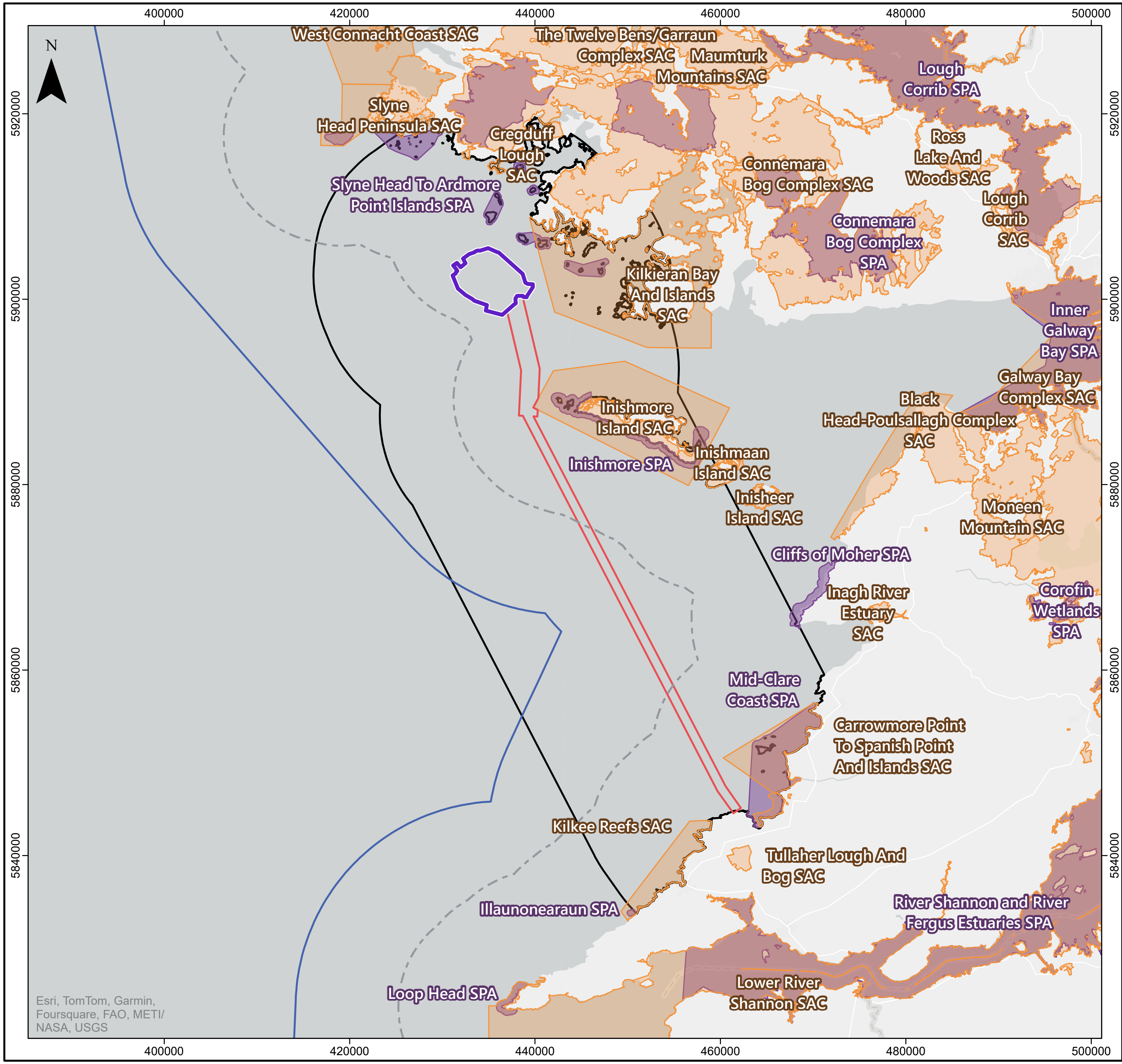

SCEIRDE ROCKS WINDFARM
Feirm Ghaoithe Charraigeacha Sceirde

LEGEND

- Offshore Array Area
- Offshore Export Cable Corridor
- Study Area
- Ireland 6 NM limit
- Ireland 12 NM Limit
- SACs with Water Dependent Features
- SPAs with Water Dependent Features

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
Designated Sites

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

DRAWING NO
Figure 8-8

SCALE	PAPER SIZE	DATUM	PROJECTION
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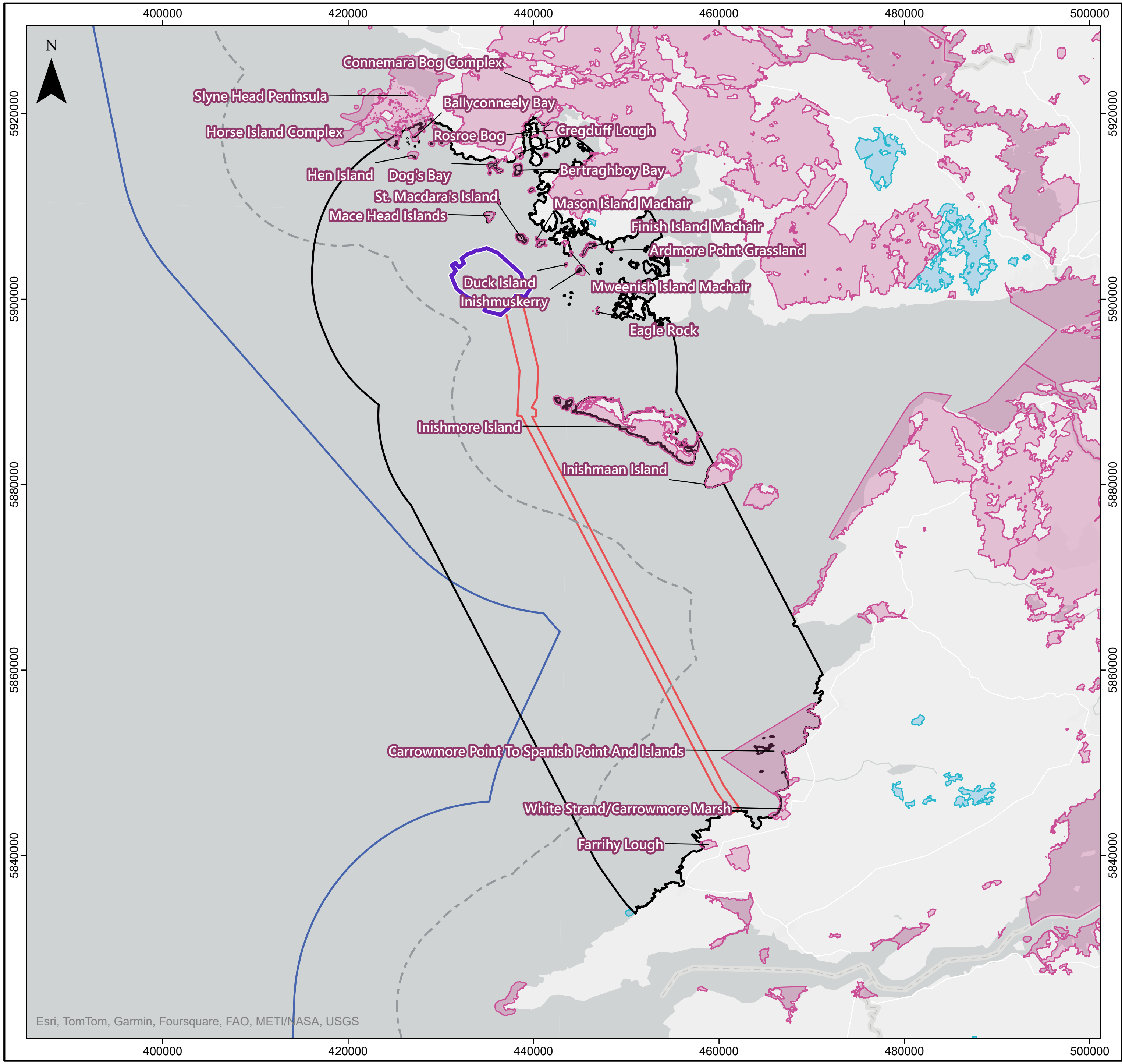

SCEIRDE ROCKS WINDFARM

Feirm Ghaoithe Charraigeacha Sceirde

LEGEND

- Offshore Array Area
- Offshore Export Cable Corridor
- Study Area
- Ireland 6 NM limit
- Ireland 12 NM Limit
- Proposed Natural Heritage Areas
- Natural Heritage Areas

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

Natural Heritage Areas

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

DRAWING NO

Figure 8-9

SCALE	PAPER SIZE	DATUM	PROJECTION
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Designated coastal and transitional waterbodies

The WSQ Study Area overlaps with coastal and transitional waterbodies designated under the WFD. Details of these coastal and transitional waterbodies which are located within the WSQ Study Area, including their classification under the RBMP is provided in Table 8-17 below. These waterbodies are also shown in Figure 8-7.

All coastal and transitional waterbodies within the WSQ Study Area are classed as having a “high” or “good” Ecological Status or Potential, with the exception of the Doonbeg Estuary transitional waterbody which has been assigned a “Moderate” Ecological Status. Additionally, although the Kilkieran Bay coastal waterbody has been assigned a “High” Ecological Status, it has been assigned a “Failing to meet good” status in the 2016-2018 assessment period for surface water chemistry. Nonetheless, no waterbody within the WSQ Study Area is found to be at risk of not achieving their WFD objectives from the latest RBMP cycle and as such no significant pressures are identified for these specific waterbodies.

Table 8-17 WFD Coastal and Transitional Waterbodies in the Study Area (EPA, 2024; Catchment.ie, 2024)

Site Name (Site Code)	Distance from Offshore Site (km)	WFD Risk**	Significant Pressures ***	Parameter	WFD Monitoring Assessment Period				
					2016 - 2021	2013-2018	2010-2015	2010-2012	2007-2009
Coastal Waterbodies									
Shannon Plume (IE_SH_070_0000)	0 (overlaps the OECC)	Not at Risk	N/A	Ecological Status or Potential	High	High	Unassigned	Unassigned	Unassigned
				Supporting Chemistry Conditions	High	N/A	N/A	N/A	N/A
				General Conditions	High	N/A	N/A	N/A	N/A
				Nutrient Conditions	High	N/A	N/A	N/A	N/A
Aran Islands, Galway Bay, Connemara* (IE_WE_010_0000)	0 (overlaps the OECC and OAA)	Review	N/A	Ecological Status or Potential	High	High	Unassigned	Unassigned	Unassigned
Doonbeg Bay* (IE_SH_080_0000)	0.8 (east of Landfall)	Not at Risk	N/A	Ecological Status or Potential	Good	High	Unassigned	Unassigned	Unassigned
Bertraghboy Bay* (IE_WE_230_0000)	5.2 (north-east of OAA)	Not at Risk	N/A	Ecological Status or Potential	High	High	Unassigned	Unassigned	Unassigned
Kilkieran Bay (IE_WE_200_0000)	9.2 (east of OAA and OECC)	Not at Risk	N/A	Ecological Status or Potential	High	Good	High	High	High
				Supporting Chemistry Conditions	High	High	High	High	High
				General Conditions	High	High	High	High	High
				Nutrient Conditions	High	High	High	High	High
				Chemical Surface Water Status	Failing to Achieve Good	Good	Good	N/A	N/A

Site Name (Site Code)	Distance from Offshore Site (km)	WFD Risk**	Significant Pressures ***	Parameter	WFD Monitoring Assessment Period				
					2016 - 2021	2013-2018	2010-2015	2010-2012	2007-2009
Liscannor Bay* (IE_SH_100_0000)	14.6 (east of OECC)	Review	N/A	Ecological Status or Potential	Good	High	Unassigned	Unassigned	Unassigned
Transitional Waterbodies									
Doonbeg Estuary* (IE_SH_080_0100)	1.5 (east of Landfall)	Review	N/A	Ecological Status or Potential	Moderate	Moderate	Unassigned	Unassigned	Unassigned
Roundstone Bay* (IE_WE_230_0100)	11(northeast of OAA)	Not at Risk	N/A	Ecological Status or Potential	High	High	Unassigned	Unassigned	Unassigned

**Grouped Assessment Technique (i.e., Not monitored individually).*

*** **Not at Risk** - they are achieving the requirements of the Directive and meeting their environmental objective of good or high-status.*

***Review** - either the measure is in place, but the water quality improvement has not yet been realised or, more commonly, there is currently inadequate information to determine whether or not the water body is At Risk.*

***At Risk**– waterbody is at risk of not meeting their environmental objective of good or high-status.*

****Only identified for those "at Risk"*

Designated bathing waters

The WSQ Study Area overlaps with 9 designated bathing waters (Marine Institute, 2022). The distance and status of the overlapping designated bathing waters is detailed in Table 8-18. The Bathing Water Directive (2006/7/EC), uses the following terminology to classify the annual bathing water quality;

- Excellent;
- Good;
- Sufficient; and
- Poor.

All nine designated bathing waters which overlap with the WSQ Study Area have an excellent annual bathing water quality from 2018 – 2022, with the exception of Quilty (New from 2020 and Excellent 2021 & 2022) (EPA, 2019 -2022).

Table 8-18 Summary of the condition of designated bathing water in the WSQ Study Area (EPA, 2023).

Bathing Water	Distance from Offshore Site (km)	2018	2019	2020	2021	2022
White Strand, Doonbeg	1.0 (east of landfall)	Excellent	Excellent	Excellent	Excellent	Excellent
Seafield, Quilty	7.0 (east of landfall)	Excellent	Excellent	Excellent	Excellent	Excellent
Cill Mhuirbhigh, Inis Mór	8.8 (east of OECC / Inishmore Island)	Excellent	Excellent	Excellent	Excellent	Excellent
Gortín, Cloch na Rón	9.1 (north of OAA)	Excellent	Excellent	Excellent	Excellent	Excellent
Trá Chaladh Fínis, Carna	9.2 (east of OAA)	Excellent	Excellent	Excellent	Excellent	Excellent
Kilkee	9.3 (west of landfall)	Excellent	Excellent	Excellent	Excellent	Excellent
Quilty	9.9 (east of landfall)	N/A	N/A	New	Excellent	Excellent
Spanish Point	12.4 (east of landfall)	Excellent	Excellent	Excellent	Excellent	Excellent
White Strand, Miltown Malbay	14.1 (east of landfall)	Excellent	Excellent	Excellent	Excellent	Excellent

Designated shellfish water protected areas

There is one designated shellfish water protected area, the Kilkieran Bay shellfish area which overlaps with the WSQ Study Area, as shown in Figure 8-7. The Kilkieran Bay shellfish area lies 9.3 km to the northeast of the OAA and 10.68 km from the OECC and has an area of 74.8 km^2 (Irish Government, 2021). The area is mainly harvested for oysters (99.9% 74.7 km^2) but also has a small area from which mussels are harvested (0.1% 0.1 km^2).

Designated shellfish waters are considered to be meeting their Protected Area objectives where a water quality parameter is below the concentrations given in the Regulations or where there is at least 75% compliance with the microbial guide value for shellfish based on quarterly sampling.

Kilkieran Bay shellfish water has four HAB sampling points, the closest sampling points to the Offshore Site are two in Kilkieran South Bay (Illauneragh (GY-KS-IH) and Cashla (GY-KS-CA)). Samples have not been obtained from these stations since 2010 (Marine Institute, 2024). For these stations, the latest samples obtained in 2010 show no harmful biotoxin levels above regulatory levels.

Additionally, the average dissolved concentrations for metals in shellfish waters for the latest reporting period (2016-2019) all complied with EQS (Irish Government, 2022).

Further to the designated shellfish protected areas, Bradán Beo Teo is a company that farms organic salmon within Kilkieran Bay. This fish farm and other fish farms which may be affected by the Offshore Site are discussed and assessed within Chapter 18: Other Sea Users.

Nutrient sensitive areas

Nutrient sensitive areas are identified for natural freshwater lakes, other freshwater bodies, estuaries and coastal waters which are eutrophic or which in the near future may become eutrophic if protective action is not taken. Assessments are carried out on waters downstream of urban waste-water discharges from urban areas above a population equivalent of 10,000.

Nonetheless, there are no nutrient sensitive areas which are located within the WSQ Study Area. Due to the absence of these protected areas, there is no pathway for impacts, and therefore these sites have not been considered further[11].

Natura 2000 sites

The Natura 2000 Network of sites is designated owing to its ecological importance in a European context under the Habitats Directive. Sites within the Natura 2000 Network are referred to as European Sites and comprising:

- a Site of Community importance (SCI) or candidate SCI;
- An SAC or candidate SAC; and
- An SPA or candidate SPA.

A list of European sites with qualifying features which are sensitive to water quality impacts within the WSQ Study Area is provided below in Table 8-19. These have been determined based on the EPA Water Map – "*SACs / SPAs with Water Dependent Habitats/Species*" (EPA, 2018) derived from data provided from Ireland's National Parks and Wildlife Service (National Parks and Wildlife Service; 2023[a-s]).

Inishmore Island Special Area of Conservation (SAC) neighbours the OECC although it does not overlap. Other sensitive European sites which overlap with the WSQ Study Area are detailed in Table 8-19 below and illustrated in Figure 8-8.

[11] See Register of Protected Areas - Nutrient Sensitive Areas - Dataset - data.gov.ie

Table 8-19 Designated sites with WSQ qualifying interests

Site Name	Distance Offshore Site (km)	Qualifying Interests
SACs		
Inishmore Island SAC	0	Reefs; Perennial vegetation of stony banks; Vegetated sea cliffs of the Atlantic and Baltic coasts; Embryonic shifting dunes; Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes); Fixed coastal dunes with herbaceous vegetation (grey dunes); Dunes with Salix repens *ssp. argentea* (Salicion arenariae); Humid dune slacks; Machairs; European dry heaths; Alpine and Boreal heaths; Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia); Lowland hay meadows (*Alopecurus pratensis, Sanguisorba officinalis*); Limestone pavements; Submerged or partially submerged sea caves; *Vertigo angustior* (Narrow-mouthed Whorl Snail); *Phocoena phocoena* (Harbour Porpoise).
Carrowmore Point to Spanish Point and Islands SAC	1.2	Coastal lagoons; Reefs; Perennial vegetation of stony banks; Petrifying springs with tufa formation (Cratoneurion).
Carrowmore Dunes SAC	1.5	Reefs; Embryonic shifting dunes; Shifting dunes along the shoreline with white dunes; Fixed coastal dunes with herbaceous vegetation (grey dunes); Narrow-mouthed Whorl Snail.
Kilkieran Bay and Islands SAC[12]	1.5	Mudflats and sandflats not covered by seawater at low tide; Coastal lagoons; Large shallow inlets and bays; Reefs; Atlantic salt meadows (Glauco-Puccinellietalia maritimae); Mediterranean salt meadows (Juncetalia maritimi); Machairs; Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or Isoeto-Nanojuncetea; Lowland hay meadows (Alopecurus pratensis, Sanguisorba officinalis); Harbour porpoise; *Lutra lutra* (Otter); *Phoca vitulina* (Harbour Seal); *Najas flexilis* (Slender Naiad).
Kilkee Reefs SAC	2.4	Large shallow inlets and bays; Reefs; Submerged or partially submerged sea caves.
Lough Nageeron SAC	5.8	Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or Isoeto-Nanojuncetea; Slender Naiad.
Dog's Bay SAC	8.1	Annual vegetation of drift lines; Embryonic shifting dunes; Shifting dunes along the shoreline with white dunes; Fixed coastal dunes with herbaceous vegetation (grey dunes); European dry heaths.
Connemara Bog Complex SAC	8.3	Coastal lagoons; Reefs; Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae); Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or Isoeto-Nanojuncetea; Natural dystrophic lakes and ponds; Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation; Northern Atlantic wet heaths with Erica tetralix; European dry heaths; Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae); Blanket bogs; Transition mires and quaking bogs; Depressions on peat substrates of the Rhynchosporion; Alkaline fens; Old sessile oak woods with Ilex and Blechnum in the British Isles; Euphydryas aurinia (Marsh Fritillary); *Salmo salar* (Salmon); Otter; Slender Naiad.
Murvey Machair SAC	9.8	Machairs; Petalophyllum ralfsii (Petalwort).
Cregduff Lough SAC	10.2	Transition mires and quaking bogs; Slender Naiad.
Inishmaan Island SAC	13.1	Reefs; Perennial vegetation of stony banks; Vegetated sea cliffs of the Atlantic and Baltic coasts; Embryonic shifting dunes; Shifting dunes along the shoreline with white dunes; Machairs; European dry heaths; Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia); Lowland hay meadows (Alopecurus pratensis, Sanguisorba officinalis); Limestone pavements.

Site Name	Distance Offshore Site (km)	Qualifying Interests
Rosroe Bog SAC	13.4	Blanket bogs; Depressions on peat substrates of the Rhynchosporion.
Slyne Head Peninsula SAC	13.9	Coastal lagoons; Large shallow inlets and bays; Reefs; Annual vegetation of drift lines; Perennial vegetation of stony banks; Atlantic salt meadows; Mediterranean salt meadows; Embryonic shifting dunes; Shifting dunes along the shoreline with white dunes; Machairs; Oligotrophic waters containing very few minerals of sandy plains; Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or Isoeto-Nanojuncetea; Hard oligo-mesotrophic waters with benthic vegetation of Chara spp.; European dry heaths; Juniperus communis formations on heaths or calcareous grasslands; Semi-natural dry grasslands and scrubland facies on calcareous substrates; Molinia meadows on calcareous, peaty or clayey-silt-laden soils; Lowland hay meadows (Alopecurus pratensis, Sanguisorba officinalis); Alkaline fens; *Tursiops truncatus* (Common Bottlenose Dolphin) *Petalophyllum ralfsii* (Petalwort); Slender Naiad.
SPAs		
Mid-Clare Coast SPA	0.8	Cormorant (*Phalacrocorax carbo*); Barnacle Goose (*Branta leucopsis);* Ringed Plover (*Charadrius hiaticula*); Sanderling (*Calidris alba*); Purple Sandpiper (*Calidris maritima*); Dunlin (*Calidris alpina*); Turnstone (*Arenaria interpres*); Wetland and Waterbirds.
Inishmore SPA	1.4	Kittiwake (*Rissa tridactyla*); Arctic Tern (*Sterna paradisaea*); Little Tern (*Sterna albifrons*); Guillemot (*Uria aalge*).
Slyne Head to Ardmore Point Islands SPA	2.3	Barnacle Goose; Sandwich Tern (*Sterna sandvicensis*); Arctic Tern; Little Tern.
Connemara Bog Complex SPA	10.8	Cormorant; Merlin (*Falco columbarius*); Golden Plover (*Pluvialis apricaria*); Common Gull (*Larus canus*).
Cliffs of Moher SPA	14.2	Fulmar (*Fulmarus glacialis*); Kittiwake; Guillemot; Razorbill (*Alca torda*); Puffin (*Fratercula arctica*); Chough (*Pyrrhocorax pyrrhocorax*).
Illaunonearaun SPA	14.9	Barnacle Goose.

NHAs

As shown in Figure 8-9, NHAs within proximity to the Offshore Site, are wholly terrestrial, with the exception of a single small NHA (Illaunonearaun NHA) which is located just beyond the WSQ Study Area, at the eastern side of the OECC boundary, near Kilkee. As such, there is no pathway to the Offshore Site and therefore these NHAs are not considered further.

Additionally, although non-statutory, there are a number of pNHAs which contain marine components within the WSQ Study Area, these are detailed below in Table 8-20.

Table 8-20 pNHAs within the WSQ Study Area

Site Name (Site Code)	Distance Offshore Site (km)	Synopsis summary, if available
Carrowmore Point to Spanish Point and Islands (001021)	1.2	Synopsis unavailable. See Carrowmore Point to Spanish Point and Islands SAC (Table 8-20)
Inishmore Island (000213)	1.7	Synopsis unavailable. See Inishmore Island SPA/SAC (Table 8-20)
St. Macdara's Island (001318)	2.4	Synopsis unavailable.
Mace Head Islands (001300)	2.8	Mace Head Islands are a group of marine islands west of Mace Head, including Freaghillaun, Illaunnacroagh More, Illaunnacroagh Beg and Croaghnakeela Island. The islands are important for wintering Barnacle Geese, particularly Croaghnakeela and Freaghillaun. The Illaunnacroagh group holds nationally important numbers of Great

Site Name (Site Code)	Distance Offshore Site (km)	Synopsis summary, if available
		Black-backed Gulls (30-36 pairs in 1970). Freaghillaun has a population of Arctic Terns (25 pairs in 1970).
White Strand/Carrowmore Marsh (001007)	3.3	Synopsis unavailable.
Mason Island Machair (001302)	3.3	Synopsis unavailable.
Farrihy Lough (000200)	3.5	Small brackish lake surrounded by a continuous reed-bed of Common Reed (*Phragmites australis*) and wet grasslands. The site supports a diverse flora with Marsh-marigold (*Caltha alustris*), Cuckooflower (*Cardamine pratensis*), Yellow Iris (*Iris seudacorus*). Due to the brackish nature of the lake complete freezing over is prevented during the winter months. This feature is of great importance to large numbers of waders and duck who flock to Farrihy Lough during these harsh weather conditions. Up to 500+ Golden Plover and 300 Lapwing along with 40-50 Whooper Swans are known to use this site. The influence of the sea is reflected in the vegetation with many maritime species recorded from the area which include Thrift (*Armeria maritima*), Buck's-horn Plantain (*Plantago coronopus*) and Common Scurvygrass (*Cochlearia officinalis*).
Duck Island (000264)	4.1	Synopsis unavailable.
Inishmuskerry (001974)	5.0	Synopsis unavailable.
Mweenish Island Machair (001306)	5.2	Synopsis unavailable.
Finish Island Machair (01266)	6.1	Synopsis unavailable.
Eagle Rock (001261)	7.1	Synopsis unavailable.
Bertraghboy Bay (001234)	7.9	Bertraghboy Bay is a south-west facing bay on the Connemara coast, known for its complex structure and sheltered nature. The bay is a candidate SAC, featuring large shallow inlets, bays, and reefs. Its shores vary from gently sloping platforms to mixed boulders, cobbles, pebbles, gravel, and sand. The upper shore is characterized by lichens and various types of wrack, while the mid and low shores host a rich variety of marine life, including barnacles, limpets, and various algae. The bay supports a diverse under-boulder fauna and has areas with strong tidal currents, which are scarce in Ireland and Britain. The *Ascophyllum nodosum* in the bay is harvested on a 3–5-year cycle, and finfish farming occurs in the outer part of the bay. The bay also features maerl beds mixed with eelgrass, and its sediments range from sands to muds in sheltered areas. The bay's fauna includes lobsters, crawfish, edible crabs, spider crabs, and various molluscs. Other habitats include a salt marsh and a low sea cliff on Inishnee Island. Terns breed on some of the islands, with species like Sandwich Tern, Common Tern, Little Tern, and Arctic Tern being notable. Overall, Bertraghboy Bay is of high conservation importance due to its excellent examples of shallow bay and reef habitats.
Dog's Bay (001257)	8.1	Synopsis unavailable. See Dog's Bay SAC (Table 8-20).
Connemara Bog Complex (002034)	8.3	Synopsis unavailable. See Connemara Bog Complex SPA (Table 8-20).
Ardmore Point Grassland (001126)	9.2	Synopsis unavailable.
Cregduff Lough (001251)	10.2	Synopsis unavailable. See Cregduff Lough SAC (Table 8-20).
Hen Island (000274)	11.6	The Hen Island site comprises a small group of marine islets about 5km off the mainland south of Ballyconneely, Co Galway. The site is of interest for Arctic Tern (75 pairs in 1984, 50 pairs Common/Arctic Tern in 1970) and considered the fifth most important tern colony in the region.
Ballyconneely Bay (001231)	11.8	The Ballyconneely Bay NHA comprises a group of islands in Ballyconneely Bay, Co. Galway, important for its colonies of terns. Fox Island, the most westerly of the island group, supports populations of Little Tern (30 individuals in 1969, 6 pairs in 1984), Sandwich Tern (35 individuals in 1969) and Arctic Tern (11 pairs in 1984). Wherune Island supports populations of Arctic Tern (23 pairs in 1984) and Little Tern (2 pairs in 1984). Inishdawros and the neighbouring islands of

Site Name (Site Code)	Distance Offshore Site (km)	Synopsis summary, if available
		Illaunnameenoga and Illaunee support populations of Sandwich Tern (34 pairs in 1984).
Inishmaan Island (000212)	13.1	Synopsis unavailable.
Rosroe Bog (000324)	13.4	Synopsis unavailable. See Rosroe Bog SAC (Table 8-20).
Horse Island Complex (000276)	13.6	Horse Island (Galway) comprises a group of islands about 4km east of Slyne Head, including Horse Island itself, Illaunurra, Carrickacummer and several islets and rocks. The site is of interest for its colonies of terns, of which the following have been recorded – Sandwich Tern (150 pairs in 1984), Arctic Tern (39 pairs in 1984) and Little Tern (4 pairs in 1984). The islands also hold a population of breeding gulls (130 individuals in 1984). Barnacle Geese occasionally graze on the grassy islets in winter.
Slyne Head Peninsula (002074)	13.9	Synopsis unavailable. See Slyne Head Peninsula SAC (Table 8-20).

8.5.5.2 Sediment Quality

8.5.5.2.1 *Seabed sediment properties*

The interpretation of the site-specific geophysical survey (EGS, 2023a; 2023b) provides a description of seabed sediments derived from acoustic reflectivity of the SSS and MBES). Where sediment was identified across the WSQ Study Area, the units were broadly classified as

- Boulders;
- SAND:
- Sandy GRAVEL
- Silty SAND;
- Gravelly SAND; and
- Sandy GRAVEL, with intermittent ROCK outcrop and boulders.

To ground truth the seabed interpretation from the geophysical survey, 65 no. grab samples were collected across the Offshore Site (section 8.5.2.2), with Particle Size Analysis (PSA) completed on 57 samples to inform the sediment type. The understanding of sediment distribution and type based on the INFOMAR seabed classification and site-specific sediment type is illustrated in Figure 8-9 and Figure 8-10.

OAA

Rocky outcrops dominate the seabed within the OAA, sediment cover is sparse, often overlying bedrock or filling gullies, faults and joints that exist within the rocky outcrops (EGS, 2022a) The majority of the surveyed area is classified as rock, with coarse sandy sediment covering areas over and between the rock outcrops (EGS, 2023a). A summary of the average percentage sediment fraction for gravel, sand and mud for the PSA samples are summarised in Table 8-21 for the OAA and OECC. Table 8-21 demonstrates that sediment within the OAA primarily comprises coarse sediment compared with that occurs across the OECC. Based on the PSA, of which 19 no. samples occur within the OAA, much of the sediment sampled from the gullies and troughs present across the OAA comprises gravelly sand (10 no. samples) to sandy gravel (5 no. samples), with a mean grain size (d50) ranging between 1.2 mm to 1.9 mm, with representative mean estimate of 1.4 mm, equivalent to very coarse sand. Other sediment types comprising the remaining samples included slightly gravelly sand, sand and muddy sandy gravel, with similar grain size ranges. Little to no fine sediment fraction is present across the OAA as represented by the low percentage occurrence for the mud fraction in Table 8-21. All sediment samples across the OAA range from poorly to moderately well sorted, with moderately sorted being the most common sorting. Figure 8-9 highlights the sediment type and distribution and PSA analysis across the OAA.

Table 8-21 Average percentage sediment fraction for PSA samples across the OAA and OECC

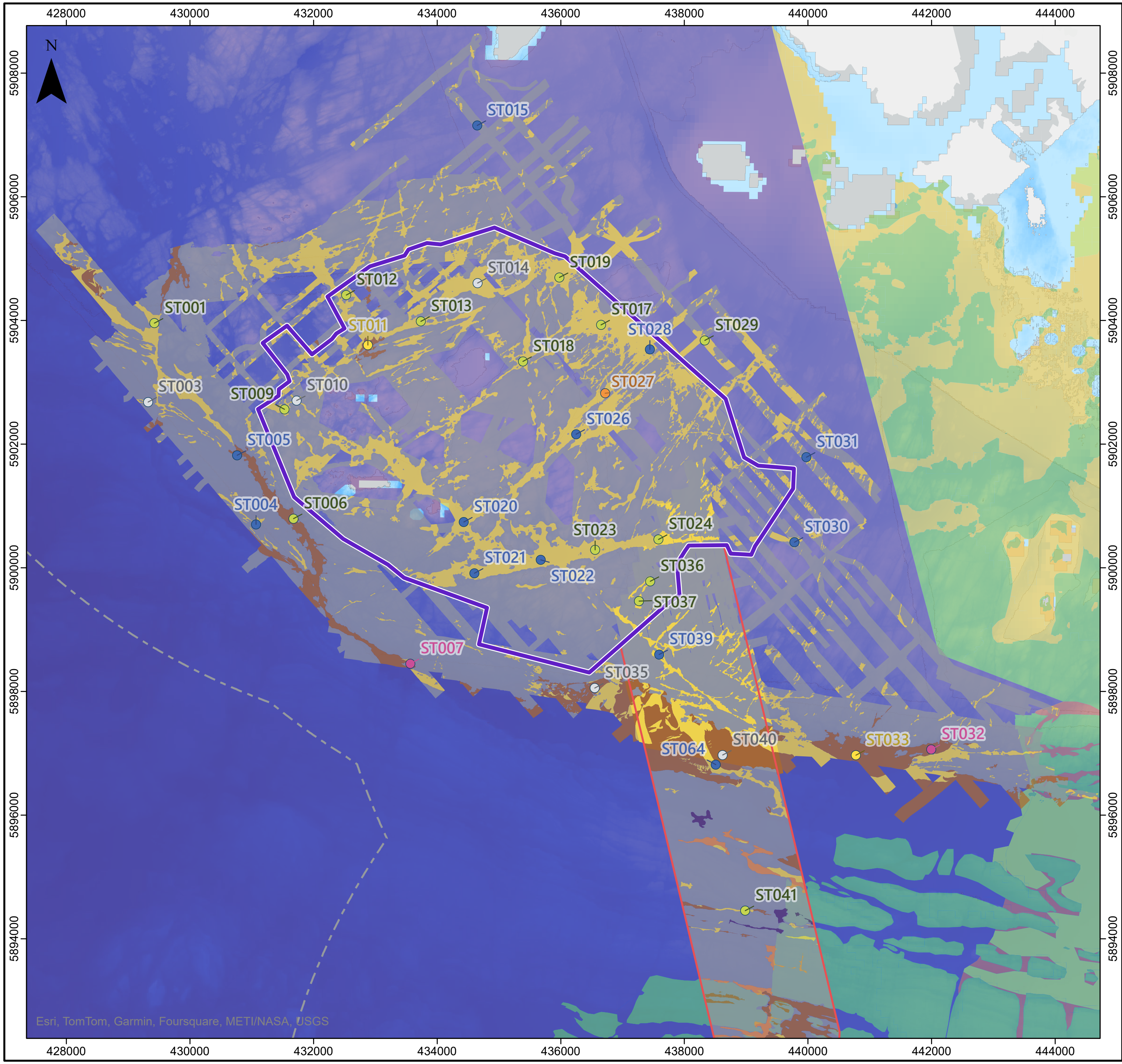
Offshore Site Area	Number of Samples	Percentage Gravel (%)	Percentage Sand (%)	Percentage Mud (%)
OAA	19	22	77	1
OECC	26	8	77	15

OECC

Approximately the first 8 km of the OECC in proximity to the OAA is classified as rock, with small patches of sand and gravelly sediment (Figure 8-9), while in the south-eastern part of the OECC, approximately 7 km from landfall there is an area covered by boulder fields and intermittent rock outcrops (Figure 8-10).

In the first 8 km of the OECC, the sediment in this region based on the PSA is similar to that which occurs across the OAA, being coarse and predominantly comprising gravelly sand and sandy gravel as illustrated in Figure 8-9. Beyond this and for the majority of the OECC (orientated approximately northwest to southeast), the seabed is classified as silty sand, with small, isolated patches of sand and gravelly sand, while the PSA mainly identifies muddy sand becoming coarser towards the landfall. Due to the varying sediment properties along the OECC, the mean grain size (based on the PSA) is quite broad, ranging between 0.05 mm and 8.2 mm, representative of coarse silt to medium gravel respectively. Considering all the sediment samples along the OECC, a mean value of 0.7 mm is estimated representative of coarse sand. The broad range of sediment across the OECC is also reflected in the percentage sediment fraction (Table 8-21), which demonstrates a larger proportion of finer sediment along the OECC, but also the presence of coarser gravel material. All sediment samples ranged from poorly sorted to moderately well sorted with poorly sorted sediment being most common state.

Along the OECC, the mean grain sizes varied with the sediment type. Based on just the muddy sand samples along the OECC (e.g., samples ST042 to ST051 in Figure 8-10), the mean grain size ranges between 0.05 mm and 0.1 mm, with mean value of 0.08 mm, representative of very fine sand. Closer towards the landfall (considering sediment samples ST051 to ST061 in Figure 8-10), the mean grain size ranges between 0.9 mm and 8.2 mm, with a with mean value of 0.9 mm, representative of coarse sand. Considering just the coarser sediment (i.e., sandy gravel, slightly gravelly sand and gravel) the mean grain size ranges between 0.1 mm and 8.2 mm, with mean value of 1.7 mm, representative of very coarse sand. As a result of the broad range of sediment grain sizes that occur along the OECC, it is the case that multiple representative values are applicable to inform the analyses of sediment transport potential. Therefore, the mean representative values of 1.7 mm, 0.08 mm and 0.9 mm are used in the analyses of sediment transport potential described in Chapter 7: Marine Physical and Coastal Processes (and summarised within section 8.5.2.1 of this chapter), as a representation of the seabed sediment close to the OAA, in the central part of the OECC and at the landfall respectively.



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). EMODnet Bathymetry Consortium (2020): EMODnet Digital Bathymetry (DTM). INFOMAR (2021 & 2022).

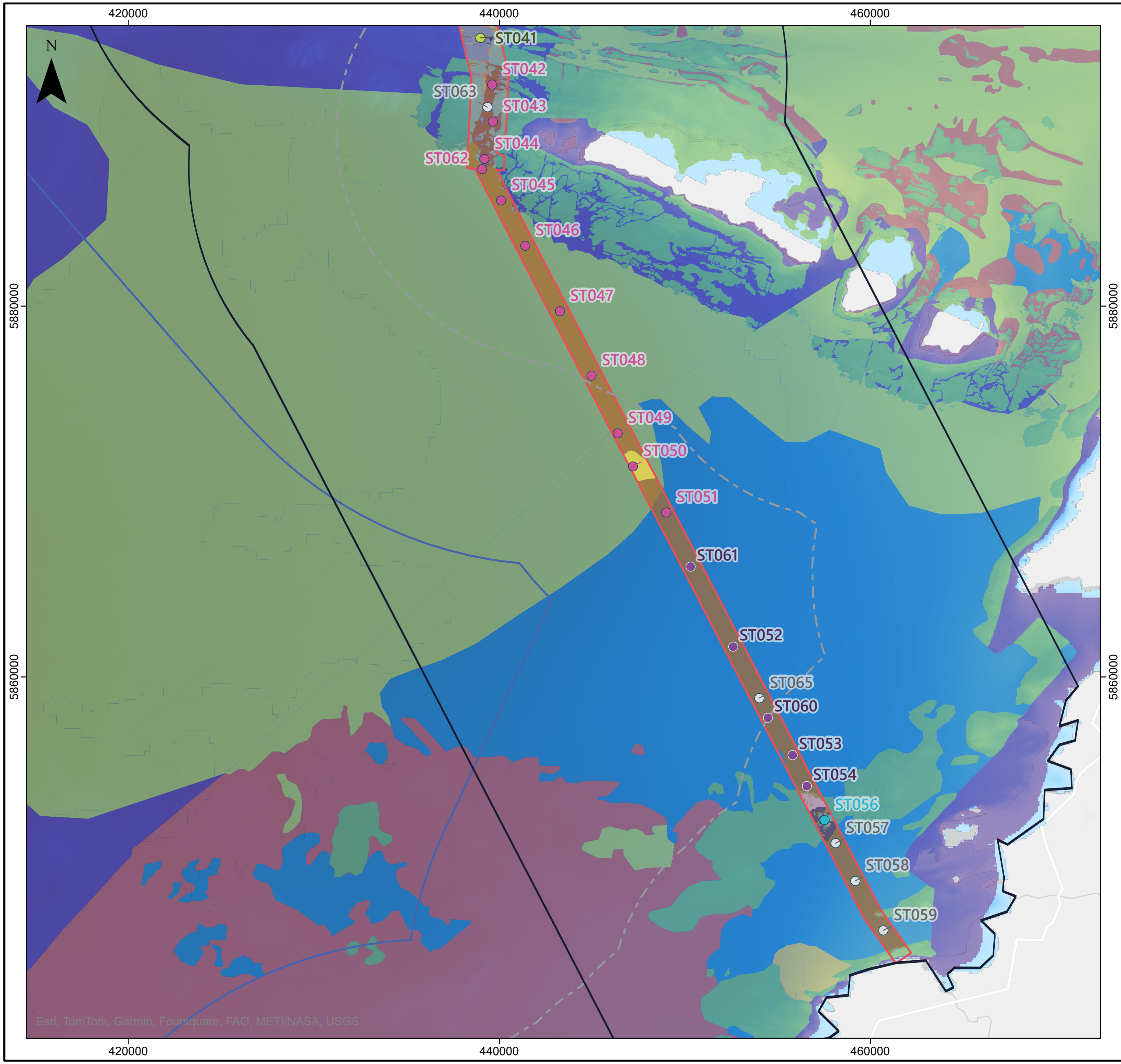
PROJECT TITLE
Sceirde Rocks

MAP TITLE
Seabed Sediments

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

DRAWING NO
Figure 8-10

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
-130

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. Corio Generation (2023). EMODnet Bathymetry Consortium (2020): EMODnet Digital Bathymetry (DTM). INFOMAR (2021 & 2022).

PROJECT TITLE
Sceirde Rocks

MAP TITLE
Seabed Sediments

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

DRAWING NO
Figure 8-11

SCALE	PAPER SIZE	DATUM	PROJECTION
1:300,000	A4	WGS 84	UTM 29N

8.5.5.2.2 *Sediment Chemistry Analysis*

As discussed in Section 8.5.2.2, samples for sediment chemistry and contaminants analyses were obtained at a total of 65 locations. The number of samples acquired and analysed for each of the sediment chemistry receptors and contaminants is detailed below.

Metals

From the 22 acquired samples, 16 were located in the Array area and 6 in the OECC. In terms of metals samples analysed (Table 8-22), the only exceedances recorded within the samples obtained were AS and CR.

For AS, three samples were marginally above the Irish Dredge Disposal Lower Limit (IDD LL) threshold: two within the OAA (ST001; 29.9 mg/kg & ST004; 20.4 mg/kg) and one within the OECC (ST041; 20.4 mg/kg). Nevertheless, all AS exceedances were well below the Irish Dredge Disposal Upper Limits (IDD UL) criteria (70 mg/kg), indicating that all samples containing AS would qualify for disposal at sea. Additionally, all samples contained concentrations of AS that were marginally above the CCME ISQG thresholds. However, all samples were well below the upper CCME PEL threshold.

For CR, one sample exceeded threshold limits in the OECC. ST060 was in exceedance of the IDD LL and CCME PEL thresholds at 198 mg/kg. Under the CCME PEL guidelines this concentration of CR could result in a probable effect range within which adverse effects could frequently occur. However, all samples were far below the IDD UL criteria, highlighting that all samples containing CR would qualify for disposal at sea under these guidelines. Given the singular occurrence of an elevated result within the survey data, it is not considered that this represents an environmental concern.

Ocean Ecology did not report any geographical trends in the AS and CR concentrations however samples taken in the OECC on average were found at higher concentrations than the OAA.

Table 8-22 Metal concentrations (mg/kg dry weight) in samples with threshold values (highlighted cells indicate exceedances)

Sampling Location ID	Metal (mg kg^{-1})							
	AS	CR	CU	NI	PB	ZN	CD	HG
LoD	0.5	0.5	0.5	0.5	0.5	2	0.04	0.01
Irish Lower Level	20	120	40	40	60	160	0.7	0.2
Irish Upper Level	70	370	110	60	218	410	4.2	0.7
CCME ISQG	7.24	52.3	18.7	-	30.2	124	0.7	0.13
CCME PEL	41.6	160	108	-	112	271	4.2	0.7
OAA								
ST001	29.9	10.4	1.6	7.7	10.7	19.6	0.17	<0.01
ST004	20.4	9	0.7	8.3	7.3	20.8	0.18	<0.01
ST007	13.3	24.1	1.7	6.9	9.1	22.1	0.12	<0.01
ST009	10.5	2.8	<0.7	4.9	4	6.2	0.06	<0.01
ST012	16.3	3.3	<0.7	5.8	5.5	7.9	0.06	<0.01
ST013	12.4	6.3	<0.7	4.6	4.6	9.8	0.05	<0.01
ST015	11.1	4.4	<0.7	3.3	5.7	10.6	0.05	<0.01
ST017	9.8	2.2	<0.7	3.6	3.3	5.7	0.07	<0.01
ST019	12.6	2.5	<0.7	6.1	4.4	6.9	0.07	<0.01
ST021	14	5.8	<0.7	6.9	5.1	8.6	0.07	<0.01
ST023	13.4	3.4	<0.7	3.7	3.2	6.2	0.07	<0.01
ST026	15.7	3.7	<0.7	2.9	4.8	8.2	0.07	<0.01
ST029	13.9	2.7	<0.7	4.8	4.4	6.6	0.07	<0.01
ST031	18.1	8.4	1.1	9.7	11.8	19.4	0.05	<0.01
ST033	14.8	18.7	<0.7	5.9	6	15.2	0.09	<0.01
ST035	15.5	49.5	1.3	9.3	7.6	22.5	0.07	<0.01

Sampling Location ID	Metal (mg kg^{-1})							
	AS	CR	CU	NI	PB	ZN	CD	HG
OECC								
ST036	13.5	4.4	1.4	3.7	4.2	8.7	0.07	<0.01
ST041	20.4	6.8	1.4	4.3	7	12	0.1	<0.01
ST045	12.1	21.6	2.8	9.4	6.3	22.7	0.12	<0.01
ST051	14.3	34.2	3.7	10.5	8.4	25.6	0.12	<0.01
ST059	19.2	25.4	<0.7	9.6	5.1	20.6	0.09	<0.01
ST060	17.5	198	1.6	11.4	13.7	33.7	0.24	<0.01
Min	9.8	2.2	0.7	2.9	3.2	5.7	0.05	<0.01
Max	29.9	198	3.7	11.4	13.7	33.7	0.24	<0.01
Median	14.15	6.55	1.5	6	5.6	11.3	0.07	<0.01

Organics

Throughout the 34 sampled and analysed locations, the total organic carbon (TOC) values ranged from 0.20% to 0.79% (Table 8-23). The minimum value of TOC was recorded in the OECC (ST052 & ST061), and the maximum value was recorded in the OAA (ST032).

Table 8-23 Percentage (%) of Total Organic Carbon (TOC) in samples

Sample ID	Total Organic Carbon (%)	Sample ID	Total Organic Carbon (%)
Array		OECC	
LoD	0.02	ST039	0.46
ST003	0.52	ST040	0.35
ST005	0.44	ST042	0.40
ST006	0.48	ST043	0.39
ST010	0.41	ST044	0.43
ST011	0.45	ST046	0.49
ST014	0.49	ST047	0.47
ST018	0.53	ST048	0.54
ST020	0.55	ST049	0.44
ST022	0.39	ST050	0.44
ST024	0.57	ST052	0.20
ST027	0.67	ST053	0.27
ST028	0.47	ST054	0.25
ST030	0.28	ST037	0.24
ST032	0.79	ST056	0.40
		ST057	0.28
		ST058	0.27
		ST061	0.20
		ST062	0.49
		ST063	0.37

Organotins

Concentrations of dibutyltin (DBT) and tributyltin (TBT) were analysed across 22 sampled locations. For all sampled locations across the OAA and OECC, concentrations of DBT and TBT were recorded at less than 0.001 mg/kg, below the LoD (0.001 mg/kg) and did not exceed the IDD LL thresholds (0.1 mg/kg). Therefore, the concentrations of organotins are not considered to be significant or a concern across the WSQ Study Area.

Hydrocarbons

For hydrocarbons (PAH), there were 22 locations sampled (17 in the OAA, 5 locations in the OECC). PAH, concentrations in the WSQ Study Area were very low and generally below the LoD (1 µg/kg). Within the OAA only stations ST007 and ST033 contained measurable concentrations. The sum of all 16 measured PAHs at these stations was 8.29 µg/kg and 3.29 µg/kg, respectively, significantly lower than the Irish Lower Level concentration of 4,000 µg/kg.

Within the OECC, four of the six stations sampled for sediment contaminants contained measurable levels of PAHs. The highest total concentration of all 16 PAHs was 23.08 µg/kg recorded at station ST045. Whilst this was the highest concentration recorded across the survey area, it is still two orders of magnitude less than the IDD LL threshold. Overall, IDD LL and CCME ISQG/ PEL thresholds for the individual contaminants were not exceeded at any station in the OAA or OECC.

Total Hydrocarbon Content (THC) concentrations within the OAA were lower than the OECC and ranged from 221 µg/kg at station ST013 to 4,430 µg/ kg at ST007. THC concentrations thin the OECC were between 1,070 µg/ kg at station ST036 and ST041, and 4,560 µg/ kg at ST045.

Table 8-24 lists the PAH and applies an identification number to each one. Tabel 8-25 presents the metal concentrations in sediment from grab sampled survey.

Table 8-24 Hydrocarbon Identification Key

Hydrocarbon	Identifying Number
Acenaphthene	1
Acenaphthylene	2
Anthracene	3
Benzo[a]anthracene	4
Benzo[a]pyrene	5
Benzo[b] fluoranthene	6
Benzo[ghi]perylene	7
Benzo[e]pyrene*	8
Benzo[k] fluoranthene	9
Chrysene	10
Dibenzo[a,h]anthracene	11
Fluoranthene	12
Fluorene	13
Indeno[123, cd]pyrene	14
Naphthalene	15
Phenanthrene	16
Pyrene	17
∑EPA 16 PAH	18
THC	19

Table 8-25 Metal concentrations in sediment from grab sampled survey

Sampling Location ID/Threshold Values	PAH and THC (µg kg^{-1})[13]																		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
LoD	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	100
CCME ISQG	6.71	5.87	46.9	74.8	88.8	-	-	-	-	108	6.22	113	21.2	-	34.6	86.7	153	-	-
CCME PEL	88.9	128	245	693	763	-	-	-	-	846	135	1494	144	-	391	544	1398	-	
IDD LL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4000	
OAA																			
ST001	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	0	746
ST004	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	0	851
ST007	<1	<1	<1	<1	<1	2.51	<1	1.69	<1	<1	<1	2.09	<1	2.00	<1	<1	<1	8.29	4430
ST009	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	0	515
ST012	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	0	420
ST013	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	0	221
ST015	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	0	992
ST017	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	0	418
ST019	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	0	467
ST021	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	0	437
ST023	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	0	515
ST026	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	0	644

[13] *Hydrocarbons detailed in Table 8-11*

Sampling Location ID/Threshold Values	PAH and THC ($\mu g\ kg^{-1}$)[13]																		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
ST029	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	0	614
ST031	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	0	1040
ST033	<1	<1	<1	<1	<1	1.60	<1	<1	<1	<1	<1	1.69	<1	<1	<1	<1	<1	3.29	4140
ST035	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	0	2370
ST036	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	0	1070
OECC																			
ST041	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	0	1070
ST045	<1	<1	<1	1.64	1.62	2.94	1.93	2.52	2.23	<1	1.64	4.04	<1	2.39	<1	1.5	2.27	24.72	4560
ST051	<1	<1	<1	<1	<1	1.57	<1	<1	<1	<1	<1	1.59	<1	1.38	<1	<1	<1	4.54	4530
ST059	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	2.32	<1	<1	<1	<1	<1	2.32	2040
ST060	<1	<1	<1	<1	<1	1.89	<1	1.55	<1	<1	<1	1.79	<1	1.49	<1	<1	<1	6.72	3350

PCBs

PCB concentrations were analysed across 22 locations across the OAA and OECC. As shown in Table 8-26 there was only one location within the Offshore Site (that was within the OAA) where PCB concentrations exceeded the LoD (ST026). The following PCBs which exceeded the LoD within ST026 included:

- PCB 101
- PCB 138
- PCB 153
- PCB 180
- PCB 118

None of these PCBs exceeded the concentrations of the IDD LL or CCME threshold values.

Table 8-26 PCB Concentrations

Sampling Location ID/Threshold Values	PCBs (µg kg^{-1})						
	PCB 028	PCB 052	PCB 101	PCB 138	PCB 153	PCB 180	PCB 118
LoD	0.1	0.1	0.1	0.1	0.1	0.1	0.1
ST001	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
ST004	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
ST007	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
ST009	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
ST012	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
ST013	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
ST015	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
ST017	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
ST019	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
ST021	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
ST023	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
ST026	<0.08	<0.08	0.1200	0.3000	0.3400	0.4300	0.1300
ST029	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
ST031	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
ST033	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
ST035	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
ST036	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
ST041	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
ST045	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
ST051	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
ST059	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08

Sampling Location ID/Threshold Values	PCBs (µg kg^{-1})						
	PCB 028	PCB 052	PCB 101	PCB 138	PCB 153	PCB 180	PCB 118
ST060	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08

Pesticides (OCP)

Organochlorine pesticides (OCP) concentrations were below the LoD limit at nearly all stations sampled. Within the OAA only station ST026 had a measurable value of OCPs present, the highest being p,p'-dichlorodiphenyldichloroethane measured at 0.21 µg kg^{-1}. The OECC recorded the OCP γ-hexachlorcyclohexane at ST051 (0.12 µg kg^{-1}) and p,p'-dichlorodiphenyltrichloroethane at stations ST036 (0.12 µg kg^{-1}) and ST060 (0.14 µg kg^{-1}). None of the stations exceeded the IDD Lower Limit for the OCPs γ-hexachlorcyclohexane and hexachlorobenzene. As such, this analysis indicates that OCPs are not considered to be a concern across the WSQ Study Area.

8.5.5.3 Marine INNS

The Chapter 9: Benthic Ecology has been used to inform WSQ baseline and assessment in relation to the presence of marine INNS in the OAA and OECC. INNS species can potentially alter the status of water quality within designated waters (Section 8.5.5.1.4).

Within the WSQ Study Area with regards to benthic ecology, multiple instances of INNS were recorded during the environmental surveys. 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 (OEL, 2024). 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* (OEL, 2024).

8.5.6 Baseline Summary

The seabed across the OAA mainly comprised outcropping exposed bedrock, with isolated areas of sandy sediment, while the OECC transitions from outcropping exposed bedrock to sand and muddy sand.

In terms of sediment chemistry across the WSQ Study Area, only concentrations of AS and CR were found to exceed lower limit thresholds, at a very small number of sampling locations. For AS, three samples were recorded exceeding IDD LL levels at two sampling stations within the OAA (ST001; 29.9 mg/kg & ST004; 20.4 mg/kg) and one within the OECC (ST041; 20.4 mg/kg). For CR, one sample exceeded the IDD LL and CCME PEL thresholds at 198 mg/kg. Nonetheless, these concentrations were below the IDD UL criteria and as such would be characterised as unlikely to cause environmental effect and qualifying for disposal at sea. No other exceedances above guideline thresholds were identified for other sediment chemistry contaminants, including organics (TOC), organotins (DBT and TBT), hydrocarbons (PAHs and THC), PCBs or pesticides.

For dissolved inorganic nutrients, the site-specific analysis was compared to the TSAS criteria. Whist not directly comparable to TSAS criterion, an estimate of 0.57 mg/l for the DIN threshold was applied given the median salinity of samples. Two samples (ST009 and ST021) slightly exceeded this threshold. For phosphate, the threshold applied based on salinity is 0.046 mg/l, with one sample (ST031 bottom) exceeding it at 0.05 mg/l. Despite the limitations in comparing criteria, the minor exceedances and the limited occurrences suggest that DIN and phosphate levels in the Offshore Site do not indicate a eutrophic environment, which is supported through evidence for the regional waters through comparison with the EPA monitoring data.

Site specific water column properties such as temperature and salinity conform to publicly available information and reveal that across the Offshore Site and surrounding area is the presence of thermal and saline stratification in line with the general understanding of the water column structure of Western Irish Shelf. Stratification is more pronounced within the OECC due to deeper waters and the absence of outcropping rock formations which are present within the OAA. Additionally, DO concentrations also highlighted stratification and were >6 mg/l throughout the water column for each sampled location within the Offshore Site and this is considered to reflect a healthy marine environment (OSPAR, 2017). During the site-specific surveys, TSS were not successfully measured. However, publicly available data from the WFD water quality monitoring for the Shannon Plume coastal waterbody shows a median TSS of 8.2 mg/l (2020-2023). Monitoring of the Kilkieran Bay coastal waterbody shows a median of 5.3 mg/l (2016-2023). These results align with the location's characteristics, indicating that the Suspended Sediment Concentration (SSC) at the Offshore Site is typically low, likely under 10 mg/l.

The WSQ Study Area encompasses six coastal waterbodies and two transitional waterbodies protected under the WFD. Except for the Doonbeg Estuary transitional waterbody, which has a "Moderate" quality status, all these waterbodies have been assessed as "High" or "Good" quality. The area also includes nine designated bathing waters protected under the Bathing Waters Directive, all rated as "Excellent" quality.

One protected shellfish water is within the WSQ Study Area, with the latest samples taken in 2010 showing no harmful biotoxin levels above regulatory limits. Additionally, the average dissolved metal concentrations in shellfish waters for the latest reporting period (2016-2019) complied with EQS (Government of Ireland, 2021). There are no nutrient-sensitive areas designated under the Urban Waste Water Treatment Directive within the WSQ Study Area.

Finally, the area includes 13 Natura 2000 SACs and six SPAs designated for water-dependent qualifying interests and features, along with 23 pNHAs.

8.6 Likely Significant Effects and Associated Mitigation Measures

8.6.1 Do Nothing Scenario

If the Project doesn't proceed, the opportunity to capture the available renewable energy resource and connect it to Ireland's electricity grid would be lost, as would the opportunity to contribute to meeting Government and EU targets for the production and consumption of electricity from renewable resources and the reduction of greenhouse gas emissions.

A qualitative assessment of future WSQ has been undertaken looking at a base case where the Offshore Site has not been constructed. Targets have been set to improve the water quality of various bodies of water including coastal waters. These targets have been agreed under the WFD which requires all member states to improve or maintain water quality to good ecological status by 2027. For the monitoring period 2016-2021, 70% of coastal waterbodies and 34% of transitional waterbodies were recorded at satisfactory level (High or Good), however, this is a 1% decline for both coastal and transitional waterbodies from the previous 2013-2018 monitoring period (Catchment.ie, 2024).

The Offshore Site is to be located generally in an area of good or excellent water quality status based on monitoring of designated waterbodies in the WSQ Study Area. The EPA identify that increased concentrations of nutrients, such as phosphorus and nitrogen e.g., from agricultural practices, wastewater (domestic and urban) and forestry, is the most significant stressors on water quality and ecosystem health. However, there is not noted to be any polluting risk areas in the Offshore Site area in relation to chemical pollution, including from phosphorus or nitrogen, with these areas of risk being predominantly in the south and southeast of Ireland.

The EPA monitoring publication (EPA, 2023) has identified the next steps in order to maintain and improve Irish water bodies, these steps will be implemented in the RBMP. The guidance highlights five points to prevent the WSQ from deteriorating, this includes:

- Commitment to address the main pressures on water quality (agriculture, wastewater, forestry and hydromorphology within the RBMP 2022-2027;
- Fully implement the Nitrates Action Programme to deliver reductions in nutrient losses to Irish waters;
- Sustained investment in water services infrastructure is required to eliminate wastewater discharges from agricultural run-off;
- Development of regulatory regime to improve management and regulation of activities which can result in hydromorphological alteration; and
- Government and relevant state bodies to improve coherence and integration with national programmes and policies relevant to WSQ.

If these EPA actions are adopted, then it is likely that the high / good WSQ status in the Offshore Site area will remain in the future.

Water quality related climate change effects (pH, salinity, DO etc.) are likely to be influenced from changes to water column properties and quality. The Marine Climate Change Impacts Partnership (MCCIP) has conducted long term future modelling of the physical environment across the UK (MCCIP, 2023). These models will likely have similar results to the future marine environment of the west coast of Ireland. These future changes to the sea surface and water column have been discussed in further depth in Chapter 7: Marine Physical and Coastal Processes.

In a case of the Do Nothing Scenario, whereby the Project is not progressed, water quality in the region would likely remain at high or good quality, should the key actions noted above be implemented for the next iteration of the RBMP. Should these actions not be implemented there is a risk that water quality may deteriorate and the objectives of the WFD for this region could be at risk.

8.6.2 Construction Phase

8.6.2.1 Changes in water quality due to increased suspended sediment concentrations

8.6.2.1.1 *Description of effect*

A number of different aspects of the Offshore Site have the potential to have an effect on SSC. This effect relates to short-term and localised increases in SSC associated with seabed disturbance during the construction and decommissioning activities.

The use of dredging during seabed preparation (OAA only) and CFE and jet trenching during cable trench installation will generate the greatest temporary disturbance to the seabed. Increases in SSC associated with installation of hard substrate (stonebed installation for WTIV or rock protection) are considered to be considerably less than that associated with dredging, CFE and jet trenching. Should installation of hard substrate occur concurrently with the CFE, jet trenching or dredging activities, it is considered that the effects from the hard substrate installation would be minimal in comparison to the disturbance generated from the seabed preparation or cable trenching, only increasing SSC by a small proportion of only a few milligrams per litre (mg/l). Given this, SSC due to dredging and disposal by TSHD for seabed clearance (OAA only) and cable trenching and installation are assessed here as the parameters likely to generate the maximum effect compared to other proposed installation methods named above.

This assessment focusses on the finest proportion of the sediment (approximately 10% of the sediment bulk) which, upon being disturbed will be suspended in the water column. CFE and dredging and disposal activities have the potential to generate a sediment plume. The potential plume associated with the fine sediment fraction has been assessed analytically within Chapter 7: Marine Physical and Coastal Processes (see Section also 8.4.5), based on the sediment settling velocity for silt (0.0001 m/s), with respect to the range of current flow speeds (0.2 m/s to 0.8 m/s) which are characteristic of the Offshore Site.

The potential increases in SSC associated with seabed clearance which includes trenching in the OECC and OAA (through dredging), disposal of dredged materials (within the OAA through a fall pipe at 5 m above the seabed) and OECC trenchless technology activities at the landfall are considered in this assessment.

Should SSC occur at high intensities and occur frequently or be persistent for extended periods throughout construction, the increase in SSC may under certain conditions have adverse effects on water quality and DO properties by reducing light penetration into the water column and by physical disturbance to the water column properties, which can then in-directly affect marine ecological species and habitats which are sensitive to changes in water quality.

Potential in-direct effects from water quality issues on other ecological receptors are assessed within the relevant receptor chapters of this EIAR.

8.6.2.1.2 *Characterisation of the unmitigated effect*

The potential for sediments to be disturbed and develop into a plume in the water column is dependent on the sediment properties across the OAA and OECC and the activities. The relevant activities during the construction period which could result in increased SSC include:

- Cable installation via trenching from the CFE and dredging in the OECC and OAA;
- Disposal of dredged material in the OAA; and
- HDD at landfall within the OECC.

Sediment characteristics across the OAA and OECC were established based on site specific geophysical surveys and environmental sampling (i.e., PSA), as discussed in Section 8.5.2. The findings of the surveys and PSA have been used to characterise the sediment distribution and properties within the OAA and OECC, a detailed interpretation of this is provided within the baseline (see Section 8.5.5.2.1), a summary is provided below.

Within the OAA sediment cover was found to be sparse, often overlaying bedrock. PSA highlights that the sediment is primarily comprised of coarse sediments including gravelly sand to sandy gravel with a mean grain size estimate of 1.4 mm, equivalent to very coarse sand. Overall PSA of the OAA showed sediment fractions of 77% sand, 22 % gravel and only 1 % mud, across the 19 samples collected for PSA analysis. Within the OECC, sediments for the first 8 km are analogous with the OAA i.e., are coarse grained and comprising gravelly sand to sandy gravel. However, beyond this area of the OECC the PSA mainly identifies muddy sand becoming coarser towards the landfall. Due to the varying sediment properties along the OECC, the mean grain size (based on the PSA) is quite broad, ranging between 0.05 mm and 8.2 mm, representative of coarse silt to medium gravel respectively. Overall PSA of the OECC showed sediment fractions of 77% sand, 8 % gravel and 15 % mud, across the 26 samples collected for PSA analysis.

Only fine sediments (e.g., muds and silts) are likely to develop into a sediment plume which may persist within the water column. Coarser materials such as sands and gravels may be disturbed but will not enter suspension as a plume, instead this sediment would quickly fall to the seabed in proximity to the disturbance activity during the active phase of sediment deposition. Based on the PSA analysis it is concluded that approximately 1 % of the sediments within the OAA have the potential to form a plume, whilst 99% of the OAA sediments will not. Similarly, within the OECC, fine sediments are limited in extent, however as 15% of the seabed in this region is characterised as mud, it is considered that 15% of the sediment disturbed through trenching or seabed clearance activities may form a plume.

With respect to the water column properties across the Offshore Site, the background SSCs are anticipated to typically be less than 10 mg/l based on EPA sampling within the WSQ Study Area (as discussed in section 8.5.5.1.3). DO concentrations ranged from 6.3 to 8.05 mg/l throughout the Offshore Site (Table 8-16), with evidence of stratification particularly within the OECC as described in section 8.5.5.1.3 and illustrated in Figure 8-6. A DO concentration of >6 mg/l near the seabed is considered an indicator of a healthy marine environment (OSPAR, 2017), as is characteristic of the Offshore Site.

The water column within the Offshore Site is not considered to be overly sensitive to increases in SSC due to the dynamic highly energetic nature of the marine environment in this region including through storm action which encourages mixing. Although a number of designated waters exist within the WSQ Study Area, these receptors have been assessed separately within section 8.6.3.4 to ensure a robust assessment is provided. Based on the absence of designated interest features directly relating to the water column and the likely recoverability following any increases in SSC, the sensitivity of the water column within the WSQ Study Area is considered to be **low.**

Dredge and disposal activities

The pathways for increases in SSC associated with dredging and disposal by TSHD includes the disturbance at the seabed as a result of the drag head moving along the seabed and with the disposal of the dredged sediment down a fall pipe at a height of 5 m above the seabed, as embedded into the Project design.

There is the potential for a suspended sediment plume to development from dredging. The instantaneous increase in SSC which could result in a plume would only occur in the immediate vicinity of disturbance activity, although much smaller and reduced sediment concentrations could advect over larger distances. The disturbance from the drag head is expected to locally increase the SSC around the drag head by several hundreds of mg/l, however based on the coarse nature of the sediment within the OAA the majority of the sediment would quickly resettle back to the seabed and not development into a plume. However, SSC would reduce with increasing distance from the disturbance site, returning to background levels of <10 mg/l at the 4 km extent, based on the greatest average current speed within the Offshore Site (0.4 m/s). Within the OECC, the larger silt sediment fraction would mean the instantaneous increases in SSC associated with the movement of the drag head would be on the order of thousands of mg/l for up to 3 hours, however, due to the slower flow speeds along the OECC (average 0.3 m/s), the plume extent would be smaller at up to 3 km.

Up to 15 disposal events of the dredged material are expected in two locations within the OAA, with plumes occurring from each disposal event (with a hopper capacity of up to 10,000 m^3). No dredge material is to be released from the sea surface, instead material will be released at a maximum height of 5 m above the seabed, therefore minimising the dispersion effects of the disposal process. At 5 m above the seabed, based on the release rate, the instantaneous SSC could be very high on the order of hundreds of thousands (to millions) of mg/l at the fall pipe. However, the high SSC would quickly reduce to thousands of mg/l from the release site based on the deposition of the majority of the sediment bulk, with only a smaller proportion of the sediment fraction developing into a plume.

Given the spatially representative depth average flow speed of 0.4 m/s and the settling duration, the plume could extend to the tidal excursion extent (conservatively estimated to be up to 15 km) on an ebb-directed flow to the northwest associated with an ebb release, because there are few obstructions to cause variations in the regional flow speeds. However, for release events during the southeast directed flood flow, as illustrated in Figure 8-11, flow speeds are highly variable, with localised higher flow speeds but also larger regions of lower flow speeds. Therefore, given the low flow speed of <0.1 m/s (as occurs in the middle of the OAA), the actual plume extent would be considerably less; ca. 5 km. The presented plume extents are thus highly conservative estimates based on a single representative flow speed for a ca. 12-hour flood–ebb tidal cycle. The reality is that flow speeds would vary in speed and direction across the tidal cycle, meaning the actual plume extent would depend on the temporally and spatially varying flows speeds.

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.

Cable installation activities using CFE

The use of CFE for cable installation is a much more targeted and focussed activity occurring at the seabed. Consequently, releases will likely occur closer to the seabed, to retain the majority of the sediment within the cable trench. Based on the same silt settling velocity of 0.0001 m/s, releases at 1 m above the seabed could remain in suspension for up to 3 hours. SSC will fall to background levels very rapidly, away from close proximity to CFE activity.

Trenchless Technology at Landfall

Trenchless technology will be used to install the export cable from an onshore location to an offshore exit within the OECC (approximately 1 km offshore). The exit pit in the OECC has a total area of 0.001 km^3 and an associated excavated volume of 2000 m^3, with excavated material being stored alongside the pit as a sediment berm. The increases in SSC associated with the excavation is likely to be similar or less than that described for the seabed clearance activities above.

At the exit pit drilling fluid (PLONOR in nature) could be released at the drilled landfall pop out, comprising 90 % water and approximately 10 % bentonite clay, for which medium silt is applied as a proxy. Based on an assumed near-bed release height of 0.5 m, deposition thickness associated with the solids could be up to 0.05 m for the exit pit, associated with a release during the slowest neap flows. In this instance it is most likely that any sedimentation would occur directly within the exit pit and a plume would not form.

Summary

Given the assessment above, any sediment disturbed as a result of the construction works that has the potential to form a plume would be extremely transient (within the boundaries of the WSQ Study Area), and due to the current flow regime within the Offshore Site sediment would settle out, returning the SSC back to ambient concentrations after a short duration (less than a day). The orientation of the plume would be roughly a north-west/south-east orientation across the Offshore Site.

The effect from increases in SSC from all offshore site activities is predicted to be of local spatial extent extending to the boundaries of the WSQ Study Area (15 km), only of short-term in duration (less than 1 day), intermittent throughout the 4 year construction period but highly reversible, returning to baseline SSCs following cessation of activity, and therefore, is unlikely to materially alter water quality within the WSQ Study Area, as such the magnitude of effect is considered to be **low.**

8.6.2.1.3 Assessment of significance prior to mitigation

Prior to mitigation, any effects on the water column such as altered DO properties or disturbance to the water column, resulting from the short-term and transient increase in SSC from trenching or seabed clearance works is assessed as a **slight negative effect** which is Not Significant.

8.6.2.1.4 Mitigation

Mitigation by design (avoidance/prevention)

Mitigation by design has been incorporated throughout the Offshore Site. The use of GBS foundations avoids the need for drilling of foundations which can cause localised high SSC. Therefore, the highest concentrations are limited to the use of CFE and the surface release of dredged material by a dredger hopper, as discussed above. Nonetheless, the project has committed to releasing dredged material through a fall pipe at a height of 5m above the seabed (rather than at sea surface) which significantly reduces the potential for dispersion of sediment and resettlement time. In addition, disposal locations were selected to ensure no significant effect on sensitive areas.

A pre-construction cable route survey has been completed to optimise the Project Design and construction methodologies, including the reduction or avoidance of environmental impacts.

The use of trenchless technologies at the landfall location will minimise the extent of seabed disturbance, thereby reducing elevated SSC in the water column. The implementation of the OEMP prior to and during construction to will also serve as mitigation in ensuring that the discharges at the pop-out location are suitable for release into the marine environment.

8.6.2.1.5 Residual effects following mitigation

Given the embedded mitigation and consideration of the **low** sensitivity of the water column as a receptor being affected by suspended sediments in a plume, combined with the short-lived elevated SSC, which is characterised as a **low** magnitude of effect, the residual effect will be a **slight negative effect** which is Not Significant.

8.6.2.2 Changes in WSQ due to accidental release of contaminated sediment

8.6.2.2.1 Description of effect

During construction and decommissioning, Project activities on the seabed such as seabed clearance, trenching and disposal activities have the potential to disturb and release seabed sediments. Should sediments be contaminated, this contamination could spread and result in an adverse effect from pollution of the water column through leaching or dispersal to seabed sediment further afield. Contamination in the water column or on the seabed can then in-directly result in toxicology impacts on marine ecological species and habitats which are sensitive to WSQ. Additionally, trenchless technology installation could result in fluid frack of drilling muds into the marine environment at the landfall end of the OECC. It should also be noted that dredge disposal, (which is one pathway that could result in dispersal of contaminated sediment), is subject to a separate Dumping at Sea permit is to be sought for the Offshore Site construction works.

The receptor is the seabed sediment and water column within the WSQ Study Area.

Potential in-direct effects from water quality issues on other ecological receptors are assessed within the relevant chapter of the EIAR.

8.6.2.2.2 Characterisation of the unmitigated effect

The seabed sediments and water column within the Offshore Site are considered to be sensitive to contamination. Both water column and seabed sediments have little capacity to avoid or adapt to a contamination or pollution event as these effects are generally persistent in the environment. It is recognised that highly sensitive receptors such as those protected through designations are also present within the WSQ Study Area, nonetheless, to ensure a robust assessment these are considered separately within section 8.6.3.4. However, there may still be species and habitats which are not protected through designations which are sensitive to any change in water and sediment, given this the sensitivity to this effect is considered to be **medium.**

The potential for chemical contaminants to be present within seabed sediment and the water column across the OAA and OECC was investigated through a site specific sampling programme, as detailed in 8.5.2, with the result of the sediment chemistry analysis presented in Section 8.5.5.2.2 and water chemistry analysis presented in Section 8.5.5.1.1.

The completed site-specific sediment sampling analysis identified very limited contamination within the samples obtained across the OAA and OECC. Overall, it was found that only low occurrences of the contaminants analysed were present, with the majority of contaminants being below the CCME ISQG/TEL and IDD LL guidelines. For sediment samples analysed, only AS and CR exceeded the lower guideline thresholds, with all other contaminants including organics (TOC), organotins (DBT and TBT), hydrocarbons (PAHs and THC), PCBs and pesticides being below the assessed threshold standards.

For AS, three samples were marginally above the IDD LL thresholds, two within the OAA (ST001; 29.9 mg/kg & ST004; 20.4 mg/kg) and one within the OECC (ST041; 20.4 mg/kg). Nevertheless, all AS exceedances were well below the IDD UL criteria (70 mg/kg), indicating that all samples containing AS would qualify for disposal at sea under IDD guidelines. For CR one sample exceeded threshold limits in the OECC, ST060 was in exceedance of IDD LL and CCME PEL thresholds at 198 mg/kg. Under the CCME PEL guidelines this concentration of CR could result in a probable effect range within which adverse effects could frequently occur. However, all samples were far below the IDD UL criteria, highlighting that all samples containing CR would qualify for disposal at sea under these guidelines. Overall, in terms of sediment quality, sediment contamination potential within either the OAA or OECC is considered as not significant.

For water chemistry, dissolved inorganic nutrient concentrations for nitrate and phosphate were generally low across the OAA and OECC. The site-specific analysis was compared to the TSAS criteria. Whist not directly comparable to TSAS criterion, an estimate of 0.57 mg/l for the DIN threshold was applied given the median salinity of samples. Two samples (ST009 and ST021) slightly exceeded this threshold. For phosphate, a threshold of 0.046 mg/l was applied based on salinity, with one sample (ST031 bottom) exceeding it at 0.05 mg/l. Despite the limitations in comparing criteria, the minor exceedances and the limited occurrences suggest that DIN and phosphate levels in the Offshore Site do not indicate a eutrophic environment, which is supported through evidence for the regional waters through comparison with the EPA monitoring data.

As a result of the site-specific contaminant analyses, there is considered to be a low to very low likelihood for contaminants across the Offshore Site. The highest sediment disturbance footprint within the Offshore Site is associated with the seabed preparation activities (CFE, seabed clearance and dredging) and export and inter-array cable installation. Additionally, sediment may be released 5m above the seabed within the OAA through dredge disposal operations, as detailed in section 8.6.2.1.

For any potential occurrence within the disturbance footprint, the contaminants would largely be attached to sediment particles. In the event of disturbance, only very small concentrations of contaminants enter to the dissolved phase, with the vast majority remaining adhered to the sediment particles when temporarily entering suspension in the water column. Should contaminants enter the dissolved phase, partition coefficients would indicate that concentrations, which are observed at below-threshold levels, would typically reduce by several orders of magnitude than the concentrations associated with suspended sediments through dilution. As detailed in section 8.6.2.1 above, the largest proportion of sediment bulk settles out within the immediate vicinity of the disturbance or disposal site, whilst the finer silt fraction that could remain in suspension, mostly settles out within the OAA with only very low concentrations of suspended sediments extending outside of the Offshore Site. Therefore, should any contaminants, in particular AS or CR, be disturbed and released during the construction activities, these would largely settle and remain within the Offshore Site boundaries. Should any proportion of contaminants dissolve into the water column, these would be of very low concentrations and would be rapidly dispersed and further reduce in concentration through tidal processes.

Due to the very low concentrations of contaminants that can be expected in the Offshore Site which are analysed to not occur at harmful levels i.e., concentrations that are assessed as safe for disposal at sea and because they do not contravene any environmental standards, the likelihood of an effect occurring is very low. Additionally, the seabed preparation, trenching and installation operations will be relatively short in duration, occurring intermittently for up to 16 months during the construction phase. Should this occur it is likely that most contaminated material within the coarser sediment fraction will be highly localised around the area of disturbance/ release, whilst any fine sediments could disperse and settle within 14 hours (as detailed above) in line with tidal processes within the Offshore Site.

Additionally, HDD installation will utilise drilling muds to lubricate the drill bit whilst drilling of the borehole occurs. The drilling fluid compromises approximately 90% water and 10% drilling mud (bentonite) which is a PLONOR chemical. Whilst bentonite in itself is a non-toxic naturally occurring swelling clay, it has a high viscosity and is denser than saltwater, so losses into the marine environments could potentially cause water quality effects if persistently released or occur at high quantities. Nonetheless, based on an assumed near-bed release height of 0.5 m, deposition thickness associated with the solids could be up to 0.05 m for the exit pit, associated with a release during the slowest neap flows. In this instance it is most likely that any coarser sedimentation would occur directly within the exit pit and a plume would not form due to the relative low intensity of drilling operations for this activity, with finer sediments being diluted rapidly due to the exposed of the marine environment in the OECC at the landfall location.

As such, given the above assessment, the magnitude of impact for release of contaminated materials is considered to be **negligible.**

8.6.2.2.3 Assessment of significance prior to mitigation

Prior to mitigation, any contamination effects on the water column and seabed sediment resulting from relatively short-term disturbance of sediments characterised as having very low contamination potential from construction activities is assessed as a **not significant negative effect which is Not Significant**.

8.6.2.2.4 Mitigation

Mitigation by design (avoidance/prevention)

Mitigation by design has been incorporated throughout the Offshore Site. Although there are no areas of high risk identified in the WSQ Study area a number of design measures aid the reduction of a potential effect. The use of GBS foundations avoids the need for drilling of foundations which could result in increased seabed disturbance and release of potential contaminants. The project has also committed to releasing dredged material through a fall pipe at a height of 5m above the seabed which significantly reduces the dispersion extents of potential contaminated sediment. This activity will also be subject to a separate permit which will safeguard the potential for contaminated material to be released.

The use of trenchless technologies at the landfall location will minimise the extent of seabed disturbance. Additionally, PLONOR drilling fluids will be used and therefore reducing the potential for release of potentially contaminated sediment.

8.6.2.2.5 *Residual effects following mitigation*

Given the embedded mitigation and consideration of the **medium** sensitivity of the water column as a receptor being affected by a limited potential for release of contaminants, the residual effect will be a **not significant negative effect which is Not Significant**.

8.6.2.3 Changes in WSQ due to routine and accidental discharges from vessels during construction

8.6.2.3.1 *Description of effect*

The accidental release of pollutants within the construction period is limited to accidental release of pollutants from construction vessels. The potential for vessels to accidentally pollute the marine environment surrounding the Offshore Site is extremely unlikely due to the strict regulations placed on vessels in operation. Additionally, routine vessel discharges within the WSQ Study Area are highly unlikely given the proximity to shore (within 6 nautical miles (nm)) and the prohibition of any wastewater (including treated wastewaters) up to 12 NM from the coast. Nonetheless, the impact of an unmitigated effect could cause direct adverse, non-reversable and long-lasting effects to the water column and/or seabed sediments depending on the type of pollution which is released. This effect could also result in in-direct effects to marine habitats and species who are sensitive to pollution effects.

The receptor is the seabed sediment and water column within the WSQ Study Area.

Potential in-direct effects from water quality issues on other ecological receptors are assessed within the relevant chapter of the EIAR.

8.6.2.3.2 *Characterisation of unmitigated effect*

The seabed sediments and water column within the Offshore Site are sensitive to pollution events. Both water column and seabed sediments have little capacity to avoid or adapt to a pollution event as these effects are generally persistent in the environment. It is recognised that highly sensitive receptors such as those protected through designations are also present within the WSQ Study Area, nonetheless, to ensure a robust assessment these are considered separately within section 8.6.3.4. However, there may still be species and habitats which are not protected through designations which are sensitive to any change in WSQ, given this the sensitivity of the water column and seabed sediments to this effect is considered to be **medium.**

Without the implementation of mitigation or adherence to regulation, vessels could cause pollution due to routine discharges or accidental release of pollutants within the marine environment surrounding the Offshore Site, such as from damage or loss of a vessel. During the construction period there is likely to be up to 23 vessels required to support the delivery and installation of the Offshore Site infrastructure. Should vessels not adhere to legal requirements, conventions and pollution management plans, there is a higher possibility of a pollution event occurring under these circumstances. The types of pollution which could be released range from oil / fuel spills to ballast waters containing a range of biological materials, including plants, animals, viruses, and bacteria. These materials can include INNS species that can cause serious harm to ecological life.

The extent to which pollution could occur is dependent on the vessel size, materials being transported, and level of containment breach, however it is considered that should an accidental pollution event from a vessel occur that without mitigation the effect could be long lasting in the environment. However, dispersion of the pollution would likely occur due to the dynamic nature of the region. Given this, the unmitigated effect is characterised as unlikely to occur but potentially resulting in long-term effects, occurring at medium intensity but at very low frequency throughout the construction phase. As such the magnitude of impact is considered to be **medium.**

8.6.2.3.3 *Assessment of significance prior to mitigation*

Prior to mitigation, any pollution effects on the water column and seabed sediment resulting from accidental vessel releases during the construction activities is assessed as a **moderate negative effect** which is Not Significant.

8.6.2.3.4 *Mitigation*

Mitigation by design (avoidance/prevention)

As per the mitigation by design (as detailed in Section 8.4.6), support and installation vessels operating during the construction phase will operate in accordance with best practice and maritime conventions including the MARPOL and BWM conventions. Adherence to these conventions seek to avoid, prevent and reduce the likelihood that vessel operations result in pollution events to the marine environment, including from routine discharges which is prohibited, except when the ship has in operation an approved sewage treatment plant or when the ship is discharging decontaminated and disinfected sewage using an approved system at a distance of more than three nautical miles from the nearest land as per MARPOL IV. Additionally, control measures and SOPEPs (for oil tankers of 150 gross tonnage and above and all vessels of 400 gross tonnage and above) will be established and adhered to, if required, under MARPOL Annex I.

Furthermore, the Project has developed and will adhere to the OEMP (Appendix 5-2) and MPCP (Appendix 5-3) and INNS (Appendix 5-8) management plans in order to reduce the likelihood of pollution events and to ensure procedures are in place should an accidental release occur. These protocols will ensure potential pollution is contained and rectified quickly. Additionally, emergency response procedures will be in place for the Offshore Site, should an emergency situation occur, including any pollution incidents.

8.6.2.3.5 *Residual effects following mitigation*

With consideration given to the embedded mitigation measures identified above, significant effects associated with the accidental release of pollution from construction vessels are not likely to occur, and should they occur the management plans in place will ensure that effects are rectified effectively and efficiently, therefore reducing the magnitude of effect to low. Given the above, the residual effect is considered to be a **slight negative effect** which is Not Significant.

8.6.2.4 Effects on water quality status of designated waterbodies due to increased suspended sediment and potential release of contaminants or accidental pollution

8.6.2.4.1 *Description of effect*

A number of designated waterbodies and protected sites overlap with the WSQ Study Area, including:

- 6 coastal and 2 transitional waterbodies protected under the WFD;
- 9 designated bathing waters protected under the Bathing Waters Directive;
- 1 protected shellfish water initially afforded protection under the Shellfish Waters Directive; however, this directive has been repealed and protection is now granted through the WFD;
- 13 SACs with water dependent qualifying features designated under the Habitats Directive;
- 6 SPAs with water dependent qualifying features designated under the Conservation of Wild Birds Directive; and
- 23 pNHAs which although are not statutory designations, are given recognition and consideration due to the important Irish plants, habitats and wildlife they encompass.

These designated areas are sensitivity to changes in WSQ and are regularly assessed to ensure that they are maintaining their objectives under the relevant Directives. As such, effects from increased SSCs (as assessed in section 8.6.2.1), contamination which is released and spread (as assessed in section 8.6.2.2) or accidental pollution events (as assessed in 8.6.2.3) from the Offshore Site construction activities, could result in a direct adverse effect to the WSQ within these sites meaning that they could fail to meet their requirements and objectives under the relevant Directives.

For the purpose of this assessment the receptor considered is the water column and sediment within each of these designated areas. In-direct effect from water quality issues on specific species and habitats designated within these European Sites are assessed within the relevant receptor chapters of this EIAR.

8.6.2.4.2 *Characterisation of the unmitigated effect*

All coastal and transitional waterbodies within the WSQ Study Area are classed as having a “high” or “good” ecological status or potential, with the exception of the Doonbeg Estuary transitional waterbody which has been assigned a “Moderate” ecological status. Additionally, although the Kilkieran Bay coastal waterbody has been assigned a “High” ecological status, it has been assigned a “Failing to meet good” status in the 2016-2018 assessment period for surface water chemistry. Nonetheless, no waterbody within the WSQ Study Area is found to be at risk of not achieving their WFD objectives from the latest RBMP cycle and as such no significant pressures are identified for these specific waterbodies.

All bathing waters within the WSQ Study Area have been assessed as having an “Excellent” water quality status and the Kilkieran Bay shellfish water harvested for oysters, mussels and salmon has shown no harmful biotoxin levels above regulatory levels since 2010 noting this was the most recent occasion the levels were measured.

There are a number of European Sites with water dependent qualifying features which overlap the WSQ Study Area. The qualifying features of these SACs and SPAs are detailed within Table 8-19. However, the Inishmore Island SAC runs adjacent to the boundaries of the OECC, and therefore is at greatest risk of effect.

Additionally, there are 23 pNHAs which overlap the WSQ Study Area, which are designated for the cconservation of plants, animals and wildlife habitats of Irish importance. Nonetheless, none of these sites overlap the boundaries of the Offshore Site.

Given the protection afforded to these designated waters and the sensitivities of features to changes in water quality within these designated sites, coupled with the High-water quality status of these waters, and the need to ensure this status is maintained in line with the requirements of the Directives, all these designated waters are considered to have **high** sensitivity to effects on WSQ.

The greatest potential for sediment plumes is attributed to the release of dredged material from a hopper at the sea surface, therefore this impact is significantly reduced when considering the mitigation committed to which will see sediment released through a fall pipe at 5 m above the seabed. This significantly reduces the extent of the plume. As plume extents could reach a maximum of 15 km (although typically considerably less than this) there is the potential for effects on designated waters within the Study Area. Increased SSCs could alter the DO properties of the water column at all designated waters within the WSQ Study Area which may reduce the health of these designated areas. However, given that effect from SSCs will only be short lived (a maximum of 14 hours), this will not materially alter oxygen conditions, particularly considering the energetic nature of the marine environment which encourages mixing. As such, it is highly unlikely that SSC effects from the Offshore Site present a significant risk to water quality status.

Additionally, due to the very low potential for chemical contaminants present throughout the Offshore Site, including DIN which is a key risk factor to achieving the objectives of the WFD waterbodies, it is unlikely that seabed disturbance from construction activities would result in the release and spread of harmful contaminants within seabed sediment. Furthermore, due to the dynamic nature of the region any increase in SSCs or potential contaminants will be diluted and dispersed rapidly so that the intensity of the effect should it occur is greatly reduced. Given this, the magnitude of water quality effects from SSCs and potential release of contaminants is considered to be **low.**

Vessel discharges and accidental releases of polluting materials could potentially occur at high intensity throughout the construction phase without the implementation of mitigation. As such, this could cause longer lasting effects to these waterbodies and risk deterioration in water quality status. The energetic nature of the marine environment, however, would likely cause dilution of any polluting materials, reducing the impact magnitude. However, any oils or fuels could remain at the water surface and so could potentially contribute to further periods of the Kilkieran Bay coastal water body “failing to achieve good” for surface water chemistry. Additionally, any INNS entering the marine environment from ballast water releases or from growths on construction materials could reduce the ecological potential of designated waterbodies. As such the impact magnitude is considered to be **medium.**

8.6.2.4.3 *Assessment of significance prior to mitigation*

Prior to mitigation, effects on designated waters from increased SSCs and/or disturbance of sediments characterised as having very low contamination potential from construction activities is assessed as a **moderate negative effect** which is Not Significant.

Prior to mitigation, effects on designated waters from pollution events caused by vessel discharges or accidental vessel releases during the construction activities is assessed as a **significant negative effect** which is Significant.

8.6.2.4.4 *Mitigation*

Mitigation by design (avoidance/prevention)

As per the mitigation by design (as detailed in Section 8.4.6), support and installation vessels operating during the construction phase will operate in accordance with best practice and maritime conventions including the MARPOL and BWM conventions. Adherence to these conventions seek to avoid, prevent and reduce the likelihood that vessel operations result in pollution events to the marine environment. Furthermore, the Project has developed and will adhere to an OEMP (Appendix 5-2) as well as the MPCP (Appendix 5-3) and INNS (Appendix 5-8) management plans in order to reduce the likelihood of pollution events, invasion by INNS and to ensure procedures are in place to safeguard biosecurity. These protocols will ensure the effect is contained and rectified quickly. Additionally, emergency response procedures will be in place for the Offshore Site, should an emergent situation occur, including any large-scale pollution incidents.

Pre-construction surveys have been completed to optimise the Project Design and construction methodologies, including the reduction or avoidance of environmental impacts.

Additionally, although there are no high-risk areas for contaminants identified in the WSQ Study area a number of design measures aid the reduction of a potential effect. The use of GBS foundations avoids the need for drilling of foundations which could result in increased seabed disturbance and release of suspended sediments and potential contaminants. The project has also committed to releasing dredged material through a fall pipe at a height of 5m above the seabed which significantly reduces the dispersion extents of suspended sediments and potential contaminated sediment. This activity will also be subject to a separate permit which will safeguard the potential for contaminated material to be released. Furthermore, the use of trenchless technologies at the landfall location will minimise the extent of seabed disturbance. The drilled landfall will also only utilise PLONOR drilling fluids thereby reducing the release of potentially contaminated sediment and suspended sediments.

8.6.2.4.5 *Residual effects following mitigation*

Given the designed in mitigations to be adopted, potential effects from SSCs and potentially contaminated sediments will be reduced, as such the residual effect will be an **imperceptible negative effect** which is Not Significant.

In terms of pollution events from vessels, with consideration given to the embedded mitigation measures identified above, significant effects associated with the release of pollution from construction vessels are not likely to occur, and should they occur compliance with the management plans in place will ensure that effects are rectified effectively and efficiently, therefore reducing the magnitude of impact to low. Given the above, the residual effect is considered to be a **slight negative effect** which is Not Significant.

8.6.3 Operation and Maintenance Phase

8.6.3.1 Effects on water quality status of designated waters due to increased suspended sediment concentrations

8.6.3.1.1 *Description of effect*

During the operations and maintenance phase minor maintenance or repairs may be required if unplanned events occur. Additionally, large scale maintenance and repairs are not planned but are likely, over the lifetime of the project as well as any major repairs. The potential aspects from these activities which may have an effect on the SSCs include works on the seabed such as planned/unplanned cable and GBS foundation maintenance. Activities for cable maintenance such as increasing the cable depth of lowering in locations along the cable route where a mobile seabed may lead to cable exposure risk, could result in similar activities to those presented for construction e.g., CFE/ dredging of the seabed. GBS foundations may also require maintenance during the operational phase. Nonetheless, it is anticipated that the scale of impacts would be reduced as it is likely maintenance will be targeted to specific locations of the cable or GBSs unless major repairs or maintenance works are required which are not anticipated.

Should SSC occur at high intensities and occur frequently or be persistent for extended periods throughout operation and maintenance phase e.g., during major repairs, the increase in SSC may under certain conditions have adverse effects on water quality and DO properties by reducing light penetration into the water column and by physical disturbance to the water column properties. This may in-directly impact marine ecological species and habitats which are sensitive to changes in water quality.

Potential in-direct effects from water quality issues on other ecological receptors are assessed within the relevant chapter of the EIAR.

8.6.3.1.2 *Characterisation of the unmitigated effect*

If major operational and maintenance phase repair works are needed during operations the SSCs and plume extent are likely to be similar for those detailed for CFE operations in Section 8.6.2.1 i.e. sediments could remain in suspension for up to 3 hours and SSC will fall to background levels very rapidly, away from close proximity to the activity. It is anticipated this would be greatly reduced for smaller repair works along targeted sections of the seabed.

Section 8.6.2.1.2 details the sensitivity of the water column within the WSQ Study Area which is not considered to be sensitive to increased SSCs due to the dynamic and high energy nature of the marine environment, therefore it is considered to have a **low** sensitivity.

The magnitude of impact assessed during the construction phase was determined to be low, the activities associated with the operational and maintenance phase will likely be less than those in the construction phase due to the reduced frequency and intensity of these maintenance activities. Nonetheless, if major repairs are required effects could be analogous with the construction impacts, as such, conservatively, the magnitude of impact is also considered to be **low.**

8.6.3.1.3 *Assessment of significance prior to mitigation*

Prior to mitigation, any effects on the water column such as altered DO properties or disturbance to the water column, resulting from the short-term and transient increase in SSC from cable maintenance works or major repairs is assessed as a **slight negative effect** which is Not Significant.

8.6.3.1.4 *Mitigation*

Mitigation by design (avoidance/prevention)

Cable surveys will be conducted throughout the operational stage to determine if intervention is needed. These surveys will ensure that maintenance is targeted to necessary areas reducing the need for large scale works where appropriate. This will reduce disturbance of the seabed and suspended sediment generation.

8.6.3.1.5 *Residual effects following mitigation*

Given that operational maintenance and / or repairs will be informed from survey works which will seek to reduce seabed disturbance by targeting operations, where appropriate, the residual effects is considered to be an **imperceptible negative effect which is Not Significant**.

8.6.3.2 Changes in WSQ due to accidental release of contaminated sediment

8.6.3.2.1 *Description of effect*

During operations and maintenance, Project activities on the seabed such as cable maintenance activities and major repairs have the potential to disturb seabed sediments. As detailed in Section 8.6.2.2.1, activities which interact with the seabed have the potential to result in an adverse effect from pollution of the water column through leaching or dispersal to seabed sediments holding contaminants to further afield. During the operation and maintenance phase the potential interactions with the seabed will be less frequent and less intense than during construction due to the nature of repairs. Nonetheless, if major repairs are needed on the seabed these could result in similar impacts to those presented in Section 8.6.2.2.1 for construction.

The receptor is the seabed sediment and water column within the WSQ Study Area.

Potential in-direct effects from water quality issues on other ecological receptors are assessed within the relevant chapter of the EIAR.

8.6.3.2.2 *Characterisation of the unmitigated effect*

The seabed sediments and water column at the Offshore Site have a **medium** sensitivity to contamination. However, due to the very low levels of contaminants in the Offshore Site, which are safe for disposal at sea as they do not contravene any environmental standards, the likelihood of contamination event is very low. Operational and maintenance activities that might release contaminated sediment are generally low intensity, except in the event of major works. On a precautionary basis, the impact is considered **low**, analogous to the construction impacts, although it is likely that any works will be very localised and over a much shorter duration.

8.6.3.2.3 *Assessment of significance prior to mitigation*

Prior to mitigation, any contamination effects on the water column and seabed sediment resulting from relatively short-term disturbance of sediments characterised as having very low contamination potential from operation and maintenance activities is assessed as a **slight negative effect** which is Not Significant.

8.6.3.2.4 *Mitigation*

Mitigation by design (avoidance/prevention)

Cable surveys will be conducted throughout the operational stage to determine if intervention is needed. These surveys will ensure that maintenance is targeted to necessary areas reducing the need for large scale works where appropriate. This will reduce disturbance of the seabed and potential for release of contaminated sediment.

8.6.3.2.5 *Residual effects following mitigation*

Given that operational maintenance and / or repairs will be informed from survey works which will seek to reduce seabed disturbance by targeting operations, where appropriate, the residual effects is considered to be an **imperceptible negative effect** which is Not Significant.

8.6.3.3 Changes in WSQ due to routine and accidental discharges from vessels and WTGs during operations and maintenance

8.6.3.3.1 *Description of effect*

The accidental release of pollutants within the operational period is limited to routine and accidental release of pollutants from operation and maintenance vessels. In addition to vessel impacts there is also potential for the accidental release of pollutants which are contained within the WTGs and OSS. These contaminants are oils and greases, unmitigated effects from these contaminants could result in direct adverse, non-reversable and long-lasting effects to the water column and/or seabed sediments. Further in-direct effect could arise impacting marine habitats and species which are sensitive to pollution effects.

The receptor is the seabed sediment and water column within the WSQ Study Area.

Potential in-direct effects from water quality issues on other ecological receptors are assessed within the relevant chapter of the EIAR.

8.6.3.3.2 *Characterisation of unmitigated effect*

The operations and maintenance phase will affect the same receptors as the construction phase. As detailed in Section 8.6.2.3.2 the sensitivity of the water column and seabed sediments to this effect is considered to be **medium.**

During the operations and maintenance phase there will be up to 2 crew transfer vessels per day, 1 support operations vessel per day, and four daily vessel trips. There is also expected to be on average two annual WTIV (jackup) intervention campaigns per year, one blade repair platform campaign per year, five unplanned cable repair vessel interventions over project life and one planned cable survey per year for first five years (1 every 5 years thereafter). Additionally, there will be one oil exchange vessel every 10 years. As the operational phase will occur over 38 years, the intensity of vessel operations will occur at much lower levels given construction activities could take place 24 hours per day and 7 days per week. However, given there is the potential for an additional effect arising from potential leaks associated with the WTGs operation and oil transfers (once every 10 years), the magnitude of impact is considered to be analogous with that during construction and is assessed as a **medium** magnitude of impact.

8.6.3.3.3 *Assessment of significance prior to mitigation*

Prior to mitigation, any pollution effects on the water column and seabed sediment resulting from accidental vessel releases during the operations and mitigation activities is assessed as a **moderate negative effect** which is Not Significant.

8.6.3.3.4 *Mitigation*

Mitigation by design (avoidance/prevention)

As detailed for the construction stage the mitigations proposed are considered sufficient to reduce the residual effects to not significant levels (see Section 8.6.2.3.4). These measures include vessels adhering to MARPOL and BWM conventions during the operations and maintenance phase. Additionally, control measures and SOPEPs will be established and adhered to, as required under MARPOL Annex I. Furthermore, the Project has developed and will adhere to an OEMP (Appendix 5-2) as well as the MPCP (Appendix 5-3) and INNS (Appendix 5-8) management plans in order to reduce the likelihood of pollution events and to ensure procedures are in place to safeguard biosecurity. An emergency response procedure will also be in place for the Offshore Site, should an emergent situation occur, including any large-scale pollution incidents.

Additionally, the WTG including the nacelle, tower, and rotor and OSS structures are designed to contain any potential leaks. The containment design of the WTG / OSS structures will therefore significantly reduce the risk of potential spills contaminating the marine environment. Additionally, for the planned oil transfers the transfer of potential pollutants to WTG's/OSS will be meticulously planned and will follow all relevant guidelines as stated by the MPCP (Appendix 5-3).

8.6.3.3.5 *Residual effects following mitigation*

With consideration given to the embedded mitigation measures identified above, significant effects associated with the accidental release of pollution from operations and maintenance vessels are not likely to occur, and should they occur the management plans in place will ensure that impacts are rectified effectively and efficiently. Additionally, the mitigation identified in relation to potential leaks from the WTGs/OSS will ensure any impacts are also rectified effectively and efficiently therefore, reducing the magnitude of impact to low. Given the above, the residual effect is considered to be a **slight negative effect** which is Not Significant.

8.6.3.4 Effects on water quality status of designated waterbodies due to increased suspended sediment and potential release of contaminants or accidental pollution

8.6.3.4.1 *Description of effect*

As detailed in Section 8.6.2.4.1 there are 35 different designated waters which overlap with the WSQ Study Area. These sites are sensitive to changes in water quality and are regularly assessed under the relevant Directives to ensure their objectives are met. The effects from increased SSCs (as assessed in section 8.6.3.1), contamination which is released and spread (as assessed in Section 8.6.3.2) or accidental pollution events (as assessed in section 8.6.3.3) from the Offshore Site operation and maintenance activities have the potential to result in an adverse effect on WSQ and, as such, pose a risk to the objectives of these protected areas being met under the relevant Directives.

For the purpose of this assessment the receptor considered is the water column and sediment within each of these designated waters.

In-direct effects from water quality issues on specific species and habitats designated within these protected sites are assessed within the relevant receptor specific chapters of this EIAR.

8.6.3.4.2 *Characterisation of unmitigated effect*

The sensitivity of designated waterbodies and protected areas within the WSQ Study area have been assessed in Section 8.6.2.4.2 and are determined to have **high** sensitivity to effects on WSQ.

There are several waterbodies which overlap the Offshore Site including the Aran Islands, Galway Bay, Connemara coastal waterbody and the Shannon Plume coastal waterbody however no European sites overlap the Offshore Site boundary.

Due to the energetic nature of the marine environment, potential pollution events from vessels and WTGs/OSS leaks would likely be quickly diluted and dispersed reducing the impact magnitude. Furthermore, during the operation and maintenance phase there will be reduced vessel intensity, further reducing the potential for impact.

Additionally, the risk of contaminants on the seabed is very low based on site-specific data and so it is unlikely that concentrations of potential contaminated sediment released would occur at a magnitude which could impact the health of these designated waters. Additionally, suspended sediment may be released in a plume should major works occur during operations. Nonetheless, effects would be short lived as suspended sediments would settle within 14 hours and beyond the boundary of the Offshore Site, SSC would be at background levels with any fine sediment fraction becoming readily incorporated into the surrounding seabed. Therefore, it is highly unlikely that these suspended sediments would alter the health of these designated waters.

Given the above considerations the impact magnitude during the operation and maintenance stage is considered to be **negligible.**

8.6.3.4.3 *Assessment of significance prior to mitigation*

Prior to mitigation, as detailed in Section 8.6.3.2.3 effects on designated waters from increased SSCs and/or disturbance of sediments characterised as having very low contamination potential from construction activities is assessed as a **not significant negative effect** which is Not Significant.

Prior to mitigation, effects on designated waters from pollution events caused by vessel discharges or accidental vessel releases and the potential for pollutants to leak from the WTGs during the operational activities is assessed as a **not significant negative effect** which is Not Significant.

8.6.3.4.4 *Mitigation*

Mitigation by design (avoidance/ prevention)

As detailed for the construction stage the mitigations proposed are considered sufficient to reduce the residual effects to not significant levels (see Section 8.6.2.3.4). These measures include vessels adhering to MARPOL and BWM conventions during the operations and maintenance phase. Additionally, control measures and SOPEPs will be established and adhered to, as required under MARPOL Annex I. Furthermore, the Project will develop and adhere to OEMPs (Appendix 5-2) including a MPCP (Appendix 5-3) and an INNS (Appendix 5-8) management plan in order to reduce the likelihood of pollution events and to ensure procedures are in place to safeguard biosecurity. An emergency response procedure will also be in place for the Offshore Site, should an emergent situation occur, including any large-scale pollution incidents.

Additionally, the WTG structures including the nacelle, tower, and rotor and OSS are designed to contain any potential leaks. The containment design of the WTG/ OSS structures will therefore reduce the risk of potential spills contaminating the marine environment. Additionally, for the planned oil transfers the transfer of potential pollutants to WTG's/OSS will be meticulously planned and will follow all relevant guidelines as stated by the MPCP (Appendix 5-3).

Finally, cable surveys will be conducted throughout the operational stage to determine if intervention is needed. These surveys will ensure that maintenance is targeted to necessary areas reducing the need for large scale works where appropriate. This will reduce disturbance of the seabed and potential for release of suspended sediments and any potentially contaminated sediment.

8.6.3.4.5 *Residual effects following mitigation*

Given that operational maintenance and / or repairs will be informed from survey works which will seek to reduce seabed disturbance by targeting operations, where appropriate, the residual effects on designated waters from increased SSCs and release of potentially contaminated sediment is considered to be an **imperceptible negative effect** which is Not Significant.

In terms of pollution events from vessels and leaks associated with the WTGs, with the embedded mitigation measures identified above, effects to designated waters are not likely to occur, and should they occur the management plans in place will ensure that impacts are rectified effectively and efficiently, therefore, reducing the magnitude of impact. Given the above, the residual effect is considered to be a **slight negative effect** which is Not Significant.

8.6.4 Decommissioning Phase

The decommissioning phase will be undertaken in accordance with the Rehabilitation Plan submitted alongside the EIAR (Appendix 5-18). There is the potential for effects to WSQ during decommissioning activities which are similar to those detailed for construction such as increased SSC, disturbance of contaminated sediment and accidental pollution events from vessels. However, it is considered that these effects during decommissioning will be akin to or of a lower magnitude than those anticipated as part of the construction phase given the less intrusive nature of removal activities compared to construction site preparation and the intention for elements to be left in-situ (seabed preparation, cables that are not exposed and accessible, cable protection measures).

The decommissioning methodology will be the reverse of the installation processes. The approach to decommissioning will, as far as possible, seek to preserve the exiting environment through reducing direct impacts to the receiving environment. For example, by leaving seabed preparation and cable protection in situ, any marine habitats and associated species which have colonised these structures throughout the operational life of the Project will remain in place.

It is considered that all methods of decommissioning and associated effects for the Project are comparable to those assessed as part of the construction phase and in line with the construction phase, all effects will be Not Significant.

8.7 Residual Effects

8.7.1 Construction Phase

Table 8-27 Residual effect of construction phase on WSQ

Impact pathway	Receptor	Magnitude	Sensitivity	Significance Prior to Mitigation	Mitigation	Residual Effect
Changes in water quality due to increased suspended sediment concentrations	Water column	Low	Low	Slight negative effect; Not Significant	As per section 8.6.2.1.4	Imperceptible negative effect; Not Significant
Changes in WSQ due to accidental release of contaminated sediment	Water column / seabed sediment	Negligible	Medium	Not significant negative effect; Not Significant	As per section 8.6.2.2.4	Imperceptible negative effect; Not Significant
Changes in WSQ due to routine and accidental discharges from vessels during construction	Water column / seabed sediment	Medium	Medium	Moderate negative effect; Not Significant.	As per section 8.6.2.3.4	Slight negative effect; Not significant
Effects on water quality status of designated waterbodies due to increased suspended sediment and potential release of contaminants	Designated waterbodies (including WFD Coastal and Transitional Waterbodies, Bathing Waters, protected shellfish waters, SACs, SPAs and pNHAs)	Low	High	Moderate negative effect; Not Significant.	As per section 8.6.2.4.4	Imperceptible negative effect; Not Significant
Effects on water quality status of designated waterbodies due to routine and accidental discharges from vessels during construction		Low	High	Moderate negative effect; Not Significant		Slight negative effect; Not significant

8.7.2 Operational and Maintenance Phase

Table 8-28 Residual effect of operational and maintenance phase on WSQ

Impact pathway	Receptor	Magnitude	Sensitivity	Significance Prior to Mitigation	Mitigation	Residual Effect
Changes in water quality due to increased suspended sediment concentrations	Water column	Low	Low	Slight negative effect; Not significant	As per section 8.6.3.1.4	Imperceptible negative effect; Not Significant
Changes in WSQ due to accidental release of contaminated sediment	Water column / seabed sediment	Low	Medium	Slight negative effect; Not significant	As per section 8.6.3.2.4	Imperceptible negative effect; Not Significant
Changes in WSQ due to routine and accidental discharges from vessels during operations	Water column / seabed sediment	Medium	Medium	Moderate negative effect; Not Significant	As per section 8.6.3.3.4	Slight negative effect; Not significant
Effects on water quality status of designated waterbodies due to increased suspended sediment and potential release of contaminants	Designated waterbodies (including WFD Coastal and Transitional Waterbodies, Bathing Waters, protected shellfish waters, SACs, SPAs and pNHAs)	Low	High	Slight negative effect; Not significant	As per section 8.6.3.4.4	Imperceptible negative effect; Not Significant
Effects on water quality status of designated waterbodies due to routine and accidental discharges from vessels during operations		Low	High	Moderate negative effect; Not Significant		Slight negative effect; Not significant

8.7.3 Decommissioning Phase

Table 8-29 Residual effect of operational and maintenance phase on WSQ

Impact pathway	Receptor	Magnitude	Sensitivity	Significance Prior to Mitigation	Mitigation	Residual Effect
All decommissioning activities	Water column	Low	Low	Slight negative effect; Not Significant	As per section 8.6.2.1.4	Imperceptible negative effect; Not Significant
All decommissioning activities	Water column / seabed sediment	Medium	Medium	Moderate negative effect; Not Significant.	As per section 8.6.2.3.4	Slight negative effect; Not significant
All decommissioning activities	Designated waterbodies (including WFD Coastal and Transitional Waterbodies, Bathing Waters, protected shellfish waters, SACs, SPAs and pNHAs)	Low	High	Moderate negative effect; Not Significant.	As per section 8.6.2.4.4	Imperceptible negative effect; Not Significant

8.8 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 WSQ. The general approach to the cumulative effects assessment (CEA) is described in Chapter 4: EIA methodology and further detail is provided below.

The list of relevant developments for inclusion within the CEA is outlined in Table 8-28. This has been informed by a screening exercise, undertaken to identify relevant developments for consideration within the CEA for each EIA topic. The Cumulative Study Area for WSQ is defined as twice the WSQ study area detailed in Section 8.5.1. Where the study area accounted for a buffer of 15 km around the Offshore Site, the Cumulative Study Area considers a buffer of 30 km. It is considered that this Cumulative Study Area provides a local (i.e. within the Offshore Site) and regional context for WSQ. This 30 km buffer has informed the screening exercise for the WSQ CEA. The 30 km buffer has also followed the Marine and Physical Processes CEA due to the interlinked nature between marine process and WSQ.

It is important to note that there are no projects/developments of an equivalent scale or type to the Project within 30 km. To date, there has been generally few large-scale construction projects on the west coast of Ireland. Therefore, many of the relevant developments in Table 8-30 represent short-term, localised activities which are not typically associated with any long-term infrastructure presence.

There are 97 aquaculture sites within the Cumulative Study Area. The closest aquaculture site (the Údarás na Gaeltachta site) is located 6.3km from the OAA. The nature of these developments is such that their associated impacts are universal between sites. While these operational developments are considered part of the baseline environment, aquaculture farms, in particular those focussing on finfish production, will discharge and deposit detritus/sediments which can impact on WSQ. However, the scale of this will be minimal allowing for rapid reincorporation of sediments into the local transport regime and is therefore highly unlikely to result in cumulative impacts on WSQ receptors. As these developments are all considered to be part of the baseline, aquaculture sites are not considered further within CEA.

The nearest dumping at sea licenced activities occur as part of maintenance dredging associated with the Kilrush Marina. The marina is located within the Shannon Estuary. Therefore, accounting for the geography of the coastline, the disposal of dredged material will occur over 30 km from the Offshore Site. Consequently, there are no relevant dumping at sea activities to consider within the scope of CEA for WSQ. There are a number of ferry ports located within 30 km of the Offshore Site. However, these ports are operational and have no associated licenced maintenance or dredging activities. Consequently, it is assumed that these port locations do not generate any impacts equivalent to those associated with the Project. Therefore, there is no opportunity for cumulative interactions and are not considered further within the CEA for WSQ.

Urban waste water treatment locations are located along the coast within 30 km of the Offshore Site, in particular close to the OECC landfall. As these locations are all terrestrial and are concerned with treatment activities which occur onshore, these waste water treatment locations are not considered further in CEA. However, some water treatments are co-located with discharge points which discharge effluent directly from the coast or into estuaries. These discharge points, and others along the coast which output directly into coastal or estuary waters are considered further in the CEA. A total of four discharge points are determined to have a relevant pathway in relation to WSQ and are listed in Table 8-30.

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 development permission application.

There were a number of planned offshore renewable developments (at various levels of inception) 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 MAC or make a development permission 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 renewables developments. In this context, we do not have sufficient information to consider these renewables developments, or associated foreshore licences for survey works any further.

The list of relevant developments for inclusion within the CEA is outlined in Table 8-30[14].

[14] *A long list of all developments is detailed in Appendix 4-1*

Table 8-30 Developments relevant to the WSQ CEA

Location	Development Type	Development Name	Distance to OAA (km)	Distance to OECC (km)	Status	Additional Information	Considered further
Galway	Cable	IRIS sub-sea fibre optic cable system	0.00	71.87	Operational	Licence held for Construction of Cable. 2022- overall duration 2-3 months	No – operational project is considered part of baseline conditions.
Galway	Scientific research	UCD Research Experiments, Inishmaan	13.12	28.21	Operational	Licence held for Data Monitoring Equipment. 2022-2027.	No – operational project is considered part of baseline conditions.
Clare / Kerry	Cable	Cross Shannon Cable Project	21.54	80.04	Operational	Licence held for Construction of Cable. Duration of construction 12 months.	No – operational project is considered part of baseline conditions.
Discharge Points							
Kilkee	Discharge Point	Kilkee	64.40	11.90	Active	Discharge in coastal water	Yes
Kilrush	Discharge Point	Kilrush	73.21	14.85	Active	Discharge in coastal water	No – no likelihood of spatial overlap with Project activities as this site lies in the Shannon estuary
Ennistymon	Discharge Point	Ennistymon Waste Water Treatment Plant	53.16	25.99	Active	Discharge to estuary	No – estuaries typically experience naturally elevated levels of SSC such that any additional discharge will likely be readily incorporated into the local environment.
Clifden	Discharge Point	Clifden Waste Water Treatment Plant	21.37	26.79	Active	Discharge to estuary	No – estuaries typically experience naturally elevated levels of SSC such that any additional discharge will likely be readily incorporated into the local environment.

Bearing in mind the list of relevant developments in Table 8-30, impacts have been screened in or out of CEA. The justification for this process is provided in Table 8-31, with Section 8.8.1 onward assessing the construction, operational and maintenance, and decommissioning phase impacts in turn.

Table 8-31 Impacts requiring consideration in CEA

Effect	Screening	Justification
Construction Phase (Section 8.8.1)		
Changes in water quality due to increased suspended sediment concentrations	In	There is potential for a cumulative effect with discharge points.
Changes in WSQ due to accidental release of contaminated sediment	Out	There is no potential for a cumulative effect with discharge points screened in to CEA.
Changes in WSQ due to routine and accidental discharges from vessels during construction	Out	There is no potential for a cumulative effect with discharge points screened in to CEA.
Effects on water quality status of designated waterbodies due to increased suspended sediment and potential release of contaminants or accidental pollution	In	There is potential for a cumulative effect with discharge points.
Operational and Maintenance Phase (Section 8.8.2)		
Changes in water quality due to increased suspended sediment concentrations	In	There is potential for a cumulative effect with discharge points which discharge into the marine environment at proximity to the Offshore Site.
Changes in WSQ due to accidental release of contaminated sediment	Out	There is no potential for a cumulative effect with discharge points screened in to CEA.
Changes in WSQ due to routine and accidental discharges from vessels and WTGs during operations and maintenance	Out	There is no potential for a cumulative effect with discharge points screened in to CEA.
Effects on water quality status of designated waterbodies due to increased suspended sediment and potential release of contaminants or accidental pollution	In	There is potential for a cumulative effect with discharge points.
Decommissioning Phase (Section 8.8.3)		
Changes in water quality due to increased suspended sediment concentrations	Out	The Project activities proposed during the decommissioning phase will result in residual effect levels the same as, or less than, those assessed for the construction phase of the Project. Therefore, there are no additional CEA considerations specific to the decommissioning phase. Consequently, this impact is not considered further in this CEA
Changes in WSQ due to accidental release of contaminated sediment	Out	The Project activities proposed during the decommissioning phase will result in residual effect levels the same as, or less than, those assessed for the construction phase of the Project. Therefore, there are no additional CEA considerations specific to the decommissioning phase. Consequently, this impact is not considered further in this CEA

Effect	Screening	Justification
Changes in WSQ due to routine and accidental discharges from vessels during decommissioning	Out	The Project activities proposed during the decommissioning phase will result in residual effect levels the same as, or less than, those assessed for the construction phase of the Project. Therefore, there are no additional CEA considerations specific to the decommissioning phase. Consequently, this impact is not considered further in this CEA
Effects on water quality status of designated waterbodies due to increased suspended sediment and potential release of contaminants or accidental pollution	Out	The Project activities proposed during the decommissioning phase will result in residual effect levels the same as, or less than, those assessed for the construction phase of the Project. Therefore, there are no additional CEA considerations specific to the decommissioning phase. Consequently, this impact is not considered further in this CEA

8.8.1 Cumulative Construction Effects

The presence of discharge points will also result in potential increases to SSC/ release of contaminated sediment. These discharge points are active; therefore, this activity already forms part of the baseline environmental conditions. However, it is considered here in the interest of acknowledging that such discharges may change over time. The discharge point at Kilkee discharges directly into coastal waters within 15 km of the OECC landfall. Sediment plumes associated with the Offshore Site CFE clearance activities (which may occur within the OECC), could extend up to several kilometres from the site of activity but will be <15 km. The discharge point is located 11 km from the Offshore Site boundary and will release urban wastewater which will likely contain variable sediments/substances. It can be assumed that the extent of any sediment plumes associated with the discharge point will be similar to, or less extensive than, the plumes associated with construction activities (i.e., up to 15 km and settling within 14 hours). Consequently, there a possibility that these plumes will interact cumulatively, albeit marginally given the intervening distance from the discharge release point. Given that any overlap will occur at the furthest extent of the potential plumes, SSCs will be significantly less than the areas of release, approaching background levels. Given this, although these regimes may interact cumulatively the intensity of the effect will be minor and will occur only over short durations during the construction period. Additionally, given the low contamination risk of sediment within the Offshore Site, this represents a negligible risk to cumulative contamination potential with the discharge point. For the Project alone residual impacts were considered to be an **imperceptible negative effect** which is Not Significant. Based on the above justification, cumulative impacts are characterised as a **slight negative effect** which is Not Significant.

Overall, the above has considered the potential for cumulative impacts and concluded that, largely due to the scale of other developments/projects in the area, there is limited potential for cumulative construction impacts from SSC or release of contaminated materials. There is therefore limited potential for cumulative effects on WSQ for designated waters. Although the sensitivity of these designated areas is considered to be high with respect to changes in WSQ, the magnitude of cumulative impacts is still considered to be low given limited potential for interactions and additive effects. Based on the above justifications, cumulative impacts from SSC/ release of contaminated sediment and accidental pollution from vessels are characterised as a **slight negative effect** which is Not Significant.

8.8.2 Cumulative Operational and Maintenance Effects

The discharge point at Kilkee releases into coastal waters within 15 km of the OECC Landfall. Sediment plumes from Offshore Site operations are expected to be more localised and temporary compared to construction. Sediment plumes from the discharge point is likely to be similar or less extensive than those from construction of the Offshore Site, settling within 14 hours. Overlap of plumes at their widest extent is possible but would result in significantly lower SSCs than at the source, approaching background levels. This overlap would have a minor cumulative effect, only during major works. Given the low contamination risk of sediment, the cumulative contamination potential is negligible. The Project alone has an **imperceptible negative effect,** which is Not Significant. Cumulative impacts are also characterised as **an imperceptible negative effect,** which is Not Significant.

Overall, the potential for cumulative impacts from SSC or release of contaminated materials, is limited due to the scale of other developments in the area during operations. Consequently, there is minimal potential for cumulative operational and maintenance effects on WSQ in designated waters. Despite the high sensitivity of these areas, the magnitude of cumulative impacts is considered low due to limited interactions and minor additive effects. Therefore, cumulative impacts are characterised as **a slight negative effect**, which is not significant.

8.8.3 Cumulative Decommissioning Effects

The Project activities proposed during the decommissioning phase will result in residual effect levels the same as, or less than, those assessed for the construction phase of the Project. There are no additional CEA considerations specific to the decommissioning phase. Decommissioning phase activities for the Project alone were assessed to have at worst, **slight negative effects** on the WSQ, which is Not Significant. Considering the scale and number of other nearby developments which may coincide with the Project either spatially or temporally, there is no potential for cumulative effects. Therefore, this judgement of residual impact will not change.

In summary, the water and sediment quality impact assessment has assessed the potential for changes to water and sediment quality and effects on designated areas. The potential effects of increased suspended sediment concentrations; accidental release of contaminated sediment and; accidental discharge from vessels due to the proposed activities were also assessed. The baseline water and sediment quality were considered, with a particular focus on the physico-chemical characteristics of the water and sediment in the study area. Designated sites and protected areas in the vicinity of the OOA were also identified. Mitigation by design has been included during project design and additional mitigation measures are proposed and considered within the assessment, for example, the use of trenchless technologies and GBS foundations to minimise seabed disturbance amongst other mitigations strategies. In conclusion, the assessment found that the residual effect pathways will be Not Significant for all water and sediment quality receptors. The cumulative effects assessment included other projects and developments; however, the cumulative effects were also characterised as being Not Significant.

GLOSSARY OF PROJECT TERMS

Term	Description
Landfall	The location where the Offshore Export Cable will be brought ashore.
Onshore Export Cable	The cable that transports electricity from the Landfall location to the onshore substation.
Onshore Site	Includes Landfall infrastructure, onshore grid connection, onshore substation and onshore export cable to the MP 400 kV substation.
Onshore Substation	Onshore substation infrastructure.
Offshore Array Area	Turbines and associated foundations and internal cabling.
Offshore Export Cable	Offshore cable that transports electricity from the Offshore Array Area to the Landfall location.
Offshore Export Cable Corridor	The 1 km corridor assumed for the Offshore Export Cable.
Offshore Site	Includes turbines and all associated infrastructure, the Offshore Substation, internal cabling, Offshore Export Cable and Landfall.
Offshore Substation	Offshore substation infrastructure, including foundations.
The Project	All infrastructure associated with the Onshore and Offshore developments.

ACRONYMS AND ABBREVIATIONS

Acronym/Abbreviation	Definition
AMOC	Atlantic Meridional Overturning Circulation
AS	Arsenic
BOT	Bottom
BWM	Ballast Water Management
CCME	Canadian Council of Ministers of the Environment
CD	Cadmium
CEA	Cumulative Effects Assessment
Cefas	Centre for Environment, Fisheries and Aquaculture Science
CFE	Controlled Flow Excavator
CLV	Cable Lay Vessel
CR	Chromium
CTD	Conductivity, Temperature, and Depth
CU	Copper
DBT	Dibutyltin
DDC	Drop-down Camera
DDT	Dichlorodiphenyltrichloroethane
DHLGH	Department of Housing, Local Government and Heritage
DIN	dissolved inorganic nitrogen
DO	Dissolved oxygen
DVV	Dual Van Veen
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EMP	Environmental Management Plan
EPA	Environmental Protection Agency
EQS	Environmental Quality Standards
EU	European Union

Acronym/Abbreviation	Definition
GBS	Gravity Base Structure
HAB	Harmful Algal Bloom
HCB	Hexachlorobenzene
γ - HCH	Lindane
HDD	Horizontal Directional Drilling
HG	Mercury
HLV	Heavy load vessel
IAC	Inter-array Cables
IDD	Irish Dredge Disposal
IDD-LL	Irish Dredge Disposal Lower Limit
IDD-UL	Irish Dredge Disposal Upper Limit
IMO	International Maritime Organization
INFOMAR	The Integrated Mapping for the Sustainable Development of Ireland's Marine Resource
INNS	Invasive Non-Native Species
ISF	Irish Shelf Front
ISQG	Interim Sediment Quality Guideline
LAWPRO	Local Authority Waters Programme
LoD	Limit of Detection
MAG	Magnetometer
MARPOL	International Convention for the Prevention of Pollution from Ships
MBES	Multi-beam echo sounder
MCCIP	Marine Climate Change Impacts Partnership
MMO	Marine Management Organisation
MPCP	Marine Pollution Contingency Plan
MSFD	Marine Strategy Framework Directive
NHA	Natural Heritage Areas
NI	Nickel
OAA	Offshore Array Area
OCP	Organochlorine Pesticides
OECC	Offshore Export Cable Corridor
OEL	Ocean Ecology Limited
OREDP	Offshore Renewable Energy Development Plan
OSPAR	Oslo-Paris Convention
OSS	Offshore 220kV Electrical Substation
PAH	Polyaromatic hydrocarbons
PB	Lead
PCB	Polychlorinated biphenyls
PEL	Probable Effect Level
PLGR	Pre-lay Grapnel Run
PLONOR	pose little or no risk to the environment
PSA	Particle Size Analysis
PSD	Particle Size Distribution
PSU	Practical Salinity Units
RBMP	River Basin Management Plans
SAC	Special Area of Conservation
SBP	Sub-bottom profiler
SCI	Site of Community importance
SD	Standard Deviation
SOPEP	Shipboard Oil Pollution Emergency Plans
SPA	Special Protection Areas
SPM	Suspended Particulate Matter

Acronym/Abbreviation	Definition
SSC	Suspended Sediment Concentrations
SSS	Side-scan Sonar
SST	Sea Surface Temperature
TBT	Tributyltin
TDS	Total Dissolved Solids
TEL	Threshold Effect Level
THC	Total Hydrocarbon Content
THSD	Trailing suction hopper dredger
TOC	Total Organic Carbon
TSAS	Trophic Status Assessment Criteria
TSHD	Trailer Suction Hopper Dredger
TSS	Total Suspended Solids
S-UHRS	Single channel ultra-high resolution seismic
UK	United Kingdom
USBL	Ultra-short baseline
WFD	Water Framework Directive
WSQ	Water and Sediment Quality
WTG	Wind Turbine Generator
WTIV	Wind Turbine Installation Vessel
ZN	Zinc