

Volume 9: Appendices (Offshore)

Appendix 11.1
Offshore Water
Framework Directive
Compliance Report

North Irish Sea Array Windfarm Ltd

Appendix 11.1. Water Framework Directive Compliance Assessment

North Irish Sea Array Offshore Wind Farm



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Revision	Date	Status	Author:	Checked by:	Approved by:
1	Nov 2023	Draft 1	AC	CH	CC
2	March 2024	Draft 2	AC	CH	CC



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Acronyms

Term	Definition
Appropriate Assessment	AA
Bathing Waters	BW
Celtic Sea Trout Project	CSTP
Dibutyltin	DBT
Escherichia coli	E. coli
Offshore Export Cable Corridor	ECC
Environmental Impact Assessment Report	EIAR
Environmental Management Plan	EMP
Environmental Protection Agency	EPA
Environmental Quality Standards	EQS
Environmental Quality Standards Directive	EQSD
European Union	EU
Horizontal Directional Drilling	HDD
High Water Mark	HWM
Intestinal Enterococci	IE
Invasive and Non-Native Species	INNS
Low Water Mark	LWM
Maximum Allowable Concentration	MAC
Marine Water and Sediment Quality	MWSQ
Natura Impact Statement	NIS
Nitrate Vulnerable Zones	NVZ
Polycyclic Aromatic Hydrocarbons	PAH
Polychlorinated Biphenyls	PCB
River Basin Management Plan	RBMP
revised Bathing Water Directive	rBWD
Special Area of Conservation	SAC
Shellfish Waters	SFW
Special Protection Area	SPA
Suspended Sediment Concentration	SSC
Tributyltin	TBT



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Ultra-Violet	UV
Urban Waste Water Treatment Directive	UWWTD
Water Framework Directive	WFD
Zone of Influence	ZoI



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11 Water Framework Directive

11.1 Introduction

11.1.1 This document has been prepared to present the findings of the Water Framework Directive (WFD) Assessment for the potential impacts of the activities on the marine environment associated with the North Irish Sea Array Offshore Wind Farm (hereafter referred to as the proposed development). The findings of the WFD assessment for the potential impacts of the activities on the onshore environment are presented in Volume 10, Appendix 22.2: Water Framework Directive. The purpose of this document is to demonstrate compliance of the proposed development with the objectives of the WFD (2000/60/EC), by ensuring proposed activities do not result in adverse effects to designated water bodies (or WFD sensitive areas). This document also demonstrates that the proposed development will not jeopardise the potential for WFD water bodies to achieve good chemical or ecological status, whether already achieved or as a future objective.

11.1.2 The proposed development (encompassing both the array area and offshore Export Cable Corridor (ECC)) is an offshore wind farm development which will be located off the coast of Dublin, Meath and Louth, covering an area of approximately 125km² in water depths ranging between 30 to 63 m below lowest astronomical tide. The Marine Water and Sediment Quality (MW&SQ) zone of influence (Zoi) consists of the array area and ECC (referred to collectively as 'offshore development area') plus a 12km buffer. In the absence of Irish-specific guidance this WFD assessment will implement UK guidance. The current standard practice for WFD, the 'Water Framework Directive assessment: estuarine and coastal waters' (English Environment Agency, 2023) (hereafter, the Guidance), requires a 2km buffer around proposed infrastructure be implemented for WFD compliance assessments. Therefore, a 2km WFD guidance buffer has been utilised for this assessment. Activities associated with both the array area and ECC will be considered within this assessment.

11.1.3 This document has been informed by the assessments presented within the Environmental Impact Assessment Report (EIAR), summarising the key findings. This document seeks to signpost to, and draw from, relevant information within the EIAR which demonstrates compliance with the WFD (as opposed to duplicating assessment). This document should therefore be read in conjunction with the following chapters of the EIAR:

- Volume 2, Chapter 6: Description of the Proposed Development - Offshore;
 - This chapter provides a detailed description of the proposed design parameters, construction and decommissioning methodologies, and associated operational activities.
- Volume 2, Chapter 8: Offshore Construction Strategy;
 - This chapter describes the strategy to construct the offshore elements and associated infrastructure of the proposed development below the HWM.
- Volume 3, Chapter 10: Marine Geology, Oceanography and Physical Processes;

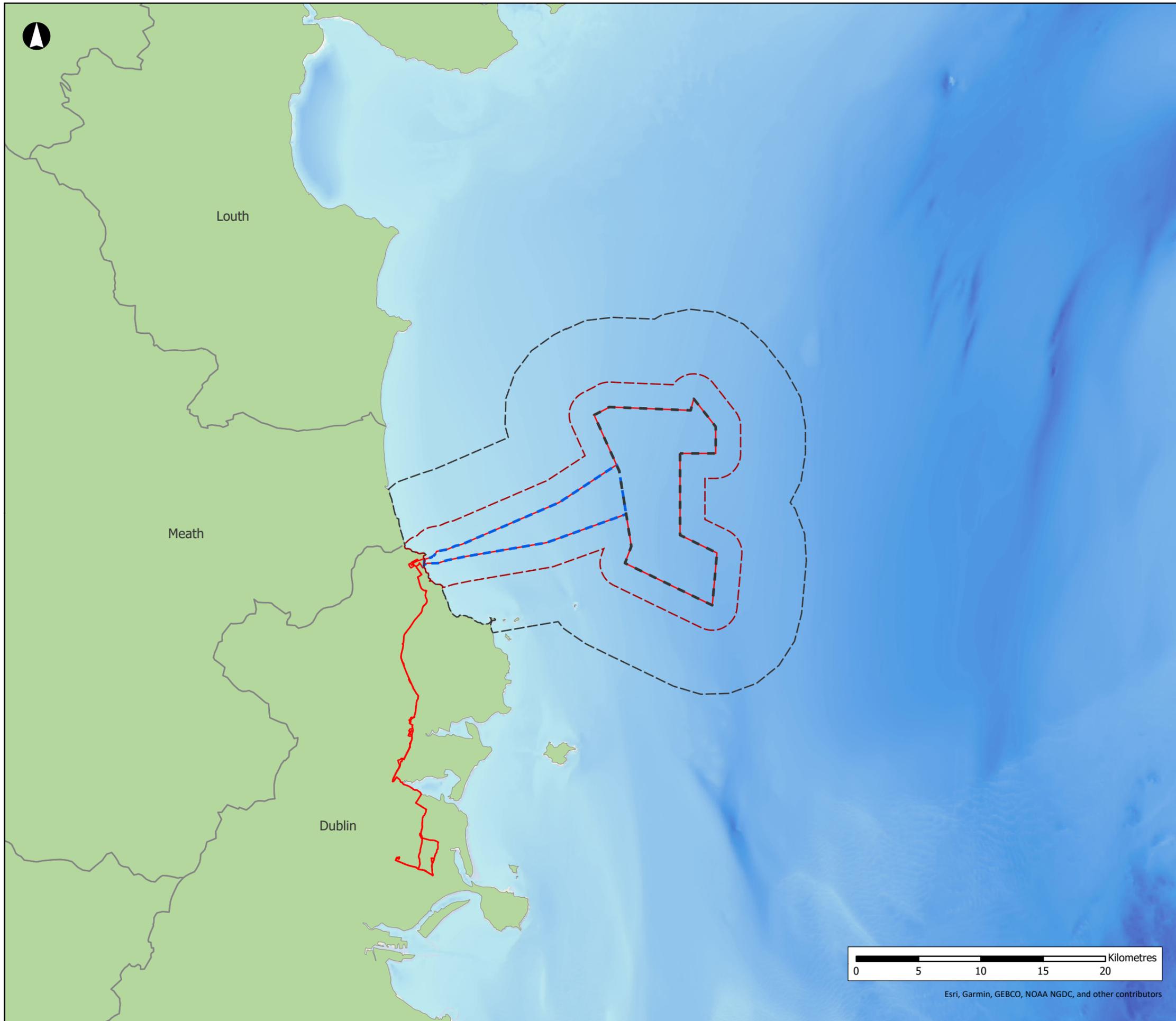


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- This chapter will be referenced to provide an overview of surficial sediment properties, suspended particulate matter, seabed features, and metocean conditions in the area. This chapter functions to provide an assessment of likely significant effects on marine geology, oceanography and physical processes receptors.
- Volume 3, Chapter 11: Marine Water and Sediment Quality;
 - This chapter will be referenced as it provides a characterisation of the water and sediment quality of the receiving environment. This chapter also functions to provide an assessment of the likely significant effects on water and sediment quality receptors.
- Volume 3, Chapter 12: Benthic and Intertidal Ecology;
 - This chapter will be referenced as it provides a detailed overview of the benthic and intertidal ecology features of relevance. This chapter provides an assessment of likely significant effects on benthic and intertidal ecology receptors.
- Volume 3, Chapter 13: Fish and Shellfish Ecology;
 - This chapter will be referenced as it characterises the baseline for fish and shellfish and provides the assessment of likely significant effects on fish and shellfish receptors.
- Volume 9, Annex 10.1: Marine Processes Review of Project Options; and
 - This technical appendix is referenced as it presents a detailed description of the relevant project options, in the context of a detailed description of the surficial sediments qualities of the receiving environment, as well as further information on suspended particulate matter, seabed features and metocean conditions.
- Volume 9, Annex 10.2: Physical Processes Modelling.
 - This technical appendix is referenced as it provides the project-specific modelling outputs, undertaken to support baseline sedimentology and metocean regimes assessment (including sediment plume and tidal excursion modelling).

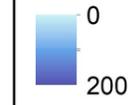
11.1.4 It is not anticipated that activities carried out in the marine environment would adversely impact freshwater water bodies. This is namely due to the parallel properties of tidal flows (with dispersion and disturbed sediment following the tidal flow and travelling parallel to the coast), and the distance of the sediment disturbance activities offshore. Therefore, this document will only consider potential impacts to coastal and transitional WFD water bodies. The study area (proposed offshore development area and 2km WFD guidance buffer) for this WFD assessment is shown in Figure 11.1.1.





- Proposed Development Boundary
- Array Area
- Offshore Export Cable Corridor
- WFD Guidance 2km Buffer
- Sediment Excursion Buffer

Bathymetry (m)



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Figure Title

The Water Framework Directive Assessment Study Area

Job No: 281240

Datum: WGS84 **Projection:** UTM30N

Date: May 2024

Figure No:

Scale: 1:300,000 @A3

11.1.1

Status: Issue

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11.2 Regulatory Background

Water Framework Directive

11.2.1 The WFD (2000/60/EC) was established in 2000 by the European Union (EU), in order to provide a framework for the protection of groundwater and surface water bodies (such as rivers, lakes, coasts, and estuaries). The Directive designates coastal water bodies (for ecological status) out to one nautical mile from the coast. This ecological status is assigned through consideration for the biological, hydromorphological, and chemical quality of the water body. The ecological statuses used for assessment are:

- High;
- Good;
- Moderate;
- Poor; and
- Bad.

11.2.2 Under the WFD there is an objective on water bodies to achieve ‘good chemical status’, which is defined by the compliance with quality standards set for chemical substances at a European level. This ensures a standardised, minimum quality is applied, particularly for toxic substances and chemicals. Designated water bodies also have an objective to attain ‘good ecological status’, pertaining to environmental quality objectives for discharged priority substances.

11.2.3 The WFD was transcribed into Irish law through The European Communities (Water Policy) Regulation 2003 (S.I. 722 of 2003). Under the Directive, management plans are designed for distinct river basin districts. The third (draft) River Basin Management Plan (RBMP) was published in 2022, and covers the period from 2022-2027. This draft RBMP identifies water bodies which may be at risk of not attaining the ecological status objectives set by the WFD within this cycle (i.e., by 2027). There is a monitoring programme in place to assess the attainment of these WFD objectives, with the latest iteration (covering the period from 2022-2027) published in 2023 (Environmental Protection Agency (EPA), 2023a).

11.2.4 The Environmental Quality Standards (EQS) used in the classification of surface water standards are established by Schedule 5 of the European Communities Environmental Objectives (Surface Waters) Regulations 2009 (S.I. 272 of 2009), as amended.

Protected Areas

Bathing waters

11.2.5 The revised Bathing Water Directive (rBWD) (2006/7/EC) was brought into force by the EU in March 2006. The rBWD builds upon the standard of the original Directive, enforcing more stringent standard of assessment. The rBWD classifies BWs into four standards:

- Excellent: the highest, cleanest classification;
- Good: generally good water quality;



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- Sufficient: the water body meets the minimum standards; and
- Poor: the water body has not met the minimum standards.

11.2.6 The rBWD has been transposed into Irish law through the Bathing Water Quality Regulations 2008 (S.I. 79 of 2008) and subsequently the Bathing Water Quality (Amendment) Regulations 2011 (S.I. 351 of 2011) (hereafter, the Bathing Water Regulations). Under the Bathing Water Regulations, local authorities are required to monitor bacterial pollution (such as *Escherichia coli* (*E. coli*) and intestinal enterococci (IE)) in water bodies, the presence of which may indicate pollution from sewage. An increase in these bacterial concentrations correlates to a decrease in the water quality. The outputs from this bacterial monitoring of Bathing Waters (BWs) are compiled by the EPA and submitted to the European Commission.

11.2.7 A classification is assigned to a BW by collating monitoring data from the previous four years, on a rolling basis. Abundance of *E. coli* and IE are assessed separately, so each is assigned its own classification. The overall BW quality is aligned with the lowest classification achieved by either *E. coli* or IE. For example, if *E. coli* is 'Good' but IE is 'Sufficient', the BW is classified as 'Sufficient' as a conservative approach.

Shellfish waters directive

11.2.8 The WFD incorporates the Shellfish Waters Directive, which was developed to protect and improve water quality to promote healthy shellfish growth (bivalve and gastropod molluscs) and support the quality of edible shellfish.

11.2.9 The Council Directive 79/923/EEC of 30 October 1979 on the quality required of Shellfish Waters as amended by Council Directive 91/692/EEC (further amended by Council Regulation 1882/2003/EC) is commonly known as the Shellfish Waters Directive. This Directive was established to protect the aquatic environment on which shellfish species depend, which is achieved by setting out standards for parameters to be monitored at designated shellfish areas. This Directive was superseded by 'Directive 2006/113/EC of the European Parliament and of the Council of 12 December 2006 on the quality of shellfish waters', which has subsequently repealed. The Shellfish Waters Directive and associated protections afforded are captured under the Water Framework Directive.

11.2.10 The Directive establishes parameters to be assessed for designated SFWs, indicative/mandatory values, and methods of analysis. This Directive dictates that pH, temperature, salinity, and the presence/concentrations of certain substances (such as dissolved oxygen, hydrocarbons, metals) are assessed. The following proportions of samples must conform to the established values:

- 100% of the samples for the parameters organohalogenated substances and metals;
- 95% of the samples for the parameters salinity and dissolved oxygen;
- 75% of the samples of all other parameters; and
- No evidence of harm to the shellfish from organohalogenated compounds.



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11.2.11 The Directive also stipulates that shellfish can be adversely affected by increased suspended sediment concentrations (due to smothering during the sediment settling), so discharges should not result in an increase to suspended sediment exceeding 30% of background levels.

11.2.12 The Shellfish Water Directive was transposed into Irish law through the European Communities (Quality of Shellfish Waters) Regulations 2006 (S.I. 268 of 2006) (hereafter referred to as the Shellfish Water Regulations). Under these Shellfish Water Regulations, there were 12 designated SFWs. The Shellfish Water Regulations were later amended to include an additional 49 SFWs under the European Communities (Quality of Shellfish Waters) (Amendment) Regulation 2009 (S.I. 55 of 2009). A further SFW was designated under European Communities (Quality of Shellfish Waters) (Amendments) (No. 2) Regulation 2009 (S.I. 464 of 2009).

Priority substances

11.2.13 The Environmental Quality Standards Directive (EQSD) (2008/105/EC) identifies the priority substances and chemical pollutants which would need consideration for coastal and transitional water bodies under the WFD. The WFD and EQSD seek to reduce the opportunity for these substances to enter the environment, by restricting discharges and outfalls. These priority substances include metals, polychlorinated biphenyls (PCBs) and polycyclic aromatic hydrocarbons (PAHs).

Nutrient sensitive waters

11.2.14 EU member states are required under the Urban Waste Water Treatment Directive (UWWTD) (91/271/EEC) to identify nutrient-sensitive areas. These are defined "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".

11.2.15 The Urban Waste Water Treatment Regulations 2001 (S.I. 254 of 2001) (which functions to transpose the UWWTD into Irish law and update the Environmental Protection Agency Act 1992 (Urban Waste Water Treatment) Regulations 1994 (as amended in 1999)) list nutrient sensitive waters.

11.2.16 The Nitrates Directive (91/676/EEC) was adopted by the EU member states with the aim of reducing water pollution from agricultural sources, and preventing such pollution in the future. Under the Nitrates Directive, surface waters are identified where the nitrogen concentration has altered the plant growth in the area, impacting existing plant and animals reliant on the water.

11.2.17 In areas where the concentrations of the nitrate in the water body exceed levels set in the Directive, they are designated as nitrate vulnerable zones (NVZs). In these NVZs mandatory rules must be enforced to reduce nitrate loss from agricultural land, protecting vulnerable resources from water pollution.

Protected areas

11.2.18 Under the WFD, member states are required to establish designated protected areas. For the purpose of the WFD, protected areas include:



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- Bathing Waters;
- Shellfish Waters;
- Nutrient-sensitive areas: including areas identified as NVZs under the Nitrates Directive or sensitive under the UWWTD;
- Natura 2000 Protected Sites; and
- Drinking Water protected areas¹.

11.3 Methodology

Overview

11.3.1 This document has been prepared to provide information demonstrating compliance of the proposed development with the WFD. To minimise duplication, this document references information provided in the EIAR and Natura Impact Statement (NIS) and that information should be read alongside this assessment.

Guidance

11.3.2 At the time of writing, there is no Irish guidance published on the undertaking of a WFD assessment for marine developments. Numerous guidance documents specific to marine water quality are available from other jurisdictions, many of which will have established offshore marine renewable energy sectors. In the absence of Irish specific guidance on WFD assessments, the Guidance has been applied. This guidance has been recommended for implementation across projects in England, Wales and Scotland. The UK guidance on WFD assessments has been chosen to supplement available Irish guidance, due to the geographical closeness of the countries. The Guidance will be used to inform the assessment of potential impacts and includes industry standard approaches, with the principles and recommendations of this Guidance considered in this document.

Data Sources

11.3.3 The following data sources and published literature have been collated and used to inform this assessment:

- National Marine Planning Framework: Project Ireland 2040 (Department of Housing, Planning and Local Government, 2021) (Compliance table considered in Volume 2, Chapter 11: Marine Water and Sediment Quality);
- Ireland's National Water Quality Monitoring Programme 2022-2027 (EPA, 2023a);
- Water Quality in Ireland Report 2013 - 2018 (EPA, 2019);
- Radioactivity Monitoring of the Irish Environment 2014 - 2015 (EPA, 2017);
- Water Quality in 2022 - an indicators report (EPA, 2023b);
- Urban Waste Water Treatment in 2021 (EPA, 2022);

¹ Only applicable in freshwater environments.



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- River Basin Management Plan for Ireland 2018 -2021 (Department of Housing, Planning and Local Government, 2018);
- EPA online Water Framework Directive Application (<https://gis.epa.ie/EPAMaps>);
- Bathing Water Quality in Ireland, A Report for the Year 2022 (EPA, 2023c);
- Register of Marine Protected Areas, held by the EPA;
- Marine Strategy Framework Programme of Measures Summary Report (2016); and
- Site-specific data including particle size and contaminant analysis of sediment samples available within the ECC, as detailed in the Volume 3, Chapter 11: Marine Water and Sediment Quality.

WFD Receptors

11.3.4 No pathways arising from the activities in the marine environment have been identified that could potentially impact freshwater WFD water bodies or protected areas. Therefore, no further consideration for freshwater environment is presented in this document. This document exclusively considers the coastal and transitional water bodies of relevance.

11.3.5 To ensure compliance with the WFD, it is necessary to identify all potential risks to WFD receptors associated with the proposed activity/activities. The receptors which are considered in this document are:

- Hydromorphology: physical characteristics of the water body including the size, shape, structure, flow and quantity of water and sediment;
- Intertidal and subtidal habitats: the habitats are included in assessment dependent on the footprint of the works and the sensitivity of the habitat;
- Fish: is only included if the activity affects fish in/migrating through an estuary or freshwater;
- Water quality: including water clarity, temperature, salinity, dissolved oxygen, nutrients, microbial patterns, history of harmful algal blooms and contamination;
- Protected areas: any identified protected areas within 2km of the ECC will be identified and Scoped In to further assessment; and
- Invasive and Non-Native Species (INNS) should also be considered.

11.3.6 The WFD assessment considers each stage of activity during the development process. The proposed activities considered (with their potential impacts on relevant receptors) are presented in Section 0.

Assessment process

11.3.7 In accordance with the Guidance (Environment Agency, 2023), a WFD compliance assessment can comprise up to three stages, with successive stages being undertaken based on the outcomes for the predecessors. These three stages are:



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- Stage 1 (WFD Screening)
 - To determine if there are any activities associated with the proposed development that would not require further consideration. This includes activities which have been ongoing prior to the current RBMP cycle, and are incorporated into the baseline conditions.
- Stage 2 (WFD Scoping)
 - To identify risks of the proposed development activities to WFD receptors (such as waterbodies and associated water quality elements).
- Stage 3 (WFD Impact Assessment)
 - To conduct a detailed assessments of WFD waterbodies and associated quality elements which are considered likely to be affected by the proposed development. This includes the identification of areas of non-compliance, consideration of relevant mitigation measures, environmental enhancements, and potential contributions to RBMP objectives.

11.4 Receiving Environment

11.4.1 Under the WFD and the Guidance (Environment Agency, 2023) (utilised in the absence of Irish-specific guidance), there is a requirement to determine if the proposed activity is carried out within 2km of any protected areas (such as BWs, SFWs, Natura 2000 sites). This section presents the designated WFD waterbodies and protected areas within 2km of the offshore development area, and their current status. As shown in Figure 11.1.2 and Figure 11.1.3, the only WFD protected areas within 2km of the array area is the Rockabill Special Protection Area (SPA), and North-West Irish Sea (NWIS) Candidate SPA (cSPA), with the remaining relevant WFD protected areas associated with the ECC and 2km WFD guidance buffer. Therefore, the assessment will consider activities within the ECC and array area.

Water bodies

There is one designated coastal or transitional waterbody located within the 2km WFD guidance buffer, the Northwestern Irish Sea (HA 08) coastal waterbody. The status of this designated site is presented below in Table 11.1, with the spatial arrangement presented in Figure 11.1.2 and Figure 11.1.3. The overall status of the Northwestern Irish Sea (HA 08) coastal waterbody is 'Good', based on 'Good' ecological and 'High' chemical status. A detailed assessment of the protected areas relevant to marine water and sediment quality is presented in Volume 3, Chapter 11: Marine Water and Sediment Quality.

In accordance with available WFD guidance, the 'Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes' (NRA, 2008), the WFD water body and protected area sensitivity are designated as 'Extremely High Sensitivity' if the "Attribute has a high quality or value on an international scale". Examples include River, Wetland or surface water body ecosystem protected by EU legislation i.e. designated under the Habitats, Birds, Shellfish, Bathing Water or Freshwater Fish, Drinking Water or Nitrate Directives.

A detailed characterisation of the receiving environment receptors is presented in the following chapters:



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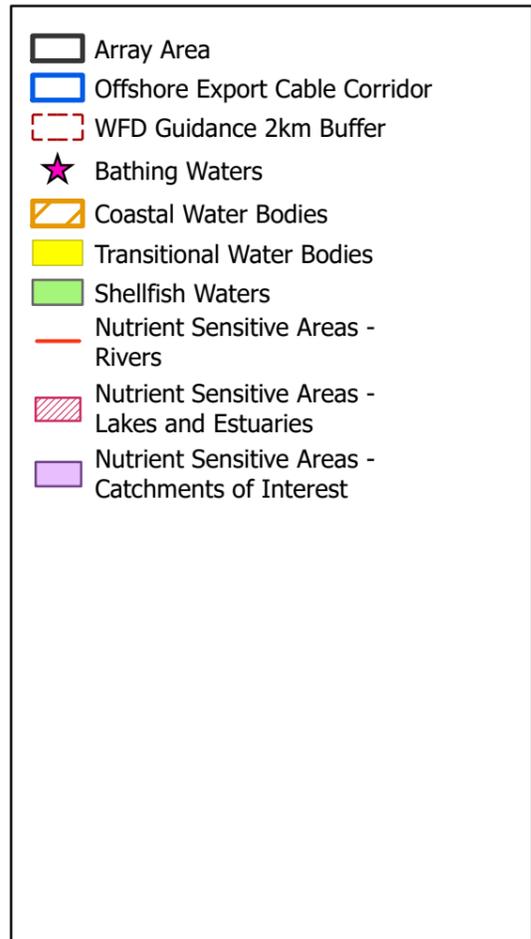
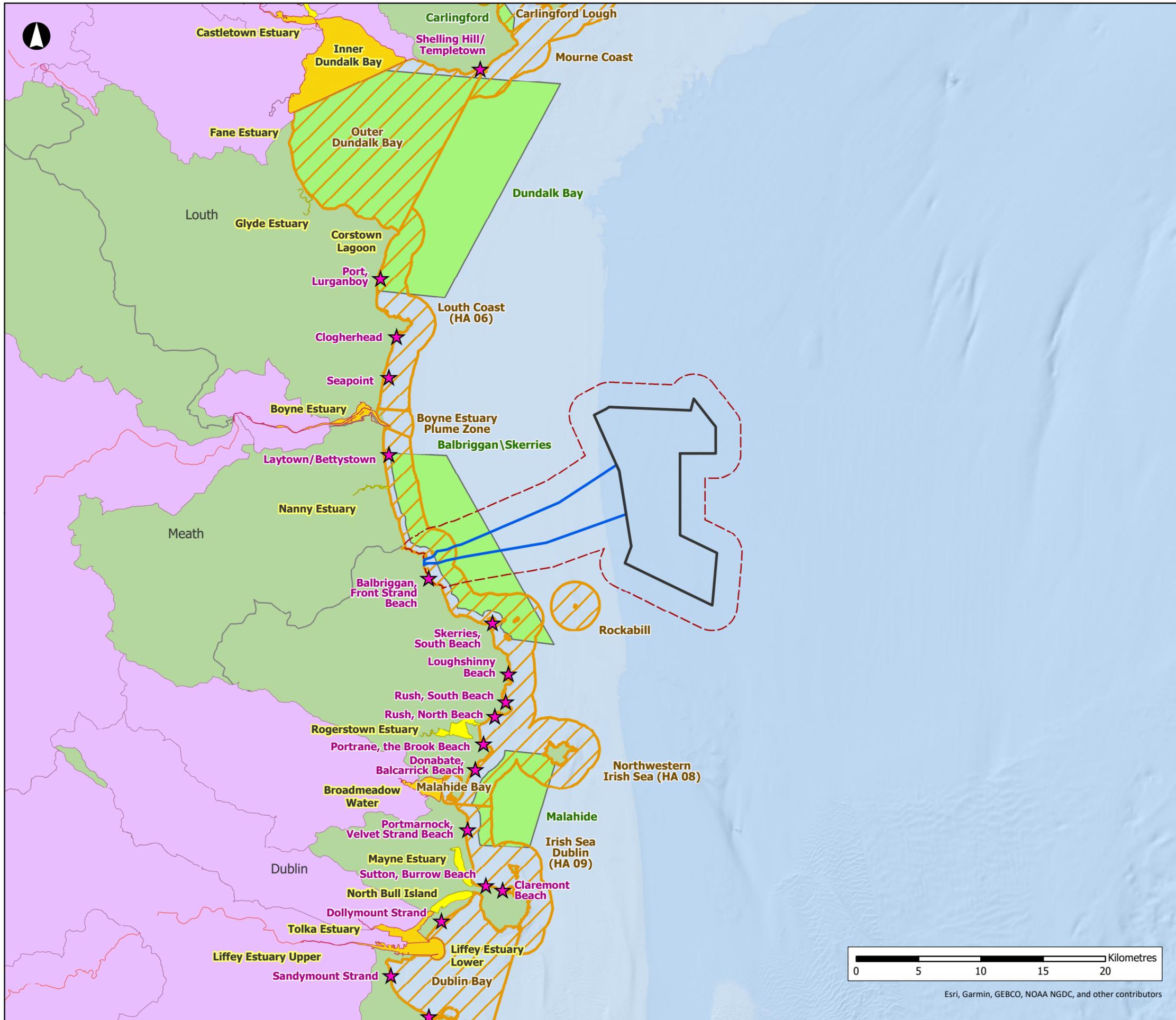
Volume 9, Appendix 10.1: Physical Processes Technical Baseline;

Volume 3, Chapter 11: Marine Water and Sediment Quality;

Volume 9, Appendix 12.1: Benthic and Intertidal Ecology Technical Baseline; and

Volume 9, Appendix 13.1: Fish and Shellfish Ecology Technical Baseline.





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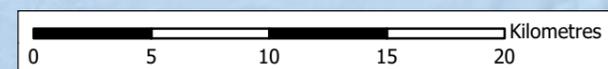
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Figure Title
**Water Framework Directive
 Waterbodies and Designated
 Sensitive Areas**

Job No: 281240	Datum: WGS84 Projection: UTM30N
Date: May 2024	Figure No:
Scale: 1:300,000 @A3	11.1.2
Status: Issue	



Esri, Garmin, GEBCO, NOAA NGDC, and other contributors

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Table 11.1- Water Framework Directive Water Bodies Within 2km of the ECC

Parameters	Coastal/Transitional Water Body*
Name	Northwestern Irish Sea (HA 08)
ID and Area (km2)	IE_EA_020_0000 117.7
Water Body Category	Coastal Water Body
Supporting Chemistry Condition	High
Ecological Status Potential	Good
Overall Status	Good
Hydromorphology	Good
Dissolved Oxygen	High
Nutrient Condition	High
Phytoplankton	High
Specific Pollutants	N/A**
Heavily Modified	N/A**
Identified as 'at risk'?	At risk

*=Based on 2016-2021 monitoring data

(https://www.catchments.ie/data/#/waterbody/IE_EA_020_0000?_k=qb6476)

**=Not assigned

Bathing Waters

The only relevant BW identified (within 2km of the ECC) was the Balbriggan, Front Strand Beach BW, which has been of 'Poor' status in 2020, 2021, and 2022.

Shellfish Waters

11.4.2 There is one designated SFW within 2km of the ECC, Balbriggan/Skerries (as shown in Figure 11.1.2). The Marine Institute monitors the presence of toxin producing phytoplankton in Irish coastal waters, ensuring the quality of shellfish harvested for consumption. Measurements taken in shellfish (*Ensis siliqua*) tissue were under the limits of detection for amnesic shellfish poisoning, azaspiracid shellfish poisoning, diarrhetic shellfish poisoning, paralytic shellfish poisoning, pectenotoxins, and yessotoxins (Marine Institute, 2024). This indicates the Balbriggan/Skerries SFW is currently in good condition and compliant with the WFD.



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Nutrient Sensitive Areas

11.4.3 The EPA previously identified various areas where sewage discharges pose a main significant pressure on water bodies (risking pollution). 'At risk of pollution' is defined as being at risk of not achieving the specific environmental target set for the water body, such as 'Good' ecological status. As shown in Figure 11.1.2, there are no designated sensitive areas within 2km of the array area or ECC. Therefore, nutrient sensitive areas will not be considered further in this assessment.

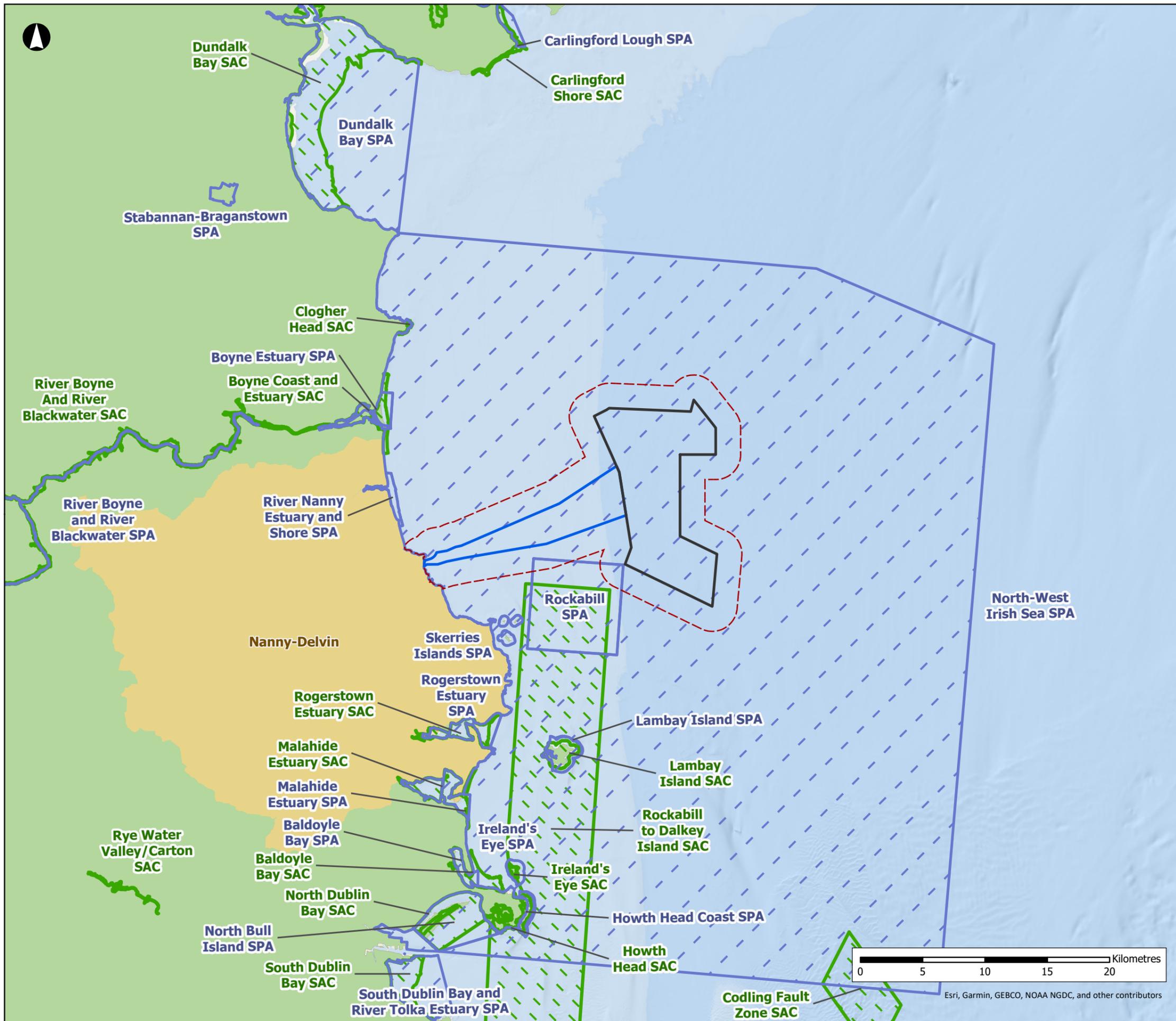
Drinking Water Protected Areas

Within the Nanny Delvin Catchment (Figure 11.1.3), there are no drinking water abstractions associated with surface waters (EPA, 2021). All groundwaters are nationally identified as Drinking Water protected areas. There are no pathways identified which may impact the designated Drink Water protected areas, so they are not considered further within this assessment.

Natura 2000 Protected Sites

11.4.4 There are two Natura 2000 sites (NWIS cSPA and Rockabill SPA) within 2km of the ECC and array area, with corresponding information presented in Table 11.4. The spatial distribution of these areas is presented in Figure 11.1.3. The Rockabill to Dalkey Island Special Area of Conservation (SAC) appears close to the 2km WFD guidance buffer but is located approximately 2.4km from the array area (at the closest point), and is therefore outwith the 2km buffer and not included in further assessment.





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Figure Title
**Natura 2000 Protected Areas
 Relevant to Water Framework
 Directive Assessment**

Job No: 281240	Datum: WGS84 Projection: UTM30N
Date: May 2024	Figure No:
Scale: 1:300,000 @A3	11.1.3
Status: Issue	

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Table 11.2 - Relevant Natura 2000 Protected Areas

Name	Site Code	Qualifying Features
North-West Irish Sea cSPA	004236	<ul style="list-style-type: none"> ▪ Common Scoter; ▪ Red -throated Diver; ▪ Great Northern Diver; ▪ Fulmar; ▪ Manx Shearwater; ▪ Shag; ▪ Cormorant; ▪ Little Gull; ▪ Kittiwake; ▪ Black-headed Gull; ▪ Common Gull; ▪ Lesser Black-backed Gull; ▪ Herring Gull; ▪ Great Black-backed Gull; ▪ Little Tern; ▪ Roseate Tern; ▪ Common Tern ▪ Arctic Tern; ▪ Puffin; ▪ Razorbill; and ▪ Guillemot.
Rockabill SPA	004014	<ul style="list-style-type: none"> ▪ Purple Sandpiper; ▪ Roseate Tern; ▪ Common Tern; and ▪ Arctic Tern.

Assessment of WFD Receptors

Project Activities

11.4.5 The proposed activities conducted throughout the lifetime of the proposed development which may impact WFD water bodies are outlined in Volume 2, Chapter 6: Description of the Proposed Development-Offshore and Volume 2, Chapter 8: Offshore Construction Strategy. The relevant parameters for the project options are presented in the following documents:

Volume 3, Chapter 10: Marine Geology, Oceanography and Physical Processes;

Volume 3, Chapter 11: Marine Water & Sediment Quality;

Volume 3, Chapter 12: Benthic and Intertidal Ecology; and

Volume 3, Chapter 13: Fish and Shellfish Ecology.

11.4.6 All mitigation measures (comprising embedded and additional measures) are presented in Volume 6, Chapter 36: Mitigation, Monitoring and Residual Effects. The initial impact assessment has been undertaken on the basis that only embedded mitigation measures have been applied, with additional mitigation applied should a significant impact be determined subsequently to determine the residual likely significant effect. The mitigation measures and industry best practice relevant to this WFD assessment are:



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- Environmental Management Plan (EMP) (Volume 8, Appendix 8.1) –will include measures which will reduce impacts on WFD protected areas, such as;
 - Marine pollution contingency measures - a chemical risk review, including information on how and when the chemicals will be used, stored and transported (in accordance with standard best practice guidance). Typical measures include storage of all chemicals in secure designated areas with impermeable bundling (generally to 110% of the volume), and double skinning of pipes and tanks containing hazardous materials. This will reduce the likelihood of potentially harmful pollutants being released into the marine environment which may impact water quality, WFD protected areas and fish and shellfish receptors;
 - Marine pollution contingency measures – vessel route management, including consideration of vessel routing and environmental impacts to receptors. A vessel management plan would be implemented, including a code of conduct for vessel operators. These measures would reduce the likelihood of potentially harmful pollutants being released into the marine environment, which may then impact water quality, WFD protected areas and fish and shellfish receptors;
 - Pollution prevention design – the Developer (North Irish Sea Array Windfarm Ltd) commits to the disposal of sewage and other waste in a manner which complies with all regulatory requirements, including (but not limited to) the International Maritime Organization International Convention for the Prevention of Pollution from Ships requirements. This measure reduces the likelihood of potential nutrient pollution, which may impact WFD protected areas (namely bathing waters and SFWs); and
 - Scour protection – to be implemented in areas where there is potential for scour pits to develop. Formation of scour pits may result in increased SSC, and partitioning of sediment bound contaminants into the water column. Implementation of scour protection reduces the likelihood of sediment bound contaminant release, and any associated impacts on water quality and WFD protected areas; and

Proposed development design – export cables will be installed via at landfall (e.g., beneath the intertidal area). This will minimise sediment disturbance in the nearshore area, which could impact designated BW and coastal water body quality.

11.4.7 The array area is sufficiently distanced from all WFD designated water bodies that activities are not anticipated to result in deterioration to these water bodies, with the exception of the NWIS cSPA and Rockabill SPA (which are considered further within this WFD assessment). A full assessment of all receptors within the ZOI has been included in the EIAR.



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Hydromorphology

This section should be read alongside Volume 3, Chapter 10: Marine Geology, Oceanography and Physical Processes, which presents the detailed assessment of potential changes to the physical environment as a result of Project specific activities. The ECC directly transects the Northwestern Irish Sea (HA 08) coastal water body, with no other coastal or transitional water bodies being located within 2km.

As presented in Volume 2, Chapter 6: Description of the Proposed Development-Offshore, there is no permanent infrastructure proposed to be installed below the HWM at landfall. The offshore export cables will be installed at landfall via horizontal direction drilling (HDD) techniques, which are a trenchless method of cable installation. The entrance pits associated with both export cables will be located landward of HWM and the exit pits seaward of the HWM in the ECC, although the exact locations will be confirmed following the completion of the planned geotechnical survey of the landfall site. Therefore, assessment will focus on temporary installation, maintenance and removal activities associated with the export cables within the ECC.

The installation of possible cable protection measures in the ECC has potential to impact wave and tidal regimes. These structures may be deployed to afford additional protection to the export cable if protection from burial alone is impracticable. Cable protection measures in shallow waters are anticipated to behave similarly to submerged offshore breakwater, affecting wave transformation nearer shore. This has the potential to alter the wave approach, resulting in the wave focusing on coastal areas and causing erosion/beach lowering. The physical cable protection structures may also intercept sediment transport, carried by wave and tidal regimes. In all areas where cable protection may be deployed it is not anticipated that this will continuously impact sediment transport (following the initial accumulation period). The extent of possible cable protection measures do not constitute continuous blockage over the extent of the ECC. Therefore, it is anticipated that while there will be some localised change to waves, hydrodynamics and sediment transport in the immediate vicinity of cable protection installation, wider change is considered spatially limited. For further details, please see Volume 3, Chapter 10: Marine Geology, Oceanography and Physical Processes.

An initial, temporary period of sediment accumulation is expected during installation activities, with associated seabed morphology impacts expected to be minor. For the locations where cable protection may be implemented, it is unlikely the presence of cable protection measures will lead to notable impacts on hydromorphology.

On the basis of the information presented above, the assessment concludes that there would be no potential for deterioration in the hydromorphology status of the Northwestern Irish Sea (HA 08) coastal water body from the proposed development, nor would it jeopardise future attainment of 'Good' hydromorphology status. The offshore development area is considered to be compliant with the WFD objectives in this regard.

Benthic Habitats

This section should be read alongside Volume 3, Chapter 12: Benthic and Intertidal Ecology, which presents the baseline characterisation and assessment of relevant benthic habitats.



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Works associated with the area intersecting the Northwestern Irish Sea (HA 08) coastal water body mainly consist of cable installation activities, such as seabed preparation, cable installation, and HDD works at landfall. There will be no open-cut trenching for cable installation in the intertidal area, with HDD exit pits being located in the subtidal area. These HDD activities will be conducted from landward of HWM, to seaward of HWM (therefore avoiding the intertidal environment). Maintenance activities occurring during the operational phase may also be required, and could include cable re-burial.

The majority of the benthic habitats present in the Northwestern Irish Sea (HA 08) coastal water body are considered to be of low sensitivity to physical disturbance, due to their adaptation to, and high tolerance for, a high energy environment. The faunal communities are characterised by mobile species (e.g., polychaetes and amphipods) and burrowing bivalves. The recoverability of such species is typically rapid, due to adult migration and larval settlement.

The habitats present in the intertidal area are considered to be common and widespread, so not geographically restricted. The potential area of habitat loss/disturbance represents a small footprint of the wider habitat area. It is anticipated that areas colonised by opportunistic species will likely recover rapidly, following recovery of the habitat/sediment.

Due to the short-term and spatially limited characteristics of the proposed works, it is concluded that the floral and faunal populations will re-colonise and recover, due to influence from un-impacted adjacent communities. The maintenance activities associated with the operational phase are expected to be lesser than construction activities, and present reduced magnitude of impacts.

On the basis of the information presented above, the assessment concludes there would be no deterioration in the ecological status of the Northwestern Irish Sea (HA 08) coastal water body from the proposed development, nor would it jeopardise future attainment of 'Good' ecological status. The offshore development area is therefore considered compliant with the WFD objectives in this regard.

Fish

This section should be read alongside Volume 3, Chapter 13: Fish and Shellfish Ecology, which presents a detailed baseline characterisation and assessment of potential impacts to fish and shellfish receptors.

The rivers Tolka, Liffey and Dodder all flow into Dublin Bay. Reports of brown trout *Salmo trutta*, Atlantic salmon *Salmo salar* and European eel *Anguilla anguilla* have been documented in these river systems (Inland Fisheries Ireland, 2018). The Lower Liffey is also a migratory corridor for river lamprey *Lampetra fluviatilis*. The river Dargle, which enters the Irish Sea at Bray, is a designated salmonid river and also hosts brown trout (Celtic Sea Trout Project (CSTP), 2016) and Atlantic salmon (Holmes et al., 2018). Additionally, salmon are known to be present in the river Fane (Millane et al., 2023).

11.4.8 Some proposed activities are likely to result in the generation of underwater noise, such as seabed clearance, infrastructure installation, vessel operations, and HDD operations at landfall. The sensitivity of fish species to noise producing activities is categorised based on hearing classifications. The fish receptors of relevance to the proposed development are grouped into: Group 1 (least sensitive), Group 2, and Group 3 (most sensitive). The fish receptors of relevance to the proposed development are presented in table 11.3. Where peer-reviewed literature is not available, a precautionary approach of assigning receptors to Group 3 has been adopted.

Table 11.3 – Hearing Categories of Fish Receptors.



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Category	Fish Receptors Relevant to the Proposed Development
Group 1: fish with no swim bladder (least sensitive)	Plaice (<i>Pleuronectes platessa</i>), lemon sole (<i>Microstomus kitt</i>), common sole (<i>Solea solea</i>), Atlantic mackerel (<i>Scomber scombrus</i>), sandeel, river lamprey, sea lamprey (<i>Petromyzon marinus</i>), elasmobranchs (thornback ray (<i>Raja clavata</i>), blonde ray (<i>Raja brachyura</i>), spotted ray (<i>Raja montagui</i>), cuckoo ray (<i>Leucoraja naevus</i>), small-eyed ray (<i>Raja microocellata</i>), tope (<i>Galeorhinus galeus</i>), spiny dogfish (<i>Squalus acanthias</i>), starry smoothhound (<i>Mustelus asterias</i>), bull huss (<i>Scyliorhinus stellaris</i>) and basking shark (<i>Cetorhinus maximus</i>)).
Group 2: fish that possess a swim bladder, but it is not involved with hearing.	Atlantic salmon, brown trout (<i>Salmo trutta</i>).
Group 3: fish that possess a swim bladder that is involving in hearing (most sensitive)	Atlantic cod (<i>Gadus morhua</i>), whiting (<i>Merlangius merlangus</i>), sprat (<i>Sprattus sprattus</i>), Atlantic herring (<i>Clupea harengus</i>), European eel* haddock (<i>Melanogrammus aeglefinus</i>), horse mackerel (<i>Trachurus trachurus</i>)*.

(*denotes uncertainty or lack of current knowledge with regards to the potential role of the swim bladder in hearing).

In general, fish are capable of adapting to impacts from underwater noise, due to the ability to temporarily leave the area. The species reliant on specific substrates for spawning are anticipated to have reduced sensitivity to noise impacts during biologically important activities, but are less capable of adapting to the noise. All affected species will be capable of rapid recolonisation from adjacent (un-affected) areas, with the wider population replacing lost numbers.

On the basis of the information presented above, the assessment concludes there would be no significant adverse residual effects on fish and shellfish receptors within the study area (due to noise generation). Therefore, there would be no potential for deterioration in the ecological status of the Northwestern Irish Sea (HA 08) coastal water body from the proposed development (regarding fish species), nor would it jeopardise the future attainment of ‘Good’ ecological status. The offshore development area is considered compliant with the WFD objectives in this regard.

Water Quality

11.4.9 This section should be read in conjunction with Volume 3, Chapter 11: Marine Water and Sediment Quality, which presents the detailed assessment for the potential changes to MW&SQ receptors. The potential impacts associated with increased suspended sediment concentration (SSC) are presented in Volume 3, Chapter 10: Marine Geology, Oceanography and Physical Processes.



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Suspended sediment concentration

The ECC intersects the Northwestern Irish Sea (HA 08) coastal water body, as shown in Figure 11.1.2. Due to this physical interaction, there is a requirement to consider the potential for deterioration of the water body quality elements. This is particularly pertinent if effects are predicted to extend over a period greater than a spring-neap tidal cycle (approximately 14 days).

11.4.10 The development activities typically resulting in sediment disturbance and increased SSC have the greatest impact on turbidity. The potential disturbance of subtidal sediment also has the potential to release sediment bound contaminants. Activities which may result in temporarily elevated SSC include:

- Seabed preparation (including sandwave clearance) for foundation and cable installation;
- Cable trenching (ECC and inter-array);
- Foundation installation (drilling);
- HDD excavation (ECC);
- Dredging (for foundation installation if required); and
- Anchoring of vessels associated with proposed development activities.

Further information on the concentrations of sediment bound contaminants relevant to the proposed development can be found in Chapter 11: Marine Water and Sediment Quality (Section 11.3.2).

As shown in Chapter 11: Marine Water and Sediment Quality, the turbidity levels associated with the proposed development area are generally considered to be low. Spikes in turbidity can be considered 'normal' due to a degree of seasonal variation and influence from extreme weather events.

The project-specific modelling has predicted that the sediment plumes resulting from development activities will disperse quickly after the cessation of construction activities, resulting in concentrations returning to background levels. Once suspended, coarser material is typically deposited close to the source of disruption, with dispersion associated with finer material (decreasing exponentially with increased distance from the source). Finer material disturbed is predicted to be dispersed widely and form part of the background SSC in the nearshore area. The increased SSC impacts are considered to be spatially limited, intermittent, temporally restricted (within one tidal excursion) and reversible. Given that sediment plumes are expected to quickly dissipate upon cessation of the disruptive activities, SSC are expected to return to background concentrations naturally.

Dissolved oxygen

11.4.11 The phytoplankton and dissolved oxygen quality elements of designated water bodies are not expected to be influenced by proposed activities, as no nutrients are expected to be released in significant concentrations (concentrations exceeding that of natural storm events). Therefore, proposed activities are not expected to cause significant effects to dissolved oxygen or eutrophication.



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Water clarity

11.4.12 Due to the potential for temporary increased in SSC, there is potential for a reduction in water clarity to result. Due to the temporary nature of activities, it is not expected that the water clarity status of the Northwestern Irish Sea (HA 08) coastal water body will be reduced.

Sediment bound contaminants

11.4.13 There are no chemical discharges proposed for any phase of the proposed development. Some substances may be accidentally released/spilled into the environment during construction/routine maintenance activities, such as oil, fuel, anti-fouling paints. The Developer is committed to implementing standard guidance and best-practice techniques throughout all construction, operational and decommissioning activities. This commitment (as referenced in Volume 2, Chapter 2: Mitigation and Monitoring Measures) serve as embedded mitigation measures, and ensure suitable preventative measures are implemented.

Under normal conditions, minute concentrations of sediment bound contaminants partition into the dissolved phase, with the vast majority remaining sediment bound and suspended in the water column. Partition coefficients can be applied to estimate the concentrations of contaminants that may enter the dissolved phase. It is considered highly unlikely that the Maximum Allowable Concentration (MAC) EQS threshold will be exceeded as a result of sediment disturbance.

11.4.14 There is the possibility for nitrate bound in sediment to be released as a result of disturbance activities. Any sediment disruption due to development activities may result in the release of sediment bound nitrate, with disruption activities being temporary, intermittent and spatially limited.

11.4.15 A detailed assessment of the sediment bound contaminants relevant to the proposed development is presented in Chapter 11: Marine Water and Sediment Quality (Section 11.3.2). The suite of chemicals analysed included heavy metals, PCBs, PAHs, tributyltin (TBT) and dibutyltin (DBT). Within the array area, it was found that no contaminants exceeded the Irish Lower Action Level, with some minor exceedances in the ECC. The Irish Lower Action Level was exceeded for cadmium (two samples) and zinc (one sample), with all other contaminants measured below Irish Lower Action Level within the ECC.

11.4.16 The EQSD identifies a list of priority substances which must also be considered in WFD assessments. This list of priority substances includes (but is not limited to) benzene, nickel and lead, for which a MAC is given (Environment Agency, 2016). These substances were designated as 'priority substances' as they were considered to cause the greatest concern for the aquatic environment. Considering the temporary nature of the proposed activities and sediment plumes, any small uplift in dissolved concentrations of priority substances would be expected to return to background concentrations in a very brief time. Therefore, due to the temporary nature of the works, the current chemical status of the Northwestern Irish Sea (HA 08) coastal water body would be expected to remain unaffected.



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Conclusion

11.4.17 This assessment has been carried out in accordance with Water Quality Policy 1, which states all proposals which may significantly adversely impact water quality must demonstrate avoidance, minimisation, or mitigation of these potential impacts (in order of preference) (Department of Housing, Planning and Local Government, 2021). Through the baseline environment characterisation showing low levels of contaminants and ‘Good’ water body status, and implementation of mitigation measures (as presented in Section 11.4.6), significant adverse impacts on water quality are expected to be avoided.

11.4.18 On the basis of the information presented above, the assessment concludes there would be no potential for deterioration in the water quality of the Northwestern Irish Sea (HA 08) coastal water body from the proposed development, nor would it jeopardise the potential to attain ‘Good’ water quality status in the future. The proposed development is considered compliant with WFD objectives in this regard.

Protected Areas

Designated bathing water(s)

There is potential for the proposed activities to result in a reduction in water quality at the designated BW within 2km of the ECC (the Balbriggan, Front Strand Beach BW). A temporary increase in suspended sediment may lead to increased bacterial counts within the water column. Bacterial mortality is influenced by the concentration of ultra-violet (UV) light penetrating the water column. During periods where there is increased SSC, there will be a reduction in the amount of UV light capable of penetrating into the water column, indirectly leading to a reduction in bacterial mortality. Sediment disturbance activities may suspend bacteria within the surficial sediment, and transport it via wave and tidal regimes to designated BWs.

Given the high performance indicator for nutrient condition of the designated BW, sedimentary bacterial levels in proximity to the BW are not significant enough to impact water quality during natural storm events. Furthermore, owing to the short-term nature of SSC, temporary increases in bacterial concentrations considered negligible for BW compliance. No deteriorations of the designated BW nutrient condition are anticipated to result from the proposed activities.

11.4.19 The reduced water clarity due to proposed works could result in temporary increases to bacterial count (as a result of decreased bacterial mortality). These elevated bacterial counts could cause a deterioration in the water quality of the BW but given the expected dilution and dispersion of resuspended sediment the increased bacterial counts would be in the order of days. The expected increase in bacterial counts would be analogous to storm events and therefore not anticipated to result in a reduction in water quality outwith background conditions and natural variations. Therefore, no deterioration in the performance of the designated Balbriggan, Front Strand Beach BW is expected.

Nutrient vulnerable zones

11.4.20 There are no designated NVZs within the study area, as shown in Figure 11.1.2. This impact pathway is not considered further within this assessment.



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Natura 2000 protected sites

11.4.21 There are two Natura 2000 protected sites within 2km of the offshore development area (as shown in Table 11.2 and Figure 11.1.3). These identified protected areas (NWIS cSPA and Rockabill SPA) are subject to the Appropriate Assessment (AA) process (Screening for Appropriate Assessment; Natura Impact Assessment). This process concluded that no adverse effects on integrity of European sites will arise (when considering both the proposed development alone and in-combination with other plans and projects).

Shellfish water protected area(s)

11.4.22 This assessment has drawn from information presented in Volume 3: Chapter 13: Fish and Shellfish Ecology. The proposed development is located within 2km of one shellfish water protected area, the Balbriggan/Skerries SFW.

11.4.23 Sessile marine species (such as shellfish) are typically more vulnerable to increased SSCs than mobile species. There are numerous activities associated with the proposed development which could lead to increased SSC (such as HDD excavation, dredging and seabed preparation/sandwave clearance), and hence potential for sediment bound contaminants to partition into the water column. These increased dissolved contaminant concentrations may affect shellfish receptors.

11.4.24 The sensitivity of shellfish receptors is dependent on numerous factors, such as species and life stages. As described in Section 0 (Sediment bound contaminants), potential impacts from dissolved chemical contaminants are anticipated to dissipate rapidly, with effects predicted to be short-term and temporary. Therefore, there is not anticipated to be a non-temporary effect on the designated waterbody (nor result in a deterioration in the status of the Balbriggan/Skerries SFW).

11.4.25 Similar to designated bathing waters, there is a requirement for SFWs to comply with microbial standards. There is potential for increased bacterial concentrations in the water column (due to release from suspended sediment), however given the temporary nature of the works and anticipated dispersion of SSC there is not anticipated to be significant impacts to microbiology of the Balbriggan/Skerries SFW as a result of the proposed development.

Conclusion

11.4.26 On the basis of the information presented above, the assessment concludes there would be no potential for deterioration of the status of the Balbriggan, Front Strand Beach BW, NWIS cSPA and Rockabill SPA. The proposed development is therefore considered to be compliant with the objectives of the WFD in this regard.

Marine Invasive and Non-Native Species

This section should be read alongside Volume 3, Chapter 12: Benthic and Intertidal Ecology, which provides a detailed assessment of the introduction/spread of INNS by the proposed development. There is the potential for the accidental introduction/spread of INNS due to the presence of cabling and vessel movement.



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The proposed development will adopt and adhere to industry best-practice guidance through the implementation of an Offshore EMP, which will include a section regarding non-native species (detailing how the risk of introduction and spread of INNS will be minimised). Any vessels utilised for transiting materials to the site will adhere to industry legislation, codes of conduct, and best practice to reduce the opportunity for INNS.

The introduction of any artificial structure provides a vector by which new organisms can colonise an area they were not originally present in. New, hard substrate will be introduced into the subtidal area, and whilst consequential impacts can be long-lasting, it is considered that the footprint is negligible on a regional scale.

The movement of commercial vessels is considered to be common throughout the study area (as shown in Volume 3, Chapter 17: Shipping and Navigation), providing an existing method by which INNS could be introduced. Therefore, it is considered the proposed developments contribution would be negligible in comparison to impacts from other marine users (due to the high variety of passenger routes and frequency).

On the basis of the information presented above, the assessment concludes that there would be no potential for deterioration in the benthic ecology and diversity (of relevance to INNS) with respect to the Northwestern Irish Sea (HA 08) coastal water body from the proposed development, nor would it jeopardise the attainment of ‘Good’ status in the future. The proposed development is considered compliant with the WFD objectives in this regard.

Conclusions

11.4.27 This WFD assessment has considered the potential effects of the proposed development to ensure that proposed activities would not cause or contribute to deterioration of status/jeopardise the potential of water bodies to achieve ‘Good’ status. The conclusion of the different receptors of the WFD assessment are presented below in Table 11.4.

11.4.28 The conclusion reached through this WFD assessment are also applicable for the Marine Strategy Framework Directive. The activities associated with the proposed development are not considered to hinder the achievement of ‘Good Environmental Status’ as prescribed under the water quality and INNS policies.

Table 11.4 – Conclusions of the WFD Assessment

Receptor	Conclusion
Hydromorphology	The proposed development will not result in a deterioration of the current status of these water bodies or jeopardise the attainment of ‘Good’ status.
Benthic Habitats	The proposed development will not result in a deterioration of the current status of these water bodies or jeopardise the attainment of ‘Good’ status.
Fish	The proposed development will not result in a deterioration of the current status of these water bodies or jeopardise the attainment of ‘Good’ status.
Water Quality	The proposed development will not result in a deterioration of the current status of these water bodies or jeopardise the attainment of ‘Good’ status.
Protected Areas	No deterioration in the current status of BWs is expected.



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	No Adverse Effect on Integrity of Natura 2000 sites relevant to WFD receptors is expected.
Marine INNS	The proposed development will not result in a deterioration of the current status of these water bodies or jeopardise the attainment of 'Good' status.



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