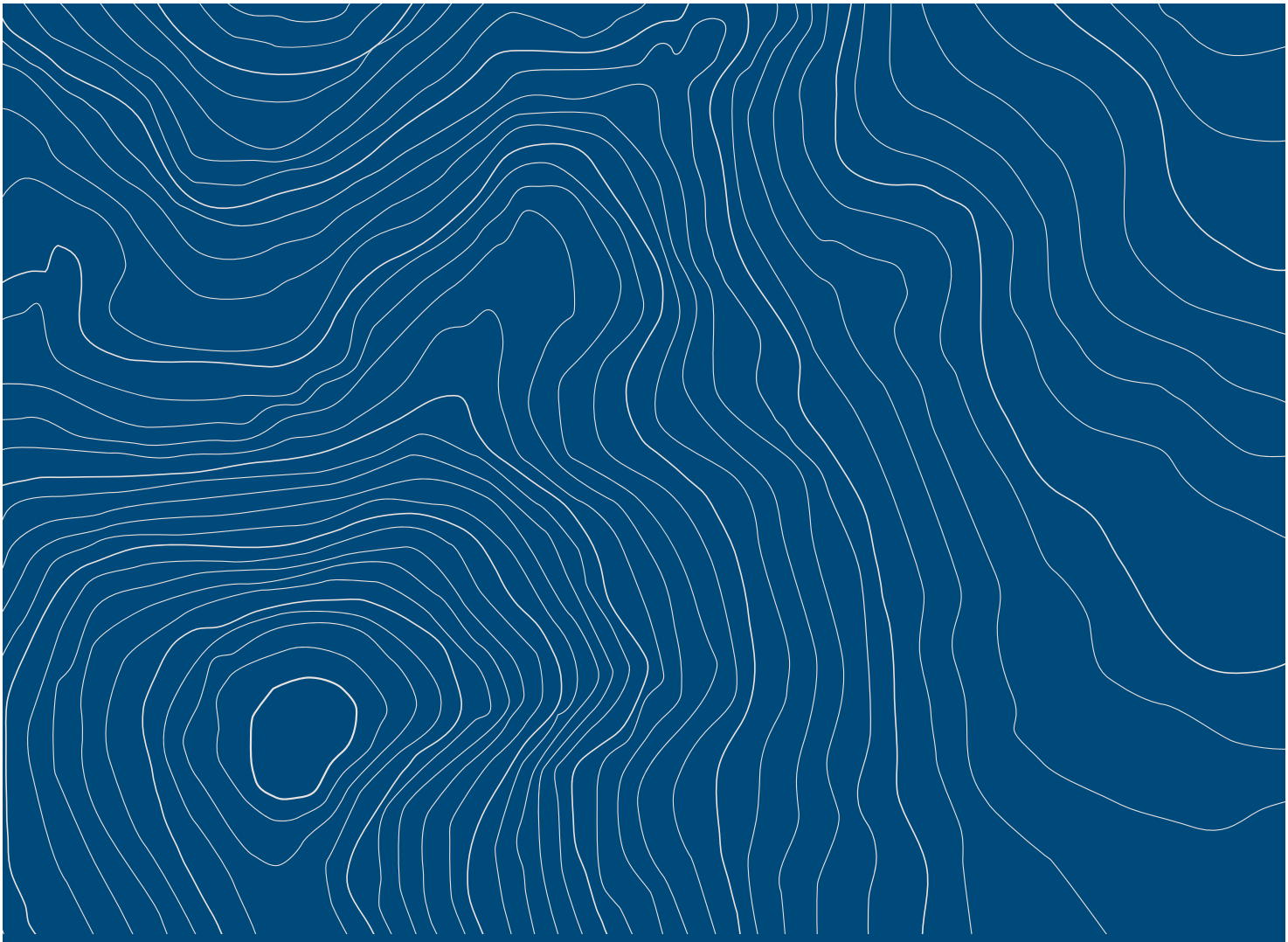


DublinArray
Generation for generations

EIAR Volume 4: Offshore Infrastructure Technical Appendices Appendix 4.3.2-1 Water Framework Directive and Marine Strategy Framework Directive Summary

Kish Offshore Wind Ltd

RWE SLR GoBe
APEM Group

www.dublinarray-marineplanning.ie

Dublin Array Offshore Wind Farm

Environmental Impact Assessment Report

Volume 4, Appendix 3.2-1: Water Framework Directive and Marine Strategy Framework Directive Summary

Contents

Figures

Tables

Glossary

Term	Definition
Tidal Excursion	Tidal excursion length is the net horizontal distance travelled by a water particle from LWS to HWS or vice versa. It can be used to describe the movement of pollutants in estuaries during a tidal cycle (Zhen-Gang, 2008).
Dissolved oxygen	Dissolved oxygen (DO) refers to the volume of oxygen that is contained in water. Oxygen enters the water by photosynthesis of aquatic biota and by the transfer of oxygen across the air-water interface. The amount of oxygen that can be held by the water depends on the water temperature, salinity, and pressure.
Far-field	Defined as the wider area surrounding the array area and the Offshore ECC over which indirect changes may occur (i.e., inherently including the ZoI); and
Near-field	Defined as the footprint of the project, including both the array area and Offshore ECC, below MHWS.
Irish Action Levels	The Irish Action Levels were defined as lower and upper threshold guidance levels based on ecotoxicological data (Cronin *et al,*, 2006). Below the lower thresholds ecotoxicological effects are not expected whereas above the upper threshold they may be.

Acronyms

Term	Definition
BW	Bathing Water
CEMP	Co-ordinated Environmental Monitoring Programme
Dublin Array	Dublin Array Offshore Wind Farm
DHPLG	Department of Housing, Local Government and Heritage
EAC	Environmental Assessment Criteria
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EPA	Environmental Protection Agency
EQS	Environmental Quality Standards
EQSD	Environmental Quality Standards Directive
FMMS	Fisheries Management and Mitigation Strategy
GES	Good Environmental Status

Term	Definition
HDD	Horizontal Directional Drilling
IAS	Invasive Alien Species
IE	Intestinal enterococci
IMO	International Maritime Organisation
km	Kilometers
LAT	Lowest Astronomical Tide
MAC	Maximum Allowable Concentration
MDO	Maximum Design Option
MPCP	Marine Pollution Contingency Plan
NIS	Natura Impact Statement
NRA	National Road Authority
NVZ	Nitrate Vulnerable Zones
O&M	Operations and Maintenance
Offshore ECC	Offshore Export Cable Corridors
OWF	Offshore Wind Farm
PEMP	Project Environment Management Plan
RBMP	River Basin Management Plan
rBWD	revised Bathing Water Directive
SAC	Special Area of Conservation
SPA	Special Protection Area
SFW	Shellfish Waters
SPM	Suspended Particulate Matter
SSC	Suspended Sediment Concentrations
TBT	Tributyltin
TTS	Temporary Threshold Shift
UWWTD	Urban Waste Water Treatment Directive
UXO	Unexploded Ordinance
VER	Valued Ecological Receptors
WFD	Water Framework Directive

1 Introduction

1.1 Overview

1.1.1 This document has been prepared to present the findings of the Water Framework Directive (WFD) assessment for the potential impacts of the construction, Operation and Maintenance (O&M) and decommissioning of the offshore infrastructure in the marine environment associated with the Dublin Array Offshore Wind Farm (Dublin Array). Consideration of the potential impacts from onshore infrastructure throughout all phases of Dublin Array is provided in Volume 5, Chapter 4: Water (Hydrology, Hydrogeology and Flood Risk); including consideration of pathways into the marine environment from onshore activities.

1.1.2 The purpose of this document is to demonstrate the Applicant's compliance with the WFD (2000/60/EC) by ensuring that the proposed activities associated with the Dublin Array do not result in a deterioration in a designated water body (or protected areas such as bathing waters, shellfish waters, nutrient sensitive waters and Natura 2000 sites). The document is part of the Environmental Impact Assessment Report (EIAR) is support of the Planning Application for development consent by Bray Offshore Limited and Kish Offshore Limited (hereafter referred to as the Applicant). This document also demonstrates the potential impacts of the construction, operation and maintenance and decommissioning of the offshore infrastructure will not jeopardise the attainment of good ecological and chemical status (or the potential to achieve good ecological and chemical status) for any WFD waterbodies.

1.1.3 Dublin Array is a proposed offshore wind farm on the Kish and Bray Banks. The Kish and Bray Banks are located, approximately 10 Kilometres (km) off the east coast of Ireland, immediately south of Dublin city off the coast of counties Dún Laoghaire and Wicklow (Figure 1). The offshore wind farm will be located within an area of approximately 59 km^2, in water depths ranging from 2 m to 50 m Lowest Astronomical Tide (LAT).

1.1.4 Compliance with the Marine Strategy Framework Directive (2008/56/EC) is additionally demonstrated in this report, drawing on information presented in the Dublin Array EIAR.

1.1.5 This document has been informed by the assessments presented within the Applicant's EIAR and provides a summary of the key findings. This document seeks to draw from, and signpost to where relevant information is provided within, the Applicant's EIAR and to demonstrate compliance with the WFD and MSFD, rather than seek to duplicate other assessments. Therefore, this document should be read in conjunction with the following chapters:

- Volume 2, Chapter 6: Project Description;
  - To be referenced for a detailed description of the proposed project design, construction methodologies and operational activities.
- Volume 3, Chapter 1: Marine Geology, Oceanography and Physical Processes;

- To be referenced for an overview on the surficial sediment properties, suspended sediments and seabed features, in addition to the metocean conditions. This chapter also provides an assessment of the potential impacts of the project upon the marine geology, oceanography and physical processes.

- Volume 3, Chapter 2: Marine Water and Sediment Quality;
  - To be referenced for a characterisation of the water and sediment quality receiving environment. This chapter also provides an assessment of the potential impacts of the project upon water and sediment quality.

- Volume 3, Chapter 4: Fish and Shellfish Ecology and Chapter 5: Marine Mammals;
  - To be referred to for information utilised to inform the assessments of impacts from underwater noise and Electromagnetic Fields (EMF) of Dublin Array during its construction, O&M and decommissioning phases associated with the infrastructure within the array area and offshore Export Cable Corridor.
  - To be referred to for an overview of the fish and shellfish baseline. This chapter also provides an assessment of the potential impacts of the project upon fish and shellfish ecology.
  - To be referred to for an overview of the marine mammals baseline. This chapter also provides an assessment of the potential impacts of the project upon marine mammal ecology.

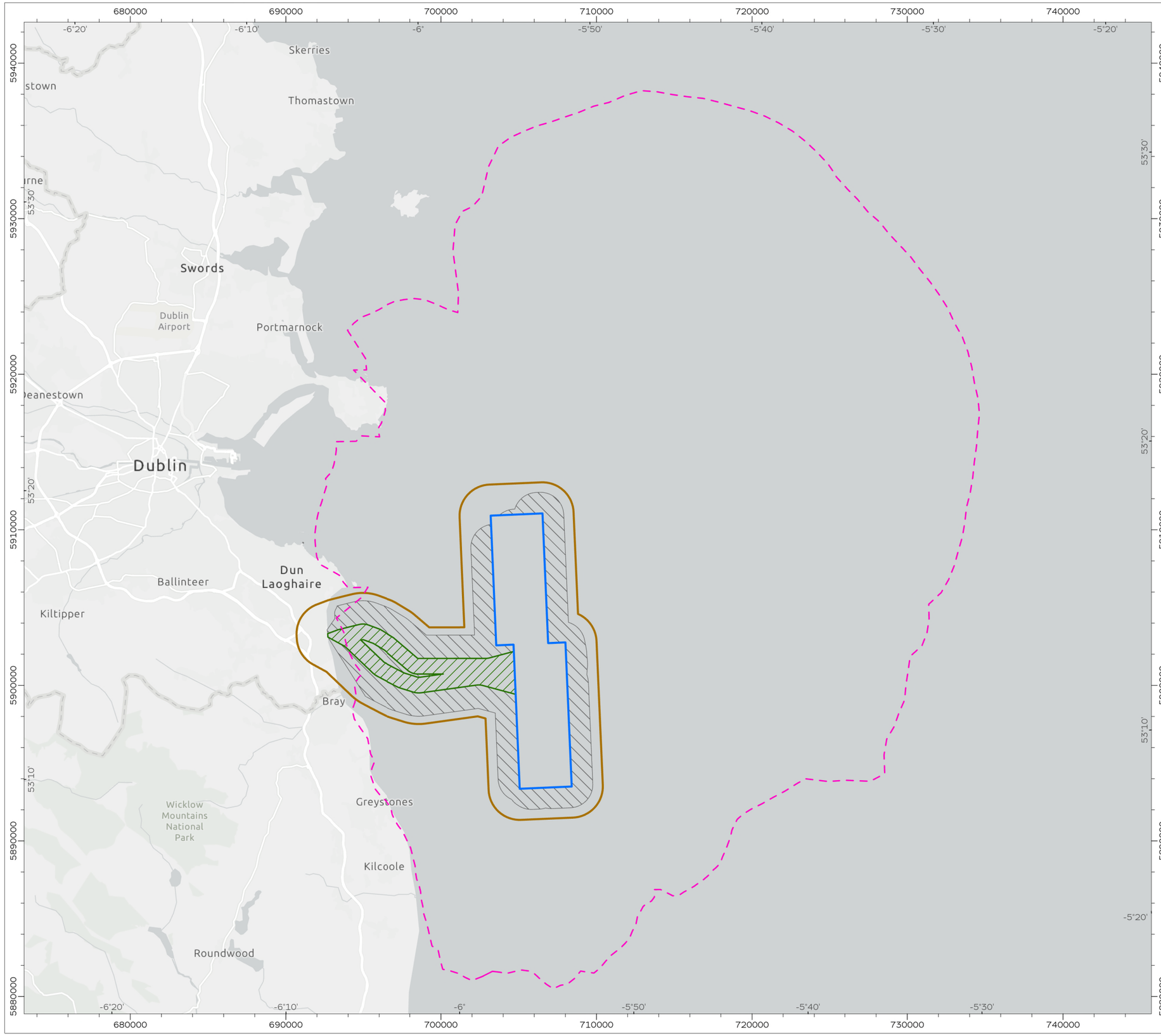
- Volume 4, Appendix 4.3.5-7: Underwater noise assessment
  - To be referenced for a detailed description of the site-specific underwater noise modelling undertaken; and
  - To be referred to for information utilised to inform the assessments of impacts from underwater noise and EMF of Dublin Array during its construction, O&M and decommissioning phases associated with the infrastructure within the array area and offshore Export Cable Corridor.

- Volume 3, Chapter 3: Benthic Subtidal and Intertidal Ecology,
  - To be referenced for an overview on the features of the benthic subtidal and intertidal ecology. This chapter also provides an assessment of the potential impacts of the project upon the benthic subtidal and intertidal ecology.

- Volume 3, Chapter 6: Offshore and Intertidal Ornithology;
  - To be referred to for an overview of the offshore ornithology baseline. This chapter also provides an assessment of the potential impacts of the project upon ornithological ecology.

- Volume 4, Annex 3.1-1: Technical Baseline Report - Physical Processes;
  - To be referenced for a detailed description of the surficial sediment properties, suspended sediments and seabed features, in addition to the metocean (wave; tide) conditions.
- Volume 4, Annex 3.1-2: Physical Process Modelling for Dublin Array Offshore Wind Farm; and
  - To be referenced for detailed information on the project specific numerical modelling undertaken to support the assessment of the project upon the baseline sedimentological and metocean regimes. This includes a presentation of the sediment plume modelling and tidal excursions.
- Part 4: Habitats Directive Assessments, Volume 4: NIS.
  - To be referenced for detailed information and assessment of Dublin Array's proposed activities on the Natura 2000 sites.

1.1.6 No pathways arising from the activities in the marine environment which could potentially impact freshwater WFD water bodies (or Protected Areas) have been identified. Therefore, this document considers coastal and transitional WFD waterbodies only.



- Array Area
- Temporary Occupation Area
- Export Cable Corridor
- Screening Buffer
- TTS Buffer

DRAWING STATUS

FINAL

DISCLAIMER

MAP NOTES / DATA SOURCES:

Esri UK, Esri, TomTom, Garmin, FAO, NOAA, USGS, Esri UK, Esri, TomTom, Garmin, Foursquare, METI/NASA, USGS ©Ordnance Survey Ireland 2024 © Tailte Eireann. (CYSL50270365) Not to be used for Navigation.

PROJECT TITLE

Dublin Array

DRAWING TITLE

Offshore Dublin Array Project Design and Screening Buffers

DRAWING NUMBER: **1**

PAGE NUMBER: **1 of 1**

VER	DATE	REMARKS	DRAW	CHEK	APRD
01	2024-07-01	For Issue	GB	BB	SS

0 2 4 6 8 km

0 1 2 3 4 nm

GRID NORTH

SCALE 1:250,000 PLOT SIZE A3

DATUM WGS 1984 VERTICAL REF LAT

PRJ WGS 1984 UTM Zone 29N

GoBe APEMGroup

Dublin Array Generation for generations

Kish Offshore Wind Limited - Bray Offshore Wind Limited

2 Regulatory background

2.1 Water Framework Directive

2.1.1 Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy (the "WFD") was established in 2000 in order to provide a single framework for the protection of surface waterbodies (including rivers, lakes, transitional and coastal waters) and groundwater. Coastal waters for the purposes of the WFD are situated between the coast and one nautical mile offshore are designated for ecological status under the WFD. Each waterbody has an assigned ecological status. The ecological status is assigned through the consideration the biological, hydromorphological, chemical determinands and the levels of specific chemicals. The WFD aims to prevent deterioration, and to enhance the status, of aquatic ecosystems, including coastal and transitional waters. The different statuses are:

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

2.1.1 The WFD's objective of a "Good surface water chemical status" is defined in terms of compliance with all the quality standards established for chemical substances at a European level such as Benzo(a)pyrene as defined in the Water Environmental Quality Standards Directive. This will ensure at least a minimum chemical quality, particularly in relation to toxic substances and chemicals. The WFD objective of 'good ecological status' also requires the achievement of environmental quality objectives for discharged priority substances and any other substances liable to cause pollution.

2.1.2 The WFD defines "surface water status" as the general expression of the status of a body of surface water, determined by the poorer of its ecological status and its chemical status. "Good surface water status" means the status achieved by a surface waterbody when both its ecological status and its chemical status are at least "Good".

2.1.3 "Good ecological status" means the status of a surface waterbody classified in accordance with Annex V of the WFD as it relates to the quality of the structure and functioning of aquatic ecosystems.

2.1.4 "Good surface water chemical status" means the chemical status required to meet the environmental objectives for surface waters, that is the chemical status achieved by a body of surface water in which concentrations of pollutants do not exceed the environmental quality standards established in Annex IX and under Article 16(7) of the WFD, and under other relevant Community legislation setting environmental quality standards at Community level.

2.1.5 Each member state is required to implement a programme of monitoring the ecological status and chemical status for surface waters, to provide a coherent and comprehensive overview of ecological and chemical status within each river basin.

2.1.6 The WFD was given legal effect in Ireland by The European Communities (Water Policy) Regulations 2003 (S.I. 722 of 2003), as amended by the following:

- Local Government Act 2001;
- European Communities (Water Policy) (Amendment) Regulations 2005 (S.I. No. 413/2005);
- European Communities (Good Agricultural Practice for Protection of Waters) Regulations 2005 (S.I. No. 788/2005);
- European Communities (Water Policy) (Amendment) Regulations 2008 (S.I. No. 219/2008);
- European Communities (Environmental Liability) Regulations 2008 (S.I. No. 547/2008);
- European Communities (Good Agricultural Practice For Protection of Waters) Regulations 2009 (S.I. No. 101/2009);
- European Communities Environmental Objectives (Surface Waters) Regulations 2009 (S.I. No. 272/2009);
- The European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009 (S.I. No. 296/2009);
- European Communities Environmental Objectives (Groundwater) Regulations 2010 (S.I. No. 9/2010);
- European Communities (Water Policy) (Amendment) Regulations, 2010 (S.I. No. 93/2010);
- European Communities (Water Policy) (Amendment) (No. 2) Regulations, 2010 (S.I. No. 326/2010);
- European Communities (Good Agricultural Practice for Protection of Waters) Regulations 2010 (S.I. No. 610/2010);
- European Communities (Technical Specifications for the Chemical Analysis and Monitoring of Water Status) Regulations, 2011 (S.I. No. 489/2011);
- Radiological Protection (Miscellaneous Provisions) Act 2014;
- European Union (Good Agricultural Practice for Protection of Waters) Regulations 2014 (S.I. No. 31/2014);

- Local Government (Performance of Reserved Functions in Respect of Municipal District Members) Regulations 2014 (S.I. No. 231/2014);
- European Union (Water Policy) Regulations 2014 (S.I. No. 350/2014);
- European Union Environmental Objectives (Surface Waters) (Amendment) Regulations 2015 (S.I. No. 386/2015); and
- European Union (Water Policy) (Amendment) Regulations 2022 (S.I. No. 166/2022).

2.1.7 The Directive requires that management plans are prepared for each river basin. The third River Basin Management Plan (RBMP) "The Water Action Plan 2024: A River Basin Management Plan for Ireland[1]" was issued in September 2024 (Government of Ireland, 2024). The RMBP "sets out the measures that are necessary to protect and restore water quality in Ireland".

2.1.8 The Environmental Quality Standards (EQSs) for classifying surface water status are established in the Schedule 5 of the European Communities Environmental Objectives (Surface Waters) Regulations 2009 (SI No. 272 of 2009), as amended.

2.2 Protected Areas

Bathing Waters

2.2.1 The EU's revised Bathing Water Directive (rBWD) (2006/7/EC) came into force in March 2006. It has been amended by Regulation (EC) No 596/2009 of the European Parliament and of the Council of 18 June 2009, and Council Directive 2013/64/EU of 17 December 2013. The rBWD provides more stringent standards than the previous Directive and place an emphasis on providing information to the public. The rBWD has four different classifications of performance, these are:

- Excellent - the highest, cleanest classification;
- Good - generally good water quality;
- Sufficient - the water meets minimum standards; and
- Poor - the water has not met the minimum required standards.

2.2.2 The rBWD was transposed into Irish law by the Bathing Water Quality Regulations 2008 (S.I. No 79 of 2008) as amended by the Bathing Water Quality (Amendment) Regulations 2011 (S.I. No. 351/2011), the Bathing Water Quality (Amendment) Regulations 2016 (S.I. No. 163/2016), the Bathing Water Quality (Amendment) Regulations 2024 (S.I. No. 322/2024) and the Local Government (Mayor of Limerick) and Miscellaneous Provisions Act 2024.

[1] https://www.gov.ie/en/policy-information/8da54-river-basin-management-plan-2022-2027/

2.2.3 Under the Bathing Water Quality Regulations, local authorities measure and monitor the number of certain types of bacteria which may indicate the presence of pollution, mainly from sewage or animal faeces, these are *Escherchia coli* (E. coli) and intestinal enterococci (IE). An increase in the concentrations of these bacteria indicates a decrease in water quality.

2.2.4 The Environmental Protection Agency (EPA) is responsible for compiling this Bathing Water (BW) information and submitting it to the European Commission. Water quality samples are taken regularly throughout the official bathing season (June 1st – September 15th).

2.2.5 An overall classification for the Bathing Water is then determined by creating a distribution from the monitoring data for the last four years on a rolling basis. A separate distribution is calculated for both E. coli and IE. This then enables the determination of the classification for each bacterium for the Bathing Water.

2.2.6 If the classification for both types of bacteria is different, then the overall Bathing Water compliance is the lowest classification achieved by either type. For example, if E. coli were performing at 'Good' but IE was performing at 'Sufficient', then the Bathing Water would be classified as performing at 'Sufficient'.

Shellfish Directive

2.2.7 Directive 2006/113/EC of the European Parliament and of the Council of 12 December 2006 on the quality required of shellfish waters (the "Shellfish Water Directive") has been repealed. However, the WFD contains provisions relevant to shellfish protection and is now the relevant authority. In particular, the WFD aims to protect and improve water quality and support the growth of healthy shellfish (bivalve and gastropod molluscs) and support the production of good quality edible shellfish. It sets out standards for various parameters that should be monitored in designated shellfish areas.

2.2.8 The relevant transposing Irish legislation is the European Communities (Quality of Shellfish Waters) Regulations 2006 (S.I. 268 of 2006), as amended by the European Communities (Quality of Shellfish Waters) (Amendment) Regulation 2009 (S.I. No. 55 of 2009) and the European Communities (Quality of Shellfish Waters (Amendment)(No 2) Regulations 2009 (S.I. No. 464 of 2009) (hereafter collectively referred to as the Shellfish Water Regulations). The Shellfish Water Regulations remain in force today in Ireland, despite the Shellfish Water Directive having been repealed. They apply to 62 designated shellfish waters.

2.2.9 The Shellfish Waters Regulations establish quality standards applicable to designated Shellfish Waters (SFWs), as well as indicative values, mandatory values, reference methods of analysis and the minimum frequency for taking samples and measurements. These parameters are set for pH, temperature, coloration, suspended solids, dissolved oxygen, salinity and the presence or concentration of certain substances (hydrocarbons, metals, organohalogenated substances, etc.), all listed in Table 1 (European Communities, 2006).

Table 1 Parameters monitored for SFWs (European Communities, 2006)

Parameter No.	Parameter	Unit of Measurement	Standard/ Value	Reference Method of Analysis or Inspection	Frequency of sampling
1	pH	pH unit	Not less than 7 nor greater than 9	Electrometry	Quarterly Measured in situ[illegible] at the time of sampling.
2	Temperature	Degrees Celsius	N/A	Thermometry	Quarterly Measured in situ[illegible] at the time of sampling.
3	Colouration (After Filtration)	Milligrams per litre	A discharge affecting shellfish waters must not cause the colour of the waters after filtrations to deviate by more that 10 milligrams per litre from the colour of water not so affected	Filter through a 0.45 micrometre membrane. Photometric method, using the platinum/ cobalt scale	Quarterly
4	Suspended solids	Milligrams per litre	A discharge affecting shellfish waters must not cause the suspended solids content of the waters to exceed by more than 30 per cent the suspended solids content of waters not so affected.	Filtration through a 0.45 micrometre membrane, drying at 105 degrees Celsius and weighing. Centrifuging (for at least 5 minutes, with mean acceleration 2,800 to 3,200g), drying at 105	Quarterly

Parameter No.	Parameter	Unit of Measurement	Standard/ Value	Reference Method of Analysis or Inspection	Frequency of sampling
				degrees Celsius and weighing.	
5	Salinity	Practical salinity units	A. Less that 40 practical salinity units; and, B. Discharges affecting shellfish waters must not cause the salinity of the waters to exceed by more than 10 per cent the salinity of waters not so affected.	Conductimetry	Monthly
6	Dissolved oxygen	Saturation per cent	a. Equal to or greater than 70 per cent (average value); and, b. No individual measurement to indicate a value less than 60 per cent unless it can be established that there are no harmful consequences for the development of shellfish colonies.	Winkler's method or electrochemical method	Monthly, with a minimum of one[illegible] sample representative of low oxygen conditions on the day of sampling. However, where major daily variations are suspected, a minimum of two samples in one day must be taken.

Parameter No.	Parameter	Unit of Measurement	Standard/ Value	Reference Method of Analysis or Inspection	Frequency of sampling
7	Petroleum hydrocarbons		Hydrocarbons must not be present in the shellfish waters in such quantities as will— A. Produce a visible film on the surface of the water or a deposit on the shellfish, or both, or b. Have harmful effects on the shellfish.	Visual examination	Quarterly
8	Polychlorinated biphenyls	µg.litre-1 (seawater)	0.30	Gas chromatography after extraction with suitable solvents and purification.	Half-yearly
	Polychlorinated Biphenyls: Sum of ICES 7CBs1	µg.kilogram-1 wet weight @ 1 per cent lipid (shellfish flesh2)	300.00		
9	Metals (Dissolved):	µg.litre-1		Spectrometry of atomic absorption preceded, when appropriate, by concentration or extraction, or both. The concentration of each substance in the shellfish water must not exceed a level that gives rise to harmful effects on	Half-yearly
	Arsenic	40.00			
	Cadmium	5.00			
	Chromium	30.00			
	Copper	10.00			
	Lead	20.00			
	Mercury	0.40			
	Nickel	50.00			
	Silver	10			
	Zinc	200.00			

Parameter No.	Parameter	Unit of Measurement	Standard/ Value	Reference Method of Analysis or Inspection	Frequency of sampling
				the shellfish and their larvae. The synergic effects of these metals must be taken into consideration.	
10	Faecal coliforms	Number of faecal coliforms per 100 millilitres		Method of dilution with fermentation in liquid substrates in at least three tubes in three dilutions. Subculturing of the positive tubes on a confirmation medium. Count according to MPN (most probable number). Incubation temperature 44°C ± 0.5°C.	Quarterly
11	Substances affecting the taste of shellfish	The concentrations of such substances in shellfish waters or in shellfish flesh must be limited so that the taste of shellfish is not impaired.		Examination of the shellfish by tasting.	If the presence of any of these substances is presumed.

2.2.10 The Minister, in consultation with the prescribed public authorities, must establish a programme of action in respect of each designated SFWs with a view to providing that, as far as reasonably practicable, those waters comply with requirements of the Shellfish Water Regulations. Every public authority that has functions which may affect SFWs must, amongst other tasks, take such action as will secure compliance with the Shellfish Water Regulations and with any programme established by the Minister. Further, the Minister, in consultation with the Environmental Protection Agency, must determine on the basis of local environmental conditions, each sampling point, the distance from a sampling point to the nearest point at which trade effluent or sewage effluent or polluting matter is discharged to shellfish waters, and the depth at which samples are to be taken. 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'; and
- 75% of the samples for the other parameters.

2.2.11 Additionally, the Shellfish Water Regulations stipulate that a discharge should not cause an increase of suspended solids to exceed 30% above background levels, as shellfish can be adversely affected by the smothering effects of sediment settling.

Priority substances

2.2.12 Directive 2008/105/EC of the European Parliament and of the Council of 16 December 2008 on environmental quality standards in the field of water policy (the Environmental Quality Standards Directive - "EQSD") as amended by Directive 2013/39/EU of the European Parliament and of the Council, identifies priority substances and polluting chemicals which should be considered in WFD assessments for transitional and coastal water bodies. The WFD and the EQSD seek to reduce these substances entering into the marine environment, primarily from discharges and outfalls. Priority substances include, but are not limited to, benzene, nickel, and lead. The EQSD was transposed into Irish Law by the European Communities Environmental Objectives (Surface Waters) Regulations 2009 (S.I. No. 272/2009) as amended by the following:

- The European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009 (S.I. No. 296/2009);
- European Communities Environmental Objectives (Surface Waters) (Amendment) Regulations 2012 (S.I. No. 327/2012);
- Radiological Protection (Miscellaneous Provisions) Act 2014;
- Dublin Docklands Development Authority (Dissolution) Act 2015;

- European Union Environmental Objectives (Surface Waters) (Amendment) Regulations 2015 (S.I. No. 386/2015);
- European Union Environmental Objectives (Surface Waters) (Amendment) Regulations 2019 (S.I. No. 77/2019);
- European Communities Environmental Objectives (Surface Waters) (Amendment) Regulations 2021 (S.I. No. 659/2021);
- European Communities Environmental Objectives (Surface Waters) (Amendment) Regulations 2022 (S.I. No. 288/2022);
- European Communities Environmental Objectives (Surface Waters) (Amendment) Regulations 2023 (S.I. No. 410/2023); and
- Local Government (Mayor of Limerick) and Miscellaneous Provisions Act 2024.

Nutrient sensitive waters

2.2.13 EU member states are required under the Urban Waste Water Treatment Directive (91/271/EEC) as amended to identify nutrient-sensitive areas. These have been 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".

2.2.14 The Urban Waste Water Treatment Directive has been amended by Commission Directive 98/15/EC of 27 February 1998, Regulation (EC) No 1882/2003 of the European Parliament and of the Council of 29 September 2003, Regulation (EC) No 1137/2008 of the European Parliament and of the Council of 22 October 2008 and Council Directive 2013/64/EU of 17 December 2013. It has been transposed into Irish law by The Urban Waste Water Treatment Regulations, 2001 (S.I. 254 of 2001) as amended by the Urban Waste Water Treatment (Amendment) Regulations, 2004 (S.I. No. 440 of 2004), the Water Services Act 2007, the European Communities Environmental Objectives (Surface Waters) Regulations 2009 (S.I. No. 272/2009), the Urban Waste Water Treatment (Amendment) Regulations, 2010 (S.I. No. 48/2010) and the Water Services (No. 2) Act 2013 .

2.2.15 Areas where the concentrations of nitrate in water exceed, or are likely to exceed, the levels set in the Directive are designated as Nitrate Vulnerable Zones (NVZs) and mandatory rules must be enforced to reduce nitrate loss from agricultural land and to protect human health and resources from water pollution.

Protected Areas

2.2.16 Under the WFD implemented by Department of Housing, Local Government and Heritage (DHLGH), member states are required to establish a register of protected areas. Protected areas for the purposes of WFD include:

- Bathing Waters;
- Shellfish Waters;
- Nutrient-sensitive areas, including areas identified as NVZs under the Nitrates Directive or areas designated as sensitive under Urban Waste Water Treatment Directive (UWWTD); and
- Natura 2000 Protected Areas; and
- Drinking Water Protected Areas[2].

2.3 Marine Strategy Framework Directive

2.3.1 Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive - "MSFD")) as amended by Commission Directive (EU) 2017/845 of 17 May 2017 is similar to the WFD in that it required all EU member states, including Ireland, to reach good environmental status in the marine environment by 2020. The Directive is implemented in six-year cycles and is currently in its second cycle, with the Marine Strategy Part 2: Monitoring Programme being currently updated (Department of Housing, Local Government and Heritage, 2021).

2.3.2 The MSFD was transposed into Irish law by S.I. 249 of 2011 - European Communities (Marine Strategy Framework) Regulations 2011, as amended by S.I. No. 265/2017 - European Communities (Marine Strategy Framework) (Amendment) Regulations 2017 and S.I. No. 648/2018 - European Communities (Marine Strategy Framework) (Amendment) Regulations 2018 (hereafter referred to as the MSFD Regulations). The purpose of the MSFD Regulations is to help develop Ireland's ocean economy whilst protecting and preserving the marine environment.

2.3.3 The following water quality descriptors considered in determining MSFD Good Environmental Status (GES) are:

- GES descriptor 5: Human-induced eutrophication is minimised, especially adverse effects thereof, such as losses in biodiversity, ecosystem degradation, harmful algae blooms and oxygen deficiency in bottom waters. The binding environmental targets for this descriptor are:
  - (D5T1) Nutrient concentrations are not at levels that indicate adverse eutrophication effects;
  - (D2T2) Chlorophyll concentrations are not at levels that indicate adverse effects of nutrient enrichment; and

[2] Applicable to freshwater environments only.

- (D2T5) The concentration of dissolved oxygen is not reduced, due to nutrient enrichment.

- GES descriptor 8: Concentrations of contaminants are at levels not giving rise to pollution effects. The binding environmental targets for this descriptor are:

  - (D8T1a) Within coastal and territorial waters, the concentrations do not exceed the thresholds specified in Directive 2000/60/EC[3];

  - (D8T1b) Concentration of contaminants in marine matrices assessed in accordance with OSPAR Co-ordinated Environmental Monitoring Programme (CEMP) do not exceed OSPAR Environmental Assessment Criteria (EAC) and concentrations are not increasing;

  - (D8T2) The degree of biological or ecological effects that can be specifically attributed to contaminants is below the agreed OSPAR criteria. At present, this is limited to evaluation of reproductive impairment in marine gastropods associated with Tributylin (TBT); and

  - Spatial extent and duration of significant acute pollution events are minimised.

2.3.4 The following non-indigenous species policy seeks to contribute to the MSFD GES descriptors:

- (2) Non-indigenous species introduced by human activities are at levels that do not adversely alter the ecosystem. The binding environmental target for this descriptor is:

  - (D2T1) The number of non-indigenous species which are newly introduced via human activity into the wild, per assessment period, is minimised and where possible reduced to zero.

2.3.5 As a framework Directive, the MSFD draws on the water quality and invasive species work under WFD and OSPAR. As such, the assessment presented within this document, drawn from the EIAR, will be undertaken with consideration for the requirements of both the MSFD and WFD, as these two directives are concerned with the monitoring, preserving and improving the marine environment in Irish Territorial Waters. Of note is that, currently, the extent of achievement of GES has not been established for individual water bodies.

[3] Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy (Paragraph 2.1.1 of this document)

3 Methodology

3.1 WFD Methodology

Overview

3.1.1 As identified in Section 1, this document seeks to draw from, and signpost to where relevant information is provided within, the Applicant's EIAR and Natura Impact Statement (NIS). The information has been presented in the context of WFD to demonstrate compliance, rather than seek to duplicate other assessments. This approach has been adopted to ensure that this document is concise and focussed whilst providing all relevant information in an appropriate context.

Guidance

3.1.2 At the time of writing, no Irish guidance has been published for undertaking a WFD assessment for marine developments. A number of other guidance documents specific to the consideration of marine water quality are available from jurisdictions/countries with established offshore renewable energy sectors. Where appropriate, the "Water Framework Directive assessment: estuarine and coastal waters" (English Environment Agency, 2023), (hereafter referred to as the Guidance) guidance has been applied. The Guidance has been recommended for analogous projects in England, Wales and Scotland. The English guidance for undertaking WFD assessments in the marine environment has been chosen to supplement the existing Irish guidance due to the close geographical links between the two countries and the experience within the UK of fully incorporating WFD studies in the Environmental Impact Assessment (EIA) processes for offshore wind projects. This Guidance will be used to inform the assessment of the potential impacts and includes industry standard approaches to matters such as scoping and definition of terms. The principles and recommendations of this guidance are considered within this document.

Data sources

3.1.3 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);
- Ireland's National Water Framework Directive Monitoring Programme 2019 – 2021 (EPA, 2021a);
- Water Quality in Ireland Report 2013 – 2018 (EPA, 2019);
- Radioactivity Monitoring of the Irish Environment 2014 – 2015 (EPA, 2017);

- Water Quality in 2019 - an indicators report (EPA, 2020);
- Urban Waste Water Treatment in 2019 (EPA,2020);
- Water Action Plan 2024: A River Basin Management Plan for Ireland (Department of Housing, Local Government and Heritage, 2024);
- EPA online Water Framework Directive Application[4] ;
- Bathing Water Quality in Ireland, A Report for the Year 2020 (EPA, 2021b);
- 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 Marine Water Quality Chapter (Volume 3, Chapter 2).

WFD Elements

3.1.4 No pathways arising from the activities in the marine environment that would potentially impact freshwater WFD water bodies (or Protected Areas) have been identified. Therefore, no further consideration of the freshwater environment is presented in this document. This document considers coastal and transitional waterbodies only.

3.1.5 In order to comply with the WFD, it is necessary to identify all potential risks to each receptor associated with the proposed activity/ activities. The elements, as per the Guidance, which have been considered are:

- Hydromorphology: physical characteristics of the waterbody including the size, shape, structure and (for marine bodies) the flow and quantity of water and sediment;
- Intertidal and subtidal habitats;
- Fish;
- Water quality: including water clarity, temperature, salinity, oxygen levels, nutrients, or microbial patterns, history of harmful algal blooms and contamination;
- Protected areas: any identified Protected Areas with 2 km of the Offshore Export Cable Corridor will be identified and scoped in for further assessment; and
- Invasive Alien Species (IAS) should also be considered.

[4] https://gis.epa.ie/EPAMaps

3.1.6 The WFD assessment considers each stage of activity at Dublin Array as relevant. Those proposed activities to be considered in terms of their potential impacts on each receptor are defined in Section 5.2.

Screening buffers

3.1.7 A area with a 2 km radius from activities, known as the Screening Buffer[5], is recommended in the Guidance for considering activities which would result in deterioration of water bodies (ecologically and chemically) and protected areas. This screening buffer is common practice in the UK for assessing Offshore Wind Farms (OWFs) on waterbodies and protected areas and has been applied in lieu of Irish specific guidance on the matter (as detailed above). The screening buffer, around the offshore ECC and array area, has been applied for consideration of effects in relation to hydro-morphology, marine water quality, benthic habitats and marine invasive alien species.

3.1.8 The use of a 2 km Screening Buffer was validated through consideration of the project specific modelling and assessments presented in the Volume 3, Chapter 1: Marine Geology, Oceanography and Physical Processes of the EIAR. This validation exercise concluded that the Screening Buffer is appropriate, robust and pre-cautionary for the purposes of screening in Protected Areas based on the following predictions:

- Release of drilling mud from trenchless techniques at landfill - As the bentonite is a fine-grained clay as may persist in suspension prior to settlement. However, the elevated Suspended Sediment Concentration (SSC) will be rapidly dispersed in ambient current conditions. The effects of the plume, following punch out will therefore be of very short duration and temporary at any given location. It can be expected that within one tidal cycle, the contribution of the bentonite to the local background levels of SSC will be negligible.

- Export cable installation - The plume is predicted in the project specific modelling for cable installation, see, Volume 4, Annex 3.1-2 Physical Process Modelling for Dublin Array Offshore Wind Farm, to be approximately 250 m^2 with a concentration of, approximately, 50 mg/l, before dissipating to ambient conditions.

- As presented in Pathways 1, 2 and 6 of the Volume 3, Chapter 1: Marine Geology, Oceanography and Physical Processes Chapter the modelling demonstrates that the sediment plumes will remain parallel to the coast and will not be measurable plumes or deposition within coastal or transitional waterbodies or Protected Areas.

3.1.9 Underwater noise modelling for piling within the array demonstrated that the potential for Temporary Thresholds Shifts (TTS) on fish species could extend to the coast and therefore the extent of this modelling has been used as a Screening Buffer for noisy activities within the array.

[5] A screening buffer has been used to identify potential protected areas, under the WFD, which have the potential to be impacted by the proposed offshore activities of Dublin Array.

3.1.10 A full assessment of all receptors within a more precautionary zone of influence has been assessed in the Applicant's EIAR and NIS (as detailed in paragraph 1.1.5).

3.2 Marine Strategy Framework Directive Methodology

Overview

3.2.1 As identified in Section 1, this document draws information from the Applicant's EIAR and NIS and signpost to the relevant aspects of each report. The information has been presented to identify which aspect of the Planning Application has considered the sections of the MSFD relevant to offshore wind farm developments.

Guidance

3.2.2 At the time of writing, no specific guidance has been published regarding how projects should assess compliance with the MSFD. Therefore, the Applicant has sought to demonstrate consideration of each of MSFD elements (see below).

Data Sources

3.2.3 The Marine Strategy Framework Directive (2008/56/EC) - Article 17 update to Ireland's Marine Strategy Part 3: Programme of Measures (Article 13) (Department of Housing, Local Government and Heritage, 2023) has been considered within the development of this MSFD assessment.

MSFD Elements

3.2.4 The Irish Maritime Area covered by the MSFD is assessed on a six year cycle against 11 qualitative descriptors and associated environmental targets. In order to comply with the MSFD, Dublin Array must not prevent a marine waterbody from achieving GES. The descriptors are divided into those that characterise the condition of the marine environment:

- Biological diversity (D1);
- Population of commercial fish/shellfish (D3);
- Marine food webs (D4); and
- Seafloor integrity (D6).

3.2.5 And descriptors referring to the anthropogenic pressures:

- Non-indigenous species (D2);
- Eutrophication (D5);
- Alteration of hydrographical conditions (D7);

- Concentration of contaminants (D8);
- Contaminants in fish/seafood for human consumption (D9);
- Marine litter (D10); and
- Introduction of energy (including underwater noise) (D11).

4 Receiving environment

4.1 Waterbodies

4.1.1 This section summarises the WFD waterbodies and protected areas within 2km of the proposed development and their current status as recommended in the Guidance. As presented in Figure 2 and Figure 3, there are no WFD waterbodies of Protected Areas within 2km of the array area. Therefore, only activities within the Offshore ECC are considered relevant to this assessment.

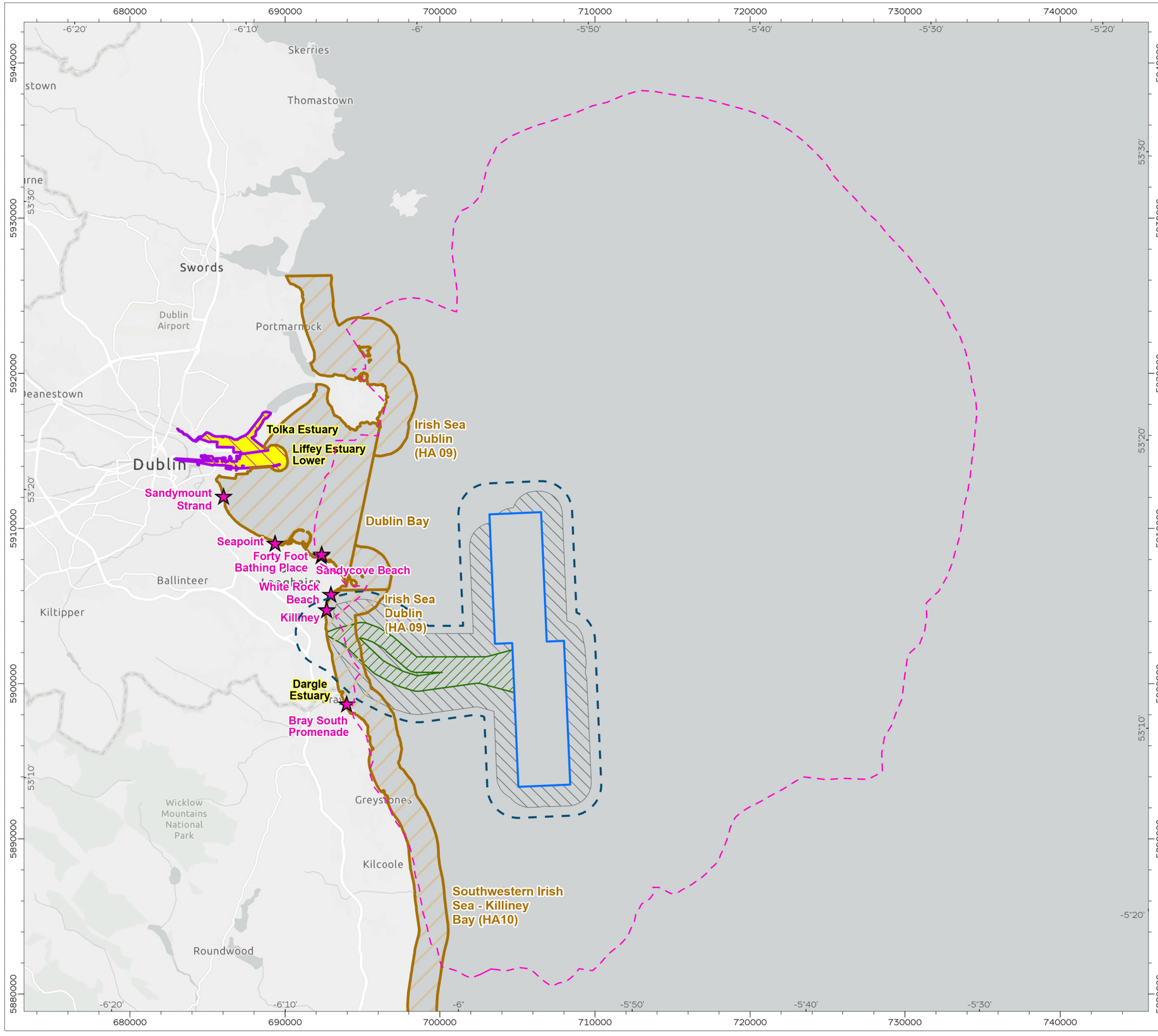
4.1.2 The status of the identified sites is presented in Table 2, with a spatial representation of these sites in relation to the Dublin Array is provided in Figure 2. An assessment of all water and sediment quality receptors within 17km is provided in Volume 3, Chapter 2: Marine Water and Sediment Quality (see Figure 1).

4.1.3 In accordance with the currently available guidelines (National Road Authority (NRA), (2008)) available to identify receptor sensitivity, the WFD waterbodies and protected areas are designated as having 'Extremely High Sensitivity' if the -

"Attribute has a high quality or value on an international scale. Examples include River, Wetland or surface waterbody ecosystem protected by EU legislation i.e. designated under the Habitats, Birds, Shellfish, Bathing Water or Freshwater Fish, Drinking Water or Nitrate Directives" (NRA, 2008).

4.1.4 Detailed baseline characterisation of the receiving environment for hydromorphology, water quality, benthic ecology and fish ecology are presented respectively in the following documents:

- Volume 4, Annex 4.3.1-1: Physical processes technical baseline;
- Volume 3, Chapter 2: Marine Water and Sediment Quality;
- Volume 4, Annex 4.3.3-1: Benthic and Intertidal Ecology Technical Baseline; and
- Volume 4, Annex 4.3.4-1: Technical Baseline Report - Fish and Shellfish Ecology.



- Array Area
- Temporary Occupation Area
- Export Cable Corridor
- 2km Buffer from Array Area and Export Cable Corridor
- Transitional Water Bodies
- Coastal Water Bodies
- Designated Nutrient Sensitive Area
- Bathing Waters
- TTS Buffer

DRAWING STATUS

FINAL

DISCLAIMER

MAP NOTES / DATA SOURCES:

Esri UK, Esri, TomTom, Garmin, FAO, NOAA, USGS, Esri UK, Esri, TomTom, Garmin, Foursquare, METI/NASA, USGS ©Ordnance Survey Ireland 2023 © Tailte Eireann. (CYSL50270365) Not to be used for Navigation.

PROJECT TITLE

Dublin Array

DRAWING TITLE

Water Framework Directive Waterbodies and Protected Areas

DRAWING NUMBER: **2**

PAGE NUMBER: **1 of 1**

VER	DATE	REMARKS	DRAW	CHEK	APRD
01	2024-07-01	For Issue	GB	BB	SS

0 2 4 6 8 km

0 1 2 3 4 nm

N GRID NORTH

SCALE 1:250,000 PLOT SIZE A3

DATUM WGS 1984 VERTICAL REF LAT

PRJ WGS 1984 UTM Zone 29N

GoBe APEM Group

Dublin Array Generation for generations

Kish Offshore Wind Limited - Bray Offshore Wind Limited

Table 2 Water Framework Directive water bodies within 2 km of the Offshore ECC

Name	ID and Area (km2)	Supporting Chemistry Condition	Ecological Status Potential	Overall Status	Hydromorphology	Dissolved Oxygen	Nutrient Condition	Phytoplankton	Specific Pollutants	Heavily modified	Identified as being 'at risk' in RBMP?
Coastal water bodies											
Southwestern Irish Sea - Killiney Bay (HA10)	IE_EA_100_0000 (Area =n/a)	High	High	High	Good	N/A*	High	N/A*	N/A*	N/A	No
Transitional water bodies											
There are no transitional water bodies within 2 km of the offshore ECC or array.											

(source: EPA, 2021c)
N/A* = Unassigned

4.2 Bathing Waters

4.2.1 The Bathing Water (BW) identified within 2 km of the Offshore ECC are presented in Table 3 and Figure 2.

Table 3 Status achieved by screened in Bathing Waters

Name	ID	Status			
		2022	2021	2020	2023
Killiney	IEEABWC100_0000_0400	Excellent	Excellent	Excellent	Excellent
White Rock Beach	IEEABWC100_0000_0450	Excellent	Excellent	Excellent	Excellent

4.3 Shellfish Waters

4.3.1 There are no designated Shellfish Waters located within 2 km of the Offshore ECC (Figure 2). Therefore, shellfish waters will not be considered further in this assessment. Details of the nearest shellfish water and justification for scoping them out is provided in Section 2.9 of Volume 3, Chapter 2: Marine Water and Sediment Quality.

4.4 Nutrient sensitive areas

4.4.1 The EPA identified 48 areas within Ireland where wastewater discharges are the main significant pressure on water bodies at risk of pollution. 'At risk of pollution' is defined as being at risk of not achieving the specific environmental target set for that waterbody, such as good ecological status under the WFD. There are no nutrient sensitive areas within 2 km of the offshore ECC or array.

4.5 Drinking Water Protected Areas

4.5.1 Within the Liffey and Dublin Bay Catchment, there are 26 abstractions of which 20 are from six groundwater bodies and six from three river water bodies (EPA catchments, 2018). There are no pathways identified from the offshore activities and propose infrastructure which could impact these designated drinking water protected areas. Therefore, no further consideration of drinking water protected areas are presented in this document.

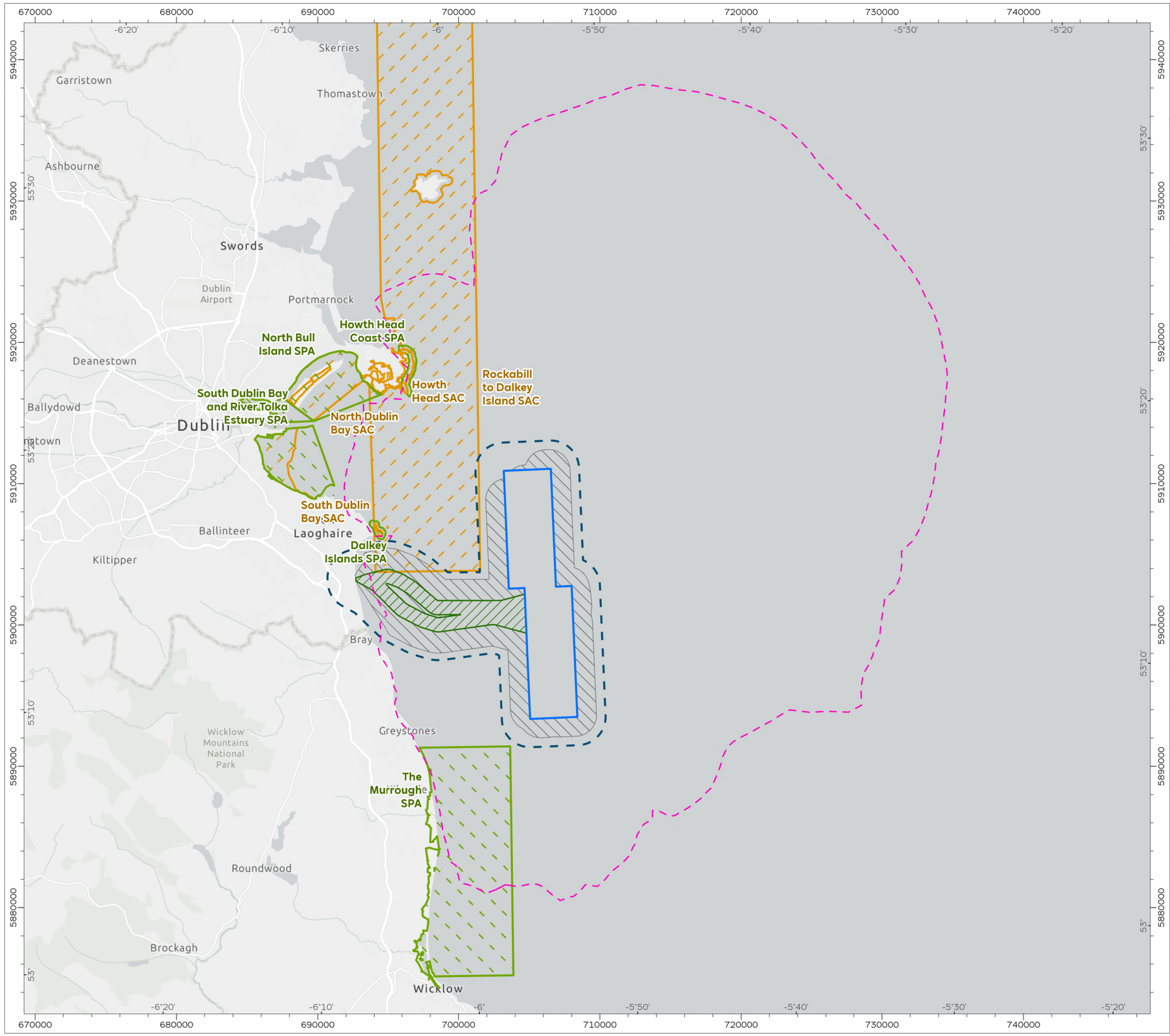
4.6 Natura 2000 Protected Areas

4.6.1 There is one Natura 2000 area (Special Protection Area (SPA); Special Area of Conservation (SAC) within 2 km of the Offshore ECC, for which the corresponding information is provided in Table 4. The location of Rockabill to Dalkey Island SAC is illustrated in Figure 3 alongside other Natura 2000 sites in proximity of the ECC. Further detail on these areas can be found in the NIS.

Table 4 Natura 2000 Protected Areas

Name	Site code	Qualifying Interests
Rockabill to Dalkey Island SAC	003000	▪ Reefs; and ▪ Harbour Porpoise.

(source: National Parks & Wildlife Service https://www.npws.ie/protected-sites)



DRAWING STATUS

FINAL

DISCLAIMER

MAP NOTES / DATA SOURCES:

Esri UK, Esri, TomTom, Garmin, FAO, NOAA, JSGS, Esri UK, Esri, TomTom, Garmin, Foursquare, METI/NASA, USGS ©Ordnance Survey Ireland 2023 © Tailte Eireann. (CYSL50270365) Not to be used for Navigation.

PROJECT TITLE

Dublin Array

DRAWING TITLE

Natura 2000 Protected Areas

DRAWING NUMBER: **3**

PAGE NUMBER: **1 of 1**

VER	DATE	REMARKS	DRAW	CHEK	APRD
01	2024-07-01	For Issue	GB	BB	SS

0 2 4 6 8 km
0 1 2 3 4 nm

N GRID NORTH

SCALE 1:275,000 PLOT SIZE A3
DATUM WGS 1984 VERTICAL REF LAT
PRJ WGS 1984 UTM Zone 29N

GoBe APEM Group

Dublin Array Generation for generations

Kish Offshore Wind Limited - Bray Offshore Wind Limited

5 Assessment of WFD Elements

5.1 Supporting information

5.1.1 This document seeks to draw from, and signpost to where relevant information is provided within, the Applicant's EIAR and NIS (see Section 3.1).

5.2 Project activities

5.2.1 The proposed project activities throughout the lifetime of Dublin Array which may impact WFD waterbodies are outlined in detail in Volume 2, Chapter 6: Project Description. Each EIAR chapter has defined the Maximum Design Option (MDO) which has the potential for the greatest magnitude of impact on the relevant receptor(s). The MDO are presented in detail within the following chapters which have been considered in this WFD assessment. Further information of the MDOs is provided in the following documents:

- Volume 3, Chapter 1: Marine Geology, Oceanography and Physical Processes;
- Volume 3, Chapter 2: Marine Water and Sediment Quality;
- Volume 3, Chapter 3: Benthic Subtidal and Intertidal Ecology,
- Volume 3, Chapter 4: Fish and Shellfish Ecology; and
- Part 4: Habitats Directive Assessments, Volume 4: NIS.

5.2.2 All committed mitigation measures, including project design features, avoidance and preventative measures and additional mitigation measures, are secured in Volume 8, Part 2: Schedule of Commitments. This WFD has been undertaken on the basis of no additional mitigation measures being applied. Inherent and designed in measures which are project design features and adoption of industry best practice to avoid or prevent impacts have been taken into account. The key project design features in relation to this document include:

- The Applicant commits to compliance with all regulatory requirements, including but not limited to the International Maritime Organisation (IMO) MARPOL requirements[6] including the disposal of sewage and other waste;
- Avoidance and preventative measures captured within a Project Environment Management Plan (PEMP) including a Marine Pollution Contingency Procedure compliant with all relevant legislation to cover accidental spills, potential contaminant release and include key emergency contact details;

[6] https://www.imo.org/en/About/Conventions/Pages/International-Convention-for-the-Prevention-of-Pollution-from-Ships-%28MARPOL%29.aspx

- A planning ready CEMP produced to accompany this Planning Application, and will be finalised post-consent. The CEMP sets out environmental management measures to be adopted during construction phase (see Volume 7, Part 8);
- The Cable Installation Plan will set out measures to minimise adverse impacts to potentially sensitive receptors. It will also set out appropriate cable burial depth in accordance with industry good practice, minimising the risk of cable exposure.

5.2.3 Within the Offshore ECC, anchoring vessels and construction buoyage are proposed. The use of anchors for vessels and buoyage during the construction, O&M, and decommissioning phases is considered to be inconsequential to the receiving environment. This is primarily as their use will result in the suspension of very small sediment volumes close to the seabed, which will rapidly settle from suspension within the immediate area. Therefore, the use of anchors will not result in notable changes in SSC and associated sediment deposition. Therefore, a 2 km buffer was determined to be appropriate around the Offshore ECC and not the temporary occupation area.

5.3 Hydromorphology

5.3.1 This section should be read in conjunction with Volume 3, Chapter 1: Marine Geology, Oceanography and Physical Processes which has undertaken a detailed assessment of the potential changes to the physical environment arising from Dublin Array. The Offshore ECC directly transects the southwestern Irish Sea – Killiney Bay coastal WFD waterbody, however, no transitional WFD waterbodies are located within 2 km from the Offshore ECC.

5.3.2 The installation of any cable protection measures, within the Offshore ECC and potentially in waterbodies, have the potential to result in a localised blockage of waves, tides and sediment transport. These structures may be deployed to provide additional protection to the export cable beyond that afforded by its burial alone. Cable protection in shallow water has potential to behave in a similar way to a submerged offshore breakwater, affecting wave transformation processes closer to shore. In turn this could potentially alter the wave approach to the shore, resulting in wave focussing on coastal areas not presently eroding thus causing beach lowering. The structures themselves could also locally intercept sediment being transported by wave and tidal driven currents. For all areas in which cable protection is used, it is not expected that the presence of the cable protection devices will not continuously affect patterns of sediment transport following the initial period of accumulation. It follows that any changes on seabed morphology away from the cable protection will also be very small. The extent of the cable protection measures does not constitute a continuous blockage along the Export ECC. Therefore, whilst it can reasonably be expected that there will be some localised change to waves, hydrodynamics and sediment transport immediately within the vicinity of the rock berms/ mattresses, the potential for wider morphological change in the waterbodies is considered to be spatially limited and not measurable in practice. Further details are provided in Pathways 10, 11 and 12 of Volume 3, Chapter 1: Marine Geology, Oceanography and Physical Processes.

5.3.3 An assessment of the potential impacts upon the hydromorphological regime is provided in Volume 3, Chapter 1: Marine Geology, Oceanography and Physical Processes. An initial period of (limited) sediment accumulation is expected around the structures following installation, with associated seabed morphology changes anticipated to be very small. The extent of the cable protection measures does not constitute or cause a continuous blockage along the Offshore ECC. For those locations where cable protection is to be used (including where sand waves are present), it is unlikely that the presence of the cable protection structures will continuously affect the hydromorphology.

5.3.4 The EIA assessment concluded that there would not be significant effects in EIA terms upon the hydromorphology resulting from the installation of export cable protection in the nearshore. As such there is not predicted to be a deterioration in the hydromorphology status of the Southwestern Irish Sea – Killiney Bay coastal waterbodies. Dublin Array will therefore not result in a deterioration of the current status of these waterbodies or jeopardise the attainment of good status.

5.4 Marine water quality

5.4.1 This section should be read in conjunction with Volume 3, Chapter 2: Marine Water and Sediment Quality which has undertaken a detailed assessment of the potential changes to marine water and sediment quality arising from Dublin Array. In addition, the potential changes in SSC are quantified in Volume 3, Chapter 1: Marine Geology, Oceanography and Physical Processesbased on the project specific modelling.

5.4.2 No discharges (continuous or intermittent) of chemicals or materials, which may be toxic or persistent within the marine environment, are proposed during any phase of Dublin Array. Substances such as grease, oil, fuel, anti-fouling paints and grouting materials may be accidentally released or spilt into the marine environment. Dublin Array is committed to the use of best-practice techniques and due diligence throughout all construction, O&M and decommissioning activities (see Volume 8, Part 2: Schedule of Commitments). This commitment ensures the use of appropriate preventative measures as part of the project design and serves as mitigation against this type of pollution incident.

5.4.3 The Offshore ECC intersects the Southwestern Irish Sea – Killiney Bay coastal waterbody (Figure 2) and therefore a requirement exists to consider the potential for a deterioration in water quality (including changes in turbidity, nutrients, phytoplankton and dissolved oxygen) within this waterbody. Specifically, the potential for these effects to extend over periods greater than a spring-neap tidal cycle (approximately 14 days).

5.4.4 Project activities and infrastructure associated with the Offshore ECC which have the potential for an increase in turbidity are typically those which involve seabed disturbance and an increase in suspended sediment concentrations. Seabed disturbance may also result in the release of sediment bound contaminants into the water column. Examples of such activities include sandwave clearance and export cable installation, including associated landfall works using Trenchless techniques (i.e. HDD or Direct Pipe) and the associated release of bentonite or similar drilling fluids.

5.4.5 Water quality monitoring within the Dublin Bay area (RPS, 2021) has shown that natural turbidity levels are highly variable, typically peaking in response to storm events. Very high spikes in turbidity were observed at Poolbeg in response to tidal conditions and the seabed sediment characteristics. Of note from the monitoring programme associated with Dublin Port activities was that:

- 'higher turbidity readings are transient and local and do not represent events of any environmental significance or diagnostic value in assessing potential impacts'; and
- 'comparisons of mean turbidity within Dublin Port during periods of 'dredging' and 'no dredging' activity showed that there is little difference between absolute values and no apparent pattern, i.e. no consistent increase in mean turbidity during dredging episodes'.

5.4.6 Dublin Array specific modelling[7] predicted that sediment plumes will quickly dissipate after the cessation of the relevant construction activities, due to settling and wider dispersion with the concentrations reducing quickly over time to background levels. Sediment deposition will consist primarily of coarser sediments deposited close to the source, with a small proportion of finer material deposition (reducing exponentially from source). Any fine material being dispersed by construction works is likely to be widely distributed and will quickly form part of the background concentration of Suspended Particulate Matter (SPM) in the nearshore and therefore is unlikely to settle in measurable thickness locally. The impact of increased SSC and deposition from construction activities is expected to be temporary, intermittent and of localised extent (within one tidal excursion) and reversible. Given that sediment plumes are expected to quickly dissipate after the cessation of the activities, due to settling and wider dispersion, suspended sediment concentrations will quickly reduce over time to background (natural) levels.

5.4.7 A reduction in water clarity associated with the proposed activities in coastal waters, namely the export cable installation, will occur in temporary and discrete events. Owing to the temporal nature of the impact, these events will not deteriorate the status of the WFD coastal or transitional water bodies within the study area or jeopardise the attainment of good status.

[7] Full details provided in Volume 4, Annex 4.3.1-2: Physical Process Modelling for Dublin Array Offshore Wind Farm

5.4.8 Nutrient release, including nitrates, from sediment naturally occurs in response to sediment disturbance by wind and tidal conditions (Chen *et al*., 2021). Any sediment disturbed due to project activities may therefore result in nitrate release, if this nutrient is available in the sediment, which could result in increased plant/algae growth. Sediment disturbance resulting from construction activities is likely to be temporary, intermittent and of localised extent (within one tidal excursion).

5.4.9 The proposed activities are not anticipated to affect phytoplankton or dissolved oxygen as no nutrients or organic matter are anticipated to be released in significant concentrations or exceed those released during typical storm conditions. In addition, the proposed design does not include the installation of outfalls or discharge of waste water. Therefore, the proposed activities are not expected to cause a measurable reduction in the dissolved oxygen or eutrophication in the water column.

5.4.10 Fugro (2021) measured to the contaminants which may be present in the sediment. There were no occurrences of contaminants exceeding the lower Irish Action Levels in the project specific campaign in the Offshore ECC (further detailed provided in Volume 3, Chapter 2: Marine Water and Sediment Quality). Such sediments have the potential to be resuspended by proposed activities. Under normal circumstances, very small concentrations of contaminants enter to the dissolved phase, with the vast majority adhering to the sediment particles when temporarily entering suspension in the water column. Partition coefficients may be applied to estimate the concentration of the contaminants entering the dissolved phase which typically result in a reduction of several orders of magnitude than the concentrations associated with suspended sediments. As such, it is considered highly unlikely that the Maximum Allowable Concentration (MAC) Environmental Quality Standards (EQS) threshold, as prescribed by the Irish Action Levels, will be exceeded for any of the substances as a result of disturbed sediment in the waterbody from the proposed activities, given the fates of the plumes.

5.4.11 Moreover, given the short term nature of the works and the short term nature of the sediment plumes, any small uplift in the water concentrations of priority substances[8] would be anticipated to return to background levels very quickly. Therefore, given the temporal nature of the works, the chemical status of the waterbodies, both locally to the works and at WFD monitoring stations would remain unaffected as a result of the proposed works.

5.4.12 There is not predicted to be a deterioration in the water quality of either the coastal or transitional waterbodies within 2 km of the Offshore ECC. Dublin Array will therefore not result in a deterioration of the status of these waterbodies or jeopardise the attainment of good status. The Dublin Array is therefore considered to be compliant with the WFD requirements.

[8] Environmental Quality Standards Directive (EQSD) (2008/105/EC) identifies priority substances and polluting chemicals which should be considered in WFD assessments for transitional and coastal water bodies. Priority substances include, but are not limited to, benzene, nickel, and lead.

5.5 Benthic habitats

5.5.1 This section should be read in conjunction with Volume 3, Chapter 3: Benthic Ecology which provides a characterisation and assessment of the habitats which may be directly or indirectly impacted by Dublin Array.

5.5.2 No works are proposed within any transitional WFD waterbodies. The Offshore ECC directly transects the Southwestern Irish Sea – Killiney Bay coastal waterbody. Works associated with export cable installation within the waterbody include seabed preparation (sandwave clearance), cable installation (burial) into the seabed and trenchless installation at landfall. Maintenance activities such as cable repair and reburial may also occur throughout the operational period and if required, may include cable re-burial.

5.5.3 The majority of the benthic biotopes present within the Southwestern Irish Sea – Killiney Bay coastal waterbody have been determined as having a low sensitivity to physical disturbance, being typical of high energy environments and as such are naturally subject to, and tolerant of, high levels of physical disturbance. The faunal communities are characterised by mobile species such as polychaetes and amphipods, as well as burrowing bivalve species which can re-enter the substratum following temporary habitat disturbance. The recoverability of such communities is therefore likely to occur rapidly (less than two years (MarESA)) predominantly as a result of adult migration from surrounding unaffected areas, as well as via larval settlement.

5.5.4 The '*Ophiothrix fragilis* and/ or *Ophiocomina nigra* brittlestar beds on sublittoral mixed sediment' biotope has been determined to be of medium sensitivity to physical disturbance. This biotope was found to be within the nearshore portion of the Offshore ECC. Two littoral rock biotopes within the Offshore ECC were also assessed to be of medium sensitivity to temporary/ loss disturbance.

5.5.5 With respect to installation activities, given the limited spatial and temporal extent of the works, it has been concluded that both faunal and floral population re-colonisation and recovery will occur from recovering and/ or un-impacted communities in adjacent habitats. The project's maintenance activities during the operational phase are expected to be less than that for construction and are therefore of a reduced magnitude.

5.5.6 The EIA benthic ecology assessment concluded that there would be no significant effects on benthic receptors from the habitat disturbance from the activities associated with the proposed development. As such there is not predicted to be a deterioration in the ecological status of the Southwestern Irish Sea – Killiney Bay coastal waterbody. There is not predicted to be a deterioration in the ecological status. Therefore, Dublin Array will not result in a deterioration of ecological status of these waterbodies or jeopardise the attainment of good ecological status. Dublin Array is therefore considered to be compliant with the WFD requirements.

5.6 Fish

5.6.1 A full and detailed assessment of relevant activities, during the construction, operational and decommissioning phases of Dublin Array, upon fish receptors is provided in Volume 3, Chapter 4: Fish and Shellfish Ecology.

Underwater noise and vibration

5.6.2 Fish receptors within the Dargle Estuary, transitional waterbody, has the potential to be affected by the generation of noise and vibration resulting from Dublin Array project activities alongside potential impediment of migration. The River Dargle, classified as a salmonid river, also has reports of sea trout (CSTP, 2016) and Atlantic salmon (Holmes et al., 2018).

5.6.3 As detailed within Volume 4, Appendix 4.3.5-7: Underwater noise assessment, there are clear differences in the potential impact ranges from differing underwater noise sources from construction activities at Dublin Array. The largest impact ranges will likely arise from pile driving of foundations (i.e., impact piling of monopiles or pin piles in the array area). Project activities which are likely to generate underwater noise in the Offshore ECC are those associated with general seabed clearance, cable installation and vessel operations, and any Unexploded Ordinance (UXO) specific seabed clearance.

5.6.4 Fish sensitivity to noise producing activities have been classified in accordance with the associated hearing categories. Those fish receptors of relevance to Dublin Array are provided in Table 5. For the impact assessment, the fish and elasmobranch Valued Ecological Receptors (VERs) were grouped into four groups based on their sound detection mechanism and hearing capabilities, following the categories recommended by Popper et al. (2014) and Popper and Hawkings (2019).

Table 5 Hearing categories of fish and shellfish receptors (Popper et al., 2014; Popper and Hawkins, 2019)

Category	Fish receptors relevant to Dublin Array
Group 1: Fishes lacking swim bladders or other gas chambers. These species are sensitive only to sound particle motion within a narrow band of frequencies. Some barotrauma may occur from the exposure to sound pressure.	Lemon sole, common dab, plaice, witch flounder, sandeel, Atlantic mackerel, Atlantic horse mackerel, elasmobranchs (small-spotted catshark, tope, nursehound, spiny dogfish, starry smooth-hound, skate species, basking shark), river and sea lamprey
Group 2: Fishes with a swim bladder or other gas filled cavities that are not involved in hearing. Hearing in these species only involves sound particle motion within a narrow band of frequencies. Some barotrauma may occur from the exposure to sound pressure.	Atlantic salmon, brown/sea trout
Group 3: Fishes with swim bladders that are close but not intimately connected to the ear.	Atlantic cod, poor cod, haddock, whiting, European eel*, anglerfish*

Category	Fish receptors relevant to Dublin Array
These species can detect both particle motion and sound pressure and show a more extended frequency range than groups 1 or 2, extending up to about 500 Hz. These species are susceptible to barotrauma.	
Group 4: Fishes that have special structures mechanically linking the swim bladders to the ear. These species are sensitive primarily to sound pressure, although they also detect sound particle motion. They have a wider frequency range, extending to several kHz and generally show higher sensitivity to sound pressure than fishes in groups 1, 2, or 3. These species are susceptible to barotrauma.	Herring, sprat, twaite shad
Eggs and larvae	Species with spawning grounds in the study area.

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

5.6.5 TTS is a temporary reduction in hearing sensitivity caused by exposure to intense sounds or sounds of long duration (e.g., tens of minutes to hours). TTS has been demonstrated in some fishes, resulting from the loss or damage of sensory hair cells of the inner ear and/or damage to auditory nerves. However, sensory hair cells are constantly added to fishes and are replaced when damaged, and therefore the extent of TTS is of variable duration and magnitude. Normal hearing ability returns following cessation of the noise causing TTS, though the recovery period is variable between species, lasting between a few hours to several days. When experiencing TTS, fish may have decreased fitness until hearing recovers, due to a reduced ability to communicate, detect predators or prey, and/or assess their environment (Popper and Hawkins, 2019).

5.6.6 Behavioural effects as a result of construction related underwater noise include a wide variety of responses including startle responses (C-turn), strong avoidance behaviour, changes in swimming or schooling behaviour, or changes of position in the water column (e.g., Hawkins et al., 2014). Depending on the intensity, timing and duration of exposure there is the potential for some of these responses to lead to significant effects at an individual level (e.g., reduced fitness, increased susceptibility to predation) or at a population level (e.g., interference with foraging, avoidance or delayed migration to key spawning grounds) (e.g., Popper and Hawkins, 2019). Some behavioural responses may only be short-term with no wider effects for the individual or population, particularly once acclimatisation to the sound has taken place (Popper and Hawkins, 2019).

5.6.7 TTS and behavioural impacts are predicted to occur over larger areas within the near-field, defined as within the array area and the offshore ECC and adjacent far-field, defined as beyond the ZoI. Whilst the Popper et al. (2014) criteria suggest a high risk of behavioural disturbance in the intermediate field and a moderate risk in the far field, the risk assessment is likely to predicate on the individuals not being involved in activities with a strong biological driver like spawning or feeding. As such, it is likely that any behavioural impacts to fish would be reduced when spawning, with consequently limited impact on spawning potential for the relevant species. Whilst there is a paucity of evidence on migratory behaviour of European eel, it is possible that migration would be an equally strong biological driver, with similar damping of behavioural reactions. Based on this combined with the intermittent and short-term nature of the impact and the temporary nature and reversibility of effects, any TTS and behavioural changes in Group 3 and Group 4 VERs during piling are assessed to be barely discernible from baseline conditions. Further details are provided in Volume 3, Chapter 4: Fish and Shellfish Ecology.

5.6.8 The largest impact ranges will likely arise from pile driving of foundations i.e., impact piling of monopiles or pin piles in the array area. These activities will generate impulse sounds, which are characterised by high acoustic energy levels with a rapid rise time followed by a rapid decay (Popper and Hawkins, 2019). Impulsive sounds will also be produced during the controlled explosion of UXO, though any detonation would represent a short-term (i.e., seconds) increase in underwater noise. Therefore, impacts on fish species for other noisy activities will be lower than those presented for piling.

5.6.9 The EIA assessment presented in Volume 3, Chapter 4: Fish and Shellfish Ecology concluded that there would be no adverse significant effects upon fish receptors within the study area due to noise generation through the construction, operation and decommissioning phases of the project.

Water quality

5.6.10 No chemical changes such as low dissolved oxygen have been recorded at Marine Institute monitoring stations in the Dublin Bay area despite the capital dredging activities ongoing within Dublin Bay and are not anticipated to be caused by any phase of the project as presented in Volume 3, Chapter 2: Marine Water and Sediment Quality. As presented in Section 5.3 and Volume 3, Chapter 1: Marine Geology, Oceanography and Physical Processes there will be no significant effects on the depth or flow of the waterbody.

Conclusion

5.6.11 There is not predicted to be a deterioration in the ecological status of the waterbodies, with respect to fish species. Therefore, Dublin Array will not result in a deterioration of ecological status of these waterbodies or jeopardise the attainment of good status. The Dublin Array is therefore considered to be compliant with the WFD requirements.

5.7 Marine invasive alien species

5.7.1 This section should be read in conjunction with Volume 3, Chapter 4: Benthic Ecology which provides an assessment of the introduction/ spread of IAS by Dublin Array. There exists the potential for the introduction/ spread of IAS through the presence of subsea infrastructures and vessel movement in relation to the Dublin Array development.

5.7.2 The project will comply with all national and internation legislation for all project vessels. Further to this. The Applicant will follow and adopt relevant best practice guidelines through the implementation of a Project Environmental Management Plan (PEMP) which includes a marine biosecurity plan to minimise IAS introduction/ spread. Any non-project vessels used for the delivery of materials to site will adhere to industry legislation, codes of conduct and/ or best practice to reduce the risk of introduction or spread of IAS.

5.7.3 The placement of any man-made structures within the Southwestern Irish Sea – Killiney Bay coastal waterbody, as cable protection, provides an opportunity for colonisation by a range of marine species, some of which may not already be present within the ecosystem. As discussed in Volume 3, Chapter 3: Benthic Subtidal and Intertidal Ecology, new hard substrate habitat will be introduced into the Dublin Array benthic subtidal ecology study area. Whilst the consequential impacts will be long-lasting, the total area of the footprint is considered negligible on a regional scale.

5.7.4 The movement of commercial vessels is common throughout the region (Volume 3, Chapter 10: Shipping and Navigation) and this provides an existing and potentially more likely method of transport for IAS species (due to the higher variety of ports and passage routes). Therefore, as discussed in Volume 3, Chapter 3: Benthic Subtidal and Intertidal Ecology, any contribution of Dublin Array would be negligible in comparison to the impacts of other marine users.

5.7.5 Considering the existing status of the Southwestern Irish Sea – Killiney Bay coastal waterbody alongside the proposed management of IAS, there is not predicted to be a deterioration in the ecological status of this waterbody, with respect to benthic ecology and biodiversity. Therefore, Dublin Array will not result in a deterioration of ecological status of these waterbodies or jeopardise the attainment of good status. The Dublin Array is therefore considered to be compliant with the WFD requirements.

5.8 Protected Areas

Bathing waters

5.8.1 The potential reduction in water quality at the following bathing waters (BWs), for which further detail is provided in Table 3, have been assessed:

- Killiney; and
- White Rock Beach.

5.8.2 An increase in suspended sediments may consequently result in an increase in bacterial counts within the water column. Bacterial mortality, including of *E.coli* and IE, is strongly influenced by the amount of UV light penetrating the water column. During periods of increased turbidity (i.e. high SSC concentrations) a reduction in the amount of ultra-violet light within the water column could occur and indirectly reduce the mortality rate of bacteria in the water. In addition, sediment resuspension as result of activities within the Offshore ECC could also mobilise bacteria within the sediments into the water column and be advected to the BWs. This could theoretically affect the performance of the local BWs.

5.8.3 Given the performance status of Excellent for both BWs, this indicates that the sedimentary bacteria levels, in close proximity to these BWs, do not result in a reduction in water quality when mobilised during storm events. This suggests that there are not elevated bacterial concentrations in the seabed sediments in the vicinity of the BWs or the Offshore ECC. Furthermore, given the short-term nature of the sediment plumes, the relative increases in bacteria are considered to be negligible in terms of BW compliance. No deterioration or non-compliances at the identified BWs are anticipated to occur as a result of the proposed activities.

5.8.4 The reduced water clarity due to works in the coastal waters could result in temporary increases in bacterial counts within the water column due to decreased bacterial mortality and ultra violet light within the water column, and the potential release of sediment bound bacteria (including *E.coli* and IE). These elevated bacterial counts could theoretically cause a deterioration in the water quality at the local bathing waters. However, given the predicted levels of dilution and dispersion of the suspended sediments (see Volume 3, Chapter 1: Marine Geology, Oceanography and Physical Processes) and so bacteria, coupled with the temporary nature of the activities, it is expected that any increases in bacterial counts in the water column would be in the order of days. The resultant increase in bacterial counts from the proposed activities would be analogous to storm events and therefore not anticipated to result in a reduction of water quality at the identified bathing waters beyond the background conditions and natural variation. Therefore, no deterioration in the performance of the seven BWs is anticipated as a result of the proposed activities associated with Dublin Array.

Nutrient sensitive areas

5.8.5 Within Dublin Bay, the Liffey Estuary from Islandbridge weir to Poolbeg Lighthouse, including the River Tolka basin and South Bull Lagoon, have been designated as a nutrient sensitive area (Figure 2). Sediment resuspension as a result of activities within the Offshore ECC has the potential to impact these areas through the release of sediment bound nitrates – as detailed in Section 5.4. No direct inputs of nutrients, including nitrates, are proposed as a result of Dublin Array's activities.

5.8.6 Sediment disturbance due to construction and maintenance activities is unlikely to occur over durations longer than natural events, for example spring tides/ storms. Therefore, any nutrient release into the water column is considered comparable to that which would occur in the absence of any project activities. Additionally, the nutrient sensitive area is an onshore designation and does not fall within the 2 km buffer. As such, it is considered unlikely that the Dublin Array project activities will result in its deterioration in nutrient sensitive areas.

Natura 2000 sites

5.8.7 One Natura 2000 sites (SPA; SAC) is present within 2 km of the Offshore ECC (**Error! Reference source not found.**Table 4). The identified protected area (Rockabill to Dalkey Island SAC) have been subjected to the Appropriate Assessment process (detailed within the Supporting Information for Screening for Appropriate Assessment (SISAA) and NIS). The conclusions of this process on the protected site within 2 km of the project boundary is presented in Part 4: Habitats Directive Assessments, Volume 4: NIS.

5.8.8 The proposed development is considered to be compliant with the WFD requirements and would not result in a deterioration of the current status of the relevant WFD elements of the designated Rockabill to Dalkey Island SAC site.

6 MSFD assessment

6.1.1 The production of energy is a theme human activities of relevance to the marine environment, as per Table 6 and Table 2b of the MSFD.

6.1.2 MSFD targets of relevance have been considered in this MSFD assessment. On the basis of the assessment outlined in Table 6 below, the proposed development is not anticipated to adversely affect the MSFD targets and will support Ireland in meeting the production of energy objectives.

Table 6 Indicative list of human activities relevant to the marine waters

Theme	Activity
Physical restructuring of rivers, coastline or seabed (water management)	Land claim
	Canalisation and other watercourse modifications
	Coastal defence and flood protection
	Offshore structures (other than for oil/gas/renewables)
	Restructuring of seabed morphology, including dredging and depositing of materials
Extraction of non-living resources	Extraction of minerals (rock, metal ores, gravel, sand, shell)
	Extraction of oil and gas, including infrastructure
	Extraction of salt
	Extraction of water
Production of energy	Renewable energy generation (wind, wave and tidal power), including infrastructure
	Non-renewable energy generation
	Transmission of electricity and communications (cables)
Extraction of living resources	Fish and shellfish harvesting (professional, recreational)
	Fish and shellfish processing
	Marine plant harvesting
	Hunting and collecting for other purposes
Cultivation of living resources	Aquaculture — marine, including infrastructure
	Aquaculture — freshwater
	Agriculture
	Forestry
Transport	Transport infrastructure
	Transport — shipping
	Transport — air
	Transport — land
Urban and industrial uses	Urban uses
	Industrial uses
	Waste treatment and disposal
Tourism and leisure	Tourism and leisure infrastructure
	Tourism and leisure activities
Security/Defence	Military operations (subject to Article 2(2))
Education and research	Research, survey and educational activities

Table 7 MSFD descriptors of relevance and how these have been considered in the EIAR

Descriptor	Target Code	Target Description	How this has been considered in the Applicant's EIAR
D1 Biodiversity	IE-D1T1	The mortality rate per species from incidental by-catch is below levels which threaten the species, such that its long-term viability is ensured.	The different species groups identified in Annex Three of Ireland Marine Strategy Program of Measures are considered within various chapters of the EIA. The proposed development will have no impacts on incidental by-catch due to the absence of fishing equipment, as demonstrated in Volume 2, Chapter 6: Project Description. As such, by-catch is not applicable to the EIAR.
	IE-D1T2	The population abundance of the species is not adversely affected due to anthropogenic pressures, such that its long-term viability is ensured.	Modelling and surveys have been undertaken to support these findings by collating data on the population abundance of fish, marine mammal and bird species, as outlined in the following appendices: Appendix 4.3.4-2: A Fisheries survey of the Kish and Bray Banks, Appendix 4.3.5-2: Dublin Array OWF Marine Mammal Abundance Estimates 2019-2021, Appendix 4.3.5-3: Estimating harbour porpoise abundance using spatial and temporal modelling and Appendix 4.3.6-7: Population Viability Analysis. The effects of the proposed development on the population abundance of vertebrate species, excluding non-commercial fish species, are assessed in: Volume 3, Chapter 4: Fish and Shellfish Ecology, Volume 3, Chapter 5: Marine Mammal Ecology, Volume 3, Chapter 6: Offshore Ornithology, Volume 4, Chapter 7: Bats and Volume 3, Chapter 9: Commercial Fisheries. These assessments concluded no adverse effects on the population abundance or the long-term viability of the species.

Descriptor	Target Code	Target Description	How this has been considered in the Applicant's EIAR
	IE-D1T4	The species distributional range and, where relevant, pattern is in line with prevailing physiographic, geographic and climatic conditions.	Species distribution of marine birds is presented in the Winter 2019/20 and Autumn 2020 survey data (Appendix 4.3.6-8) and subsequently assessed in Volume 3, Chapter 6: Offshore and Intertidal Ornithology. Species distributions of marine mammals are presented in the 2019/20 and 2020/21 survey reports (Appendix 4.3.5-4 and 4.3.5-5) and are discussed in Appendix 4.3.5-1 Marine Mammal Technical Baseline. The distribution of fish and shellfish species is considered within Volume 3, Chapter 5: Fish and Shellfish Ecology. A fisheries survey of the Kish and Bray Banks was undertaken, with results presented in Appendix 4.3.4-2: A Fisheries survey of the Kish and Bray Banks. The assessment has concluded that the proposed development will have no significant impact on the distributional range and pattern of relevant species. The relevant species will remain in line with prevailing physiopgraphic, geographic and climatic conditions.
	IE-D1T5	The habitat for the species has the necessary extent and condition to support the different stages in the life history of the species.	The habitats for relevant species are assessed in Section 4.16: Impacts 1 and 2, Section 4.17: Impacts 6, 7, 9, 10 and 11, and Section 4.18: Impact 13 of Volume 3, Chapter 4: Fish and Shellfish Ecology, Section 5.13: Impact 6, Section 5.14: Impact 14 and Section 5.15: Impact 18 of Volume 3, Chapter 5: Marine Mammal Ecology, and Section 6.15: Impact 5, Section 6.16: Impacts 7, 9 and 10 of Volume 3, Chapter 6: Offshore and Intertidal Ornithology. The assessments in the EIAR conclude that there are no significant effects relating to the extent and condition of habitats for supporting the different stages in the life history of species.

Descriptor	Target Code	Target Description	How this has been considered in the Applicant's EIAR
D2 Non-indigenous Species	IE-D2T1	The number of non-indigenous species which are newly introduced via human activity into the wild, per assessment period is minimised and where possible reduced to zero.	Within the Project Environmental Management Plan (PEMP; Volume 7: 7.1), a marine biosecurity plan details how the risk of introduction and spread of invasive non-native species will be minimised following relevant best practice guidelines. Any vessels used for the delivery of materials to site will adhere to industry legislation, codes of conduct and/or best practice to reduce the risk of introduction or spread of invasive non-native species. The potential for introduction of IAS and translocations is presented under Impact 6 in Section 3.16, and Impact 11 in Section 3.17 of Volume 3, Chapter 3: Benthic Subtidal and Intertidal Ecology and Section 5.7 above. Through the implementation of the PEMP assessments, it has been concluded that the spread of invasive non-native species will be minimised (and where possible reduced to zero).
D3 Commercial Fish and Shellfish	IE-D3T1	The Fishing mortality rate of populations of commercially exploited species is at or below levels which can produce the maximum sustainable yield (MSY).	There are no activities associated with the proposed development which will increase the fishing mortality rate of commercially exploited populations. The assessments in the EIAR conclude no significant effects relating to fish species at a population level. As such, there will be no significant effects on the MSY as a result of the proposed development due to increase in fishing mortality.
	IE-D3T2	The Spawning Stock Biomass of populations of commercially exploited species are above biomass levels capable of producing maximum sustainable yield.	The Fish and Shellfish Ecology Technical Baseline (Appendix 4.3.4-1) considers fish and shellfish spawning in the receiving environment. Sections 4.16 - 4.18 of Volume 3, Chapter 4: Fish and Shellfish Ecology assesses the impact of the proposed development on fish and shellfish habitats, including spawning grounds. Volume 3, Chapter 9: Commercial Fisheries assesses the subsequent impact of these changes for commercial fish and shellfish resources in Sections 4.14 to 4.16.

Descriptor	Target Code	Target Description	How this has been considered in the Applicant's EIAR
			A Fisheries Management and Mitigation Strategy (FMMS) has been produced as part of the EIAR to detail liaison, co-existence and mitigation strategies for commercial fisheries, including measures to mitigate any potential impacts on spawning grounds or areas of fish and shellfish abundance. The assessments conclude that there will be no significant effects on the spawning stock biomass of commercially exploited species as a result of the proposed development.
D4 Food Webs	IE-D4T1	The diversity (species composition and their relative abundance) of the trophic guild is not adversely affected due to anthropogenic pressures.	The EIAR provides a comprehensive assessment of the effects of the proposed development on biodiversity, including relationships between predators and prey, and concluded no significant effects. No adverse effects are anticipated on trophic guilds as a result of the proposed development.
	IE-D4T2	The balance of total abundance between the trophic guilds is not adversely affected due to anthropogenic pressures.	The EIAR provides a comprehensive assessment of the effects of the proposed development on species abundance, concluding no significant effects. No adverse effects are anticipated on the abundance of trophic guilds as a result of the proposed development.
D5 Eutrophication	IE-D5T1	Nutrient concentrations are not at levels that indicate adverse eutrophication effects.	There are no nutrient sensitive areas within 2 km of the offshore infrastructure (Section 4.4) and the proposed activities will not release significant concentrations of organic matter from seabed sediments (Section 5.4). As outlined in Section 5.4 above and Sections 2.13-2.15 (Impacts 1, 5, and 7) of Volume 3, Chapter 2: Marine Water and Sediment Quality, offshore activities are not anticipated to result in significant adverse eutrophication effects.

Descriptor	Target Code	Target Description	How this has been considered in the Applicant's EIAR
	IE-D5T2	Chlorophyll a concentrations are not at levels that indicate adverse effects of nutrient enrichment.	As outlined in Section 5.4 above, the proposed activities will not affect phytoplankton levels, and chlorophyll a concentrations, as no significant concentrations of nutrients will be released. Sections 2.13-2.15 (Impacts 1, 5, and 7) of Volume 3, Chapter 2: Marine Water and Sediment Quality concludes that offshore activities are not anticipated to result in eutrophication effects or reduction of dissolved oxygen. No adverse effects of nutrient enrichment are anticipated as a result of the proposed development.
	IE-D5T3	The concentration of dissolved oxygen is not reduced due to nutrient enrichment.	The proposed activities are not anticipated to affect dissolved oxygen as no nutrients of organic matter are anticipated to be released in significant concentrations (Section 5.4). As demonstrated within Section 2.7 of Part 1: Volume 3, Chapter 2: Marine Water and Sediment Quality dissolved oxygen levels vary between ~ 95 -125% close to or above saturation level at all four Marine institute monitoring systems. The potential for the offshore activities to result in reduction of dissolved oxygen is not considered to have significant effects, as assessed in Sections 2.11 to 2.13 (Impacts 1, 5, and 7). No nutrient enrichment or concentrations of dissolved oxygen is anticipated.
D6 Sea-floor Integrity	IE-D6T1	The spatial extent and distribution of physical loss (permanent change) of the natural seabed is at a level that ensures that the structure and functions of the ecosystems are safeguarded and that benthic ecosystems, in particular, are not adversely affected	The potential for physical loss by smothering, and damage from changes in siltation on benthos are presented under Impacts 1 and 2 in Section 3.16, Impact 8 in Section 3.17 and Impact 14 in Section 3.18 of Volume 3, Chapter 3: Benthic, Subtidal and Intertidal Ecology. Consideration of long term physical loss of habitat is assessed in Impact 7 in Section 3.17 of Volume 3, Chapter 3: Benthic, Subtidal and Intertidal Ecology. The assessment concludes no significant adverse effects from the proposed development from habitat loss that adversely effects that the structure and functions of the benthic ecosystems.

Descriptor	Target Code	Target Description	How this has been considered in the Applicant's EIAR
	IE-D6T2	The spatial extent and distribution of physical disturbance pressures on the seabed is at a level that ensures that the structure and functions of the ecosystems are safeguarded and that benthic ecosystems, in particular, are not adversely affected.	Physical disturbance pressures on the seabed from Dublin Array individually are considered within Section 1.12 of Volume 3, Chapter 1: Marine Geology, Oceanography and Physical Processes. Consideration of the effects structure and function of ecosystems as a result of the proposed development was considered in Sections 3.16 to 3.18 of Volume 3, Chapter 3: Benthic, Subtidal and Intertidal Ecology. The assessment concludes no significant effects on structure and functions of benthic ecosystems from the proposed development.
	IE-D6T4	The extent of loss of the habitat type, resulting from anthropogenic pressures, does not exceed a specified proportion of the natural extent of the habitat type in the assessment area.	Volume 3, Chapter 3: Benthic, Subtidal and Intertidal Ecology considers habitat loss throughout the environmental assessment (Sections 3.16 to 3.18), concluding no significant adverse effects on benthic habitats as a result of the proposed development, which loss does not exceed a specified proportion[9] of the natural extent of the habitat type in the assessment area.
	IE-D6T5	The extent of adverse effects from anthropogenic pressures on the condition of the habitat type, including alteration to its biotic and abiotic structure and its functions, does not exceed a specified proportion of the natural extent of the habitat type in the assessment area.	The extent of adverse effects on the condition of habitat types is used to form the basis of the environmental assessment throughout Sections 3.16 to 3.18 of Volume 3, Chapter 3: Benthic, Subtidal and Intertidal Ecology. Adverse effects are restricted in extent and are not anticipated to have significant adverse effects on benthic habitats as a result of the proposed development and does not exceed a specified proportion[9] of the natural extent of the habitat type in the assessment area.
D7 Hydrographical Conditions	IE-D7T1	The spatial extent and distribution of permanent alteration of hydrographical	Hydrographical conditions are defined in Section 3.1 of the Physical Processes Modelling Report (Appendix 4.3.1-2). The project specific

[9] The total area of the footprint of the foundations and rock protection equates to approximately 1.12% of the subtidal environment within the array area and Offshore ECC, which is regarded as negligible on a western Irish Sea regional scale.

Descriptor	Target Code	Target Description	How this has been considered in the Applicant's EIAR
		conditions to the seabed and water column is at a level that ensures that the structure and functions of the ecosystems are safeguarded and that benthic ecosystems, in particular, are not adversely affected.	modelling predicted changes for all stages of the tide are less than circa 0.1 cm (1 mm), with the exception of the peak flood and ebb stages of a mean spring tide, where changes of up to ± 0.2 cm (2 mm) are predicted. Such changes are, in reality, immeasurable. The maximum extent of this small change beyond the array area is up to, approximately, 2 km from the southern edge of this site. The model predicted that the changes to significant wave heights would be limited to within the array area and its immediate vicinity (up to 200 m from the array boundary). Based on an analysis of the bed shear stress it was concluded that no meaningful change to the sediment regime will occur at locations of structures in the array. Therefore, the spatial extent and distribution of alterations to hydrographical conditions will not be adversely effects as a result of the proposed development. Impact 12 in Section 3.17 of Volume 3, Chapter 3: Benthic, Subtidal and Intertidal Ecology assessed the changes to seabed habitats as a result of potential changes to hydrodynamics and sedimentary transport arising from the proposed development. No significant alterations of the hydrographical conditions to the seabed and water column is anticipated as a result of the proposed development. Therefore, no adverse effects are anticipated on ecosystem structure or function as a result of the proposed development.
D8 Contaminants	IE-D8T1a	Within coastal and territorial waters, the concentrations of contaminants do not exceed the threshold values set in accordance with Directive 2000/60/EC.	The potential release of contaminants into the marine environment is considered in Sections 2.13 to 2.15 (Impacts 2, 5 and 7) of Volume 3, Chapter 2: Marine Water and Sediment Quality, with no significant adverse effects concluded to result from offshore works and no exceedance of the threshold values are anticipated as a result of the proposed development.

Descriptor	Target Code	Target Description	How this has been considered in the Applicant's EIAR
			Potential contaminant concentrations from accidental spills of construction materials and chemicals will be controlled by measures captured within the Project Environment Management Plan (PEMP).
	IE-D8T1b	Concentration of contaminants in marine matrices are assessed in accordance with OSPAR Coordinated Environmental Monitoring Programme (CEMP) do not exceed OSPAR Environmental Assessment Criteria (EAC) and concentrations are not increasing.	The potential release of contaminants into the marine environment is considered in Sections 2.13 to 2.15 (Impacts 2, 5 and 7) of Volume 3, Chapter 2: Marine Water and Sediment Quality, with no significant adverse effects concluded to result from offshore works. These assessments considered exceedances of the Irish Action Levels which are informed by the OSPAR guidelines. No exceedances of the Irish Action Levels (of the Environmental Assessment Criteria) are anticipated as a result of the proposed development.
	IE-D8T2	The health of species and the condition of habitats (such as their species composition and relative abundance at locations of chronic pollution) are not adversely affected due to contaminants including cumulative and synergistic effects.	Impacts 5, 9 and 17 (Section 3.16 to Section 3.18) of Volume 3, Chapter 3: Benthic, Subtidal and Intertidal Ecology assess the effects of potential contaminants on benthic ecology, with Section 3.20 considering the interrelationships with other factors. No effects on the health of species or condition of habitats from contaminants are assessed as significant in the project-alone assessment and the effects of contaminants and accidental pollution on benthic subtidal and intertidal receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase. Therefore, the health of species and the condition of habitats are not anticipated to be adversely affected due to contaminants cumulatively or by synergistic effects.
	IE-D8T3	The spatial extent and duration of significant acute pollution events are minimised.	Due to the mitigation measures, the spatial extent and duration of significant acute pollution events are minimized as presented within

Descriptor	Target Code	Target Description	How this has been considered in the Applicant's EIAR
			Marine Pollution Contingency Plan (MPCP) (Volume 7: Contingency Plan MPCP), presented within the PEMP (Volume 7: PEMP 7.1).
D9 Contaminants in Seafood	IE-D9T1	Levels of contaminants in fish* and shellfish caught or harvested in Irish seas for human consumption complies with maximum limits listed in EU Regulation 1881/2006 (as amended).	The effects of contaminants on fish and shellfish receptors are assessed as not discernible from baseline conditions, concluding potential effects as not significant, in Impacts 3, 8 and 14 of Sections 4.16-4.18 of Volume 3, Chapter 4: Fish and Shellfish Ecology. Therefore, no changes in the level of contaminants in fish and shellfish for human consumption are anticipated as a result of the proposed development.
D10 Marine Litter	IE-D10T1a	The composition, amount and spatial distribution of litter in the coastline, and on the seabed, are at levels that do not cause harm to the coastal or marine environment.	There will be no litter discharged into the maritime area, either accidentally or intentionally, as part of any phase of the proposed development. As such, the composition, amount and spatial distribution of litter in the coastline and on the seabed are not anticipated to increase as a result of offshore activities.
	IE-D10T1b	In accordance with the provisions of Article 5 of Directive (EU) 2019/904 by year- end 2023 eliminate beach litter caused by the items prohibited from the market under that Directive. These items are; plastic cotton bud sticks, disposable plastic cutlery and plates, plastic straws, plastic beverage stirrers, plastic balloon sticks, expandable polystyrene fast food containers and expandable polystyrene beverage containers and cups.	No plastic cotton bud sticks, disposable plastic cutlery and plates, plastic straws, plastic beverage stirrers, plastic balloon sticks, expandable polystyrene fast food containers or expandable polystyrene beverage containers and cups will be used as part of the proposed development.
D11 Energy including Underwater Noise	IE-D11T1	The spatial distribution, temporal extent, and levels of anthropogenic impulsive sound sources do not exceed levels that	Underwater noise is considered within Volume 4, Appendix 4.3.5-7: Underwater noise assessment and assessed based upon the MDO within Section 5.2. Modelling results of underwater noise are presented in

Descriptor	Target Code	Target Description	How this has been considered in the Applicant's EIAR
		adversely affect populations of marine animals.	Section 4 within Volume 4, Appendix 4.3.5-7: Underwater noise assessment. Impacts of anthropogenic impulsive sound sources, both piling and UXO clearance, on fish species was assessed in Impact 4 in Section 4.16 of Volume 3, Chapter 4: Fish and Shellfish Ecology. The assessment concluded no ecologically significant adverse effects on fish species. Impacts of anthropogenic impulsive sound sources, both piling and UXO clearance, in Impacts 3 to 6 in Section 5.13 of Volume 3, Chapter 5: Marine Mammals. The assessments concluded no ecologically significant adverse effects on marine mammal species. The spatial distribution, temporal extent and levels of impulsive sound sources will not exceed levels that will adversely affect populations of marine animals as a result of the proposed development.

7 Conclusions

7.1.1 This WFD Assessment has considered the potential effects of Dublin Array to ensure that the proposed activities offshore would not cause a deterioration of status or jeopardise any waterbodies from achieving Good status. The conclusions of the different elements of the WFD assessment are summarised in Table 8.

7.1.2 The conclusions reached for this WFD assessment are also applicable to the Marine Strategy Framework Directive. In particular, the proposed activities of Dublin Array offshore are not considered to hinder the achievement of Good Environmental Status as prescribed under the water quality and invasive species policies.

7.1.3 As outlined in Table 7, the assessment of the proposed development has concluded there to be no significant effects on any Descriptors of the MSFD, with mitigation measures in place to minimise potential adverse effects.

Table 8 Conclusions of the WFD assessment

Receptor	Conclusion
Hydromorphology (Section 5.3)	Dublin Array will not result in a deterioration of the current status of these waterbodies or jeopardise the attainment of good status.
Water quality (Section 5.4)	Dublin Array will not result in a deterioration of the current status of these waterbodies or jeopardise the attainment of good status.
Biology – habitats (Section 5.4.12)	Dublin Array will not result in a deterioration of the current status of these waterbodies or jeopardise the attainment of good status.
Biology – fish (Section 5.6)	Dublin Array will not result in a deterioration of the current status of these waterbodies or jeopardise the attainment of good status.
Marine invasive and non-native species (Section 5.75.6.11)	Dublin Array will not result in a deterioration of the current status of these waterbodies or jeopardise the attainment of good status.
Protected Areas (Section 5.8)	No deterioration in the current status of the BWs are predicted. No deterioration in the current status of the nutrient sensitive area is predicted. No Adverse Effect on Integrity on Natura 2000 sites for the relevant WFD elements is predicted.

8 References

Che, X., Wang, Y., Sun, T., Huang, Y., Chen, Zhang, M., and Ye, C. (2021). Effects of sediment dredging on nutrient release and eutrophication in the gate-controlled estuary of norther Taihu Lake. Journal of Chemistry, Volume 2020, Article ID 7457832, 13pp.

Department of Housing, Local Government and Heritage (2021). 'Project Ireland 2040 – National Marine Planning Framework', draft 23 March 2021. Available online: https://opac.oireachtas.ie/Data/Library3/Documents%20Laid/2021/pdf/HLGHdocslaid240321_240321_172341.pdf

Department of Housing, Local Government and Heritage (2024). 'River Basin Management Plan 2022 – 2027', Available from: https://www.gov.ie/en/policy-information/8da54-river-basin-management-plan-2022-2027/ [Accessed January 2025]

Environment Agency (2023), 'Clearing the Waters for All. Water Framework Directive assessment: estuarine and coastal waters guidance.', Available from: https://www.gov.uk/guidance/water-framework-directive-assessment-estuarine-and-coastal-waters [Accessed November 2024]

European Communities (Quality of Shellfish Waters) Regulations 2006 (S.I. No. 268 of 2006). Available online: https://www.irishstatutebook.ie/eli/2006/si/268/made/en/print [Accessed January 2025].

Environmental Protection Agency (2021a) 'Ireland's National Water Framework Directive Monitoring Programme 2019 - 2021, Available online: https://www.epa.ie/publications/monitoring--assessment/freshwater--marine/EPA_WFD_MonitoringProgramme_2019_2021-(1).pdf [Accessed November 2024]

Environmental Protection Agency (2021b) 'Bathing Water Quality in Ireland: A report for the year 2020. Available online: https://www.epa.ie/publications/monitoring--assessment/freshwater--marine/Bathing_Water_Quality_in_Ireland_2020.pdf. [Accessed November 2024]

Environmental Protection Agency (2021c), 'Waterbody: Southwestern Irish Sea - Killiney Bay (HA10)' https://www.catchments.ie/data/#/waterbody/IE_EA_100_0000?_k=gnjebx [Accessed November 2024].

Environmental Protection Agency (2020) 'Water Quality in 2019 - an indicators report', Available online: http://www.epa.ie/pubs/reports/water/waterqua/waterqualityin2019-anindicatorsreport.html [Accessed November 2024]

Environmental Protection Agency (2020) 'Urban Waste Water Treatment in 2019', Available online: http://www.epa.ie/pubs/reports/water/wastewater/Urban%20waste%20water%20treatment%20in%202019%20Report%20%20web%20version.pdf [Accessed November 2024]

Environmental Protection Agency (2019) 'Water Quality in Ireland 2013-2018', Available online: http://www.epa.ie/pubs/reports/water/waterqua/waterqualityinireland2013-2018.html [Accessed November 2024]

Environmental Protection Agency Catchments Unit (2019) 'Significant Pressure: Invasive Species', Available online: Significant Pressures: Invasive Species - Catchments.ie - Catchments.ie [Accessed November 2024]

Environmental Protection Agency catchments (2018) 'Liffey Catchment Assessment 2010-2015 (HA 09), Available online: https://catchments.ie/wp-content/files/catchmentassessments/09%20Liffey%20and%20Dublin%20Bay%20Catchment%20Summary%20WFD%20Cycle%202.pdf [Accessed November 2024]

Environmental Protection Agency (2017) Radioactivity Monitoring of the Irish Environment 2014-2015, Available:

http://www.epa.ie/pubs/reports/radiation/RPT_Monitoring_Data_2014_2015.pdf [Accessed November 2024]
National Roads Authority (2008), 'Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes', https://www.tii.ie/media/llvnszei/guidelines-on-procedures-for-assessment-and-treatment-of-geology-hydrology-and-hydrogeology-for-national-road-schemes.pdf [Accessed November 2024].
Government of Ireland, 'The Water Action Plan 2024', Available online: https://lawaters.ie/app/uploads/2024/09/Water-Action-Plan-2024_ENG_v5.pdf [Accessed January 2025].
RPS (2021). Maintenance Dredging Programme 2022 – 2029: Application for Foreshore Licence. Water Quality Risk Assessment. Report for Dublin Port Company
Sea-Fisheries Protection Authority (2021),' 2024/2025 List of Classified Bivalve Mollusc Production Areas in Ireland (5th March 2024)', Available online: https://www.sfpa.ie/What-We-Do/Molluscan-Shellfish/Classified-Areas [Accessed November 2024]

Unit 5,
Desart House,
Lower New Street,
Kilkenny
www.rwe.com

Registered office:
Unit 5,
Desart House,
Lower New Street,
Kilkenny