Environmental Impact Assessment Report

Volume 3

Chapter 8 Subtidal and Intertidal Ecology

codling wind park

Table of contents

List of tables

List of figures

Abbreviations

Abbreviation	Term in full
AEZ	Archaeological exclusion zone
CEMP	Construction Environmental Management Plan
CIEEM	Chartered Institute of Ecology and Environmental Management
CWP	Codling Wind Park
CWPL	Codling Wind Park Limited
DCCAE	Department of Communications, Climate Action & Environment
EcIA	Ecological Impact Assessment
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EMF	Electromagnetic Fields
EPA	Environmental Protection Agency
EU	European Union
FOCI	Feature of Conservation Interest
HPI	Habitat of Principal Importance
IAM	Impact Assessment Matrix
INNS	Invasive non-native species
LoD	Limit of Deviation
MAP	Maritime Area Planning
MarESA	Marine Evidence based Sensitivity Assessment
MarLIN	Marine Life Information Network
MI	Marine Institute
MSDA	Marine Safety Demarcation Area
MSFD	Marine Strategy Framework Directive
NIS	Natura Impact Statement
NPWS	National Parks and Wildlife Services
O&M	Operations and maintenance
OECC	Offshore export cable corridor
ORE	Offshore renewable energy
OWF	Offshore wind farm
OSS	Offshore substation structure
SAC	Special Area of Conservation

Abbreviation	Term in full
SPA	Special Protection Area
SSC	Suspended Sediment Concentration
TJB	Transition joint bay
WFD	Water Framework Directive
WTG	Wind turbine generator
ZoI	Zone of influence

Definitions

Glossary	Meaning
the Applicant	The developer, Codling Wind Park Limited (CWPL).
array site	The red line boundary area within which the wind turbine generators (WTGs), inter-array cables (IACs) and the Offshore Substation Structures (OSSs) are proposed.
Codling Wind Park (CWP) Project	The proposed development as a whole is referred to as the Codling Wind Park (CWP) Project, comprising the offshore infrastructure, the onshore infrastructure and any associated temporary works.
Codling Wind Park Limited (CWPL)	A joint venture between Fred. Olsen Seawind (FOS) and Électricité de France (EDF) Renewables, established to develop the CWP Project.
Environmental Impact Assessment (EIA)	A systematic means of assessing the likely significant effects of a proposed project, undertaken in accordance with the EIA Directive and the relevant Irish legislation.
Environmental Impact Assessment Report (EIAR)	The report prepared by the Applicant to describe the findings of the EIA for the CWP Project.
export cables	The cables, both onshore and offshore, that connect the offshore substations with the onshore substation.
generating Station	Comprising the wind turbine generators (WTGs), inter-array cables (IACs) and the interconnector cables.
high Water Mark (HWM)	The line of high water of ordinary or medium tides of the sea or tidal river or estuary.
inter-array cables (IACs)	The subsea electricity cables between each WTG and the OSSs.
interconnector cables	The subsea electricity cables between OSSs.
landfall	The point at which the offshore export cables are brought onshore and connected to the onshore export cables via the transition joint bays (TJB). For the CWP Project the landfall works include the installation of the offshore export cables within Dublin Bay out to approximately 4 km offshore, where water depths that are too shallow for conventional cable lay vessels to operate.
limit of deviation (LoD)	Locational flexibility of permanent and temporary infrastructure is described as a LoD from a specific point or alignment.
Maritime Area Consent (MAC)	A Maritime Area Consent (MAC) provides State authorisation for a prospective developer to undertake a maritime usage and occupy a specified part of the maritime area. A MAC is required to be in place before planning consent can be sought.

Glossary	Meaning
Maritime Area Planning (MAP) Act 2021	An Act to regulate the maritime area, to achieve such regulation by means of a National Marine Planning Framework, maritime area consents for the occupation of the maritime area for the purposes of maritime usages that will be undertaken for undefined or relatively long periods of time (including any such usages which also require development permission under the Planning and Development Act 2000) and licences for the occupation of the maritime area for maritime usages that are minor or that will be undertaken for relatively short periods of time
offshore development area	The total footprint of the offshore infrastructure and associated temporary works including the array site and the OECC.
offshore export cables	The cables which transport electricity generated by the wind turbine generators (WTGs) from the offshore substation structures (OSSs) to the TJBs at the landfall.
offshore export cable corridor (OECC)	The area between the array site and the landfall, within which the offshore export cables cable will be installed along with cable protection and other temporary works for construction.
offshore infrastructure	The permanent offshore infrastructure, comprising the WTGs, IACs, OSSs, Interconnector cables, offshore export cables and other associated infrastructure such as cable and scour protection.
offshore substation structure (OSS)	A fixed structure located within the array site, containing electrical equipment to aggregate the power from the wind turbine generators and convert it into a more suitable form for export to shore.
OSS Topside	This is the offshore substation topside structure resting on the OSS monopile foundation and housing all electrical and ancillary equipment. This includes all systems such as electrical, SCADA, safety and mechanical equipment.
OSS monopile foundation	This is the bottom fixed structure piled to the seabed supporting the OSS Topside. It consists of a monopile and a transition piece. It can include systems such as electrical, SCADA, cathodic protection, safety and mechanical equipment.
offshore Transmission Infrastructure (OfTI)	The offshore transmission assets comprising the OSSs and offshore export cables. The EIAR considers both permanent and temporary works associated with the OfTI.
operations and maintenance (O&M) activities	Activities (e.g., monitoring, inspections, reactive repairs, planned maintenance) undertaken during the O&M phase of the CWP Project.
O&M phase	This is the period of time during which the CWP project will be operated and maintained.
operations and maintenance base (OMB)	The operational and maintenance facilities to support the CWP Project, including buildings/warehouses, laydown areas, cranes, parking and marine works such as pontoons for maintenance vessels.

Glossary	Meaning
parameters	Set of parameters by which the CWP Project is defined, and which are used to form the basis of assessments.
Phase 1 Project	Under the special transition provisions in the Maritime Area Planning Act 2021, as amended (the MAP Act), the Minister for the Department of Environment, Climate and Communications (DECC) has responsibility for assessing and granting a Maritime Area Consent (MAC) for a first phase of offshore wind projects in Ireland. The Phase 1 Projects include Oriel Wind Park, Arklow Bank II, Dublin Array, North Irish Sea Array, Codling Wind Park and Skerd Rocks. A MAC has since been granted by DECC for each of the Phase 1 Projects.
planning application boundary	The area subject to the application for development consent, including all permanent and temporary works for the CWP Project.
zone of Influence (ZoI)	Spatial extent of potential impacts resulting from the project.

8 SUBTIDAL AND INTERTIDAL ECOLOGY

8.1 Introduction

1. Codling Wind Park Limited (hereafter 'the Applicant') is proposing to develop the Codling Wind Park (CWP) Project, which is located in the Irish sea approximately 13–22 km off the east coast of Ireland, at County Wicklow.

2. This chapter forms part of the Environmental Impact Assessment Report (EIAR) for the CWP Project. The purpose of the EIAR is to provide the decision-maker, stakeholders and all interested parties with the environmental information required to develop an informed view of any likely significant effects resulting from the CWP Project, as required by the European Union (EU) Directive 2011/92/EU (as amended by Directive 2014/52/EU) (the EIA Directive) and as transposed into Irish law by the Maritime Area Planning (MAP) Act 2021, as amended, and the Planning and Development Act 2000, as amended.

3. This EIAR chapter describes the potential impacts of the CWP Project's Offshore Infrastructure on subtidal and intertidal ecology during the construction, operations and maintenance (O&M) and decommissioning phases.

4. In summary, this EIAR chapter:

- Details the EIA scoping and consultation process undertaken and sets out the scope of the impact assessment for subtidal and intertidal ecology;
- Identifies the key legislation and guidance relevant to subtidal and intertidal ecology, with reference to the latest updates in guidance and approaches;
- Confirms the study area for the assessment and presents the impact assessment methodology for subtidal and intertidal ecology;
- Describes and characterises the baseline environment for subtidal and intertidal ecology, established from desk studies, project survey data and consultation;
- Defines the project design parameters for the impact assessment and describes any embedded mitigation measures relevant to the subtidal and intertidal ecology assessment;
- Presents the assessment of potential impacts on subtidal and intertidal ecology and identifies any assumptions and limitations encountered in compiling the impact assessment; and
- Details any additional mitigation and / or monitoring necessary to prevent, minimise, reduce or offset potentially significant effects identified in the impact assessment.

5. The assessment should be read in conjunction with **Appendix 8.1 Subtidal and Intertidal Ecology** Cumulative Effects Assessment (CEA), which considers other plans, projects and activities that may act cumulatively with the CWP Project and provides an assessment of the potential cumulative impacts on subtidal and intertidal ecology.

6. A summary of the CEA for subtidal and intertidal ecology is presented in **Section 8.11 Cumulative impacts**.

7. Additional information to support the assessment includes:

- **Appendix 6.3 Marine Geology, Sediments and Coastal Processes Modelling Report**;
- **Appendix 8.2 Representative Scenario and Limits of Deviation Assessment;**
- **Appendix 8.3 Benthic Baseline Report**; and
- **Appendix 8.4 Marine Protected Areas Assessment Report**.

8.2 Consultation

8. Consultation with statutory and non-statutory organisations is a key part of the EIA process. Consultation with regard to subtidal and intertidal ecology has been undertaken to inform the approach to and scope of the assessment.

9. The key elements to date have included EIA scoping, consultation events and ongoing topic specific meetings with key stakeholders. The feedback received throughout this process has been considered in preparing the EIAR. EIA consultation is described further in **Chapter 5 EIA Methodology,** the **Planning Documents** and in the **Public and Stakeholder Consultation Report**, which has been submitted as part of the development consent application.

10. **Table 8-1** provides a summary of the key issues raised during the consultation process relevant to subtidal and intertidal ecology and details how these issues have been considered in the production of this EIAR chapter.

Table 8-1 Consultation responses relevant to subtidal and intertidal ecology

Consultee	Comment	How issues have been addressed
Scoping responses		
National Parks and Wildlife Services (NPWS). 26 January 2021	NPWS had no comments to make on the Scoping Report. However, advised would discuss the Scoping Report at scoping meeting.	No issues to address, however, scoping meeting arranged.
Marine Institute (MI) 3 February 2021	MI advised that establishing a baseline is critical to assessing likely impact of the activities as well as any future monitoring. It is important to assist in identifying the likely impacts of the proposed development on the environment. It is the advice of the Marine Institute that the scale of effects of the proposed development be considered beyond the footprint of the turbines and the licenced area.	The scale of effects has been considered beyond the footprint of the turbines and licenced area. See **Section 8.4** for study area description. A detailed baseline has been established for this impact assessment and is provided in **Section 8.6**.
Topic specific meetings		
NPWS 27 February 2021	Brief discussion on benthic habitat in terms of pre- and post-construction monitoring. Impacts to benthos considered low risk providing the turbines and cables are sited away from sensitive areas / habitats. CWP advised that the UK Government produced a report in 2014 reviewing all post construction monitoring undertaken and it was	Impacts on benthic habitats from the Offshore Development are assessed in **Section 8.10 Impact assessment**. Potential monitoring requirements are discussed in **Sections 8.9 and 8.14**.

Consultee	Comment	How issues have been addressed
	considered that offshore wind farms (OWFs) have not had significant adverse impact on benthic habitats and associated faunal communities and where changes were evident, they were largely attributed to natural variability (MMO, 2014).	
	Discussion on cumulative assessment EIA guidance from 2017 suggests that only consented projects are to be considered in the assessment. It was advised that there was no formal observation from NPWS, however a min / max scenario where min is only those projects that are consented and max is inclusive of projects that could be consented in the time between assessment and works commencing was suggested.	A tiered approach to cumulative impact assessment has been adopted whereby projects in planning or consented or constructed have been considered in the EIAR. **Appendix 8.1 CEA**, **Cumulative Effects Assessment**.
NPWS 15 April 2021	List of data sources and guidance documents approach to data gathering agreed.	Guidance documents include the Department of Communications, Climate Action & Environment (DCCAE) guidance documents for Offshore Renewable Energy (ORE) projects. Listed in **Section 8.3 Legislation, policy and guidance**.
	Scope of assessment agreed. NPWS agreed with scoping out pollution events but requested invasive non-native species (INNS) are considered during construction phase. Due consideration to be given to Electromagnetic Fields (EMF). Cumulative Impact Assessment projects agreed on provision projects are updated as far as possible prior to submission. Approach to Appropriate Assessment agreed.	The impact of project-related accidental pollution events has however been considered in the assessment (**Section 8.10**). The potential impact of INNS and EMF on the benthos has been assessed in **Section 8.10 Impact assessment**. Cumulative Impacts addressed in **Appendix 8.1 Cumulative Effects Assessment.** Appropriate Assessment (AA) Screening and Natura Impact Statement (NIS).

Consultee	Comment	How issues have been addressed
Marine Institute (MI) 12 May 2021	Background to project provided, along with discussion on general approach to assessment. MI advised scoping in the presence of EMF.	EMF has been considered in this assessment (**Section 8.10**).
Other		
MI 21 June 2021	Email received confirming approval of Draft Intertidal Sampling Plan.	Details of the intertidal survey are provided in **Appendix 8.3 Benthic Baseline Report** and the findings summarised in **Section 8.6 Existing environment**.
NPWS 22 June 2021	Email received confirming approval of Draft Intertidal Sampling Plan.	Details of the intertidal survey are provided in **Appendix 8.3 Benthic Baseline Report** and the findings summarised in **Section 8.6 Existing environment**.
NPWS 3 June 2021	Approval of Draft Benthic Sampling Plan.	Details of the subtidal survey are provided in **Appendix 8.3 Benthic Baseline Report** and the findings summarised in **Section 8.6 Existing environment**.
MI 8 June 2021	Approval of Draft Benthic Sampling Plan.	Details of the subtidal survey are provided in **Appendix 8.3 Benthic Baseline Report** and the findings summarised in **Section 8.6 Existing environment**.

8.3 Legislation, policy and guidance

8.3.1 Legislation

11. The legislation that is applicable to the assessment of subtidal and intertidal ecology is summarised below. Further detail is provided in **Chapter 2 Policy and Legislative Context**.

- EIA Directive 2011/92/EU, as amended by Directive 2014/52/EU and transposed into Irish law in the Planning and Development Act 2000 (as amended) and the Planning and Development Regulations 2001–2022 as amended by S.I. No. 296 of 2018 and the Irish Maritime Area Planning (MAP) Act (2021);
- Water Framework Directive (WFD) (2000/60/EC);
- Marine Strategy Framework Directive (MSFD) (2008/56/EC);
- Habitats Directive (92/43/EEC) which is transposed into law by the European Communities Regulations 2011 (as amended);
- The Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR Convention);
- Convention on Conservation of European Wildlife and Natural Habitats (1979); and
- Convention for the Protection of the Marine Environment of the North-East Atlantic (1992).

8.3.2 Policy

12. The overarching planning policy relevant to the CWP Project is described in EIAR **Chapter 2 Policy and Legislative Context**.

13. The assessment of the CWP Project against relevant planning policy is provided in the **Planning Report**. This includes planning policy relevant to subtidal and intertidal ecology.

8.3.3 Guidance

14. The principal guidance and best practice documents used to inform the assessment of potential impacts on subtidal and intertidal ecology are summarised below:

- Guidelines on the information to be contained in Environmental Impact Assessment Reports (Environmental Protection Agency (EPA), 2022);
- Guidelines for Ecological Impact Assessment (EcIA) in the UK and Ireland. Terrestrial, Freshwater, Coastal and Marine (Chartered Institute of Ecology and Environmental Management (CIEEM), 2022);
- Guidance on Marine Baseline Ecological Assessments & Monitoring Activities for Offshore Renewable Energy Projects Parts 1 and 2. Department of the Environment, Climate and Communications (DECC, 2018 a & b);
- Guidance on EIS and NIS preparation for Offshore Renewable Energy Projects. Department of the Environment, Climate and Communications (DECC, 2017);
- Guidelines for Data Acquisition to Support Marine Environmental Assessments of Offshore Renewable Energy Projects (Judd, 2012); and
- Assessment of the Environmental Impacts of Cables (OSPAR, 2009a) and Underwater Noise (OSPAR, 2009b).

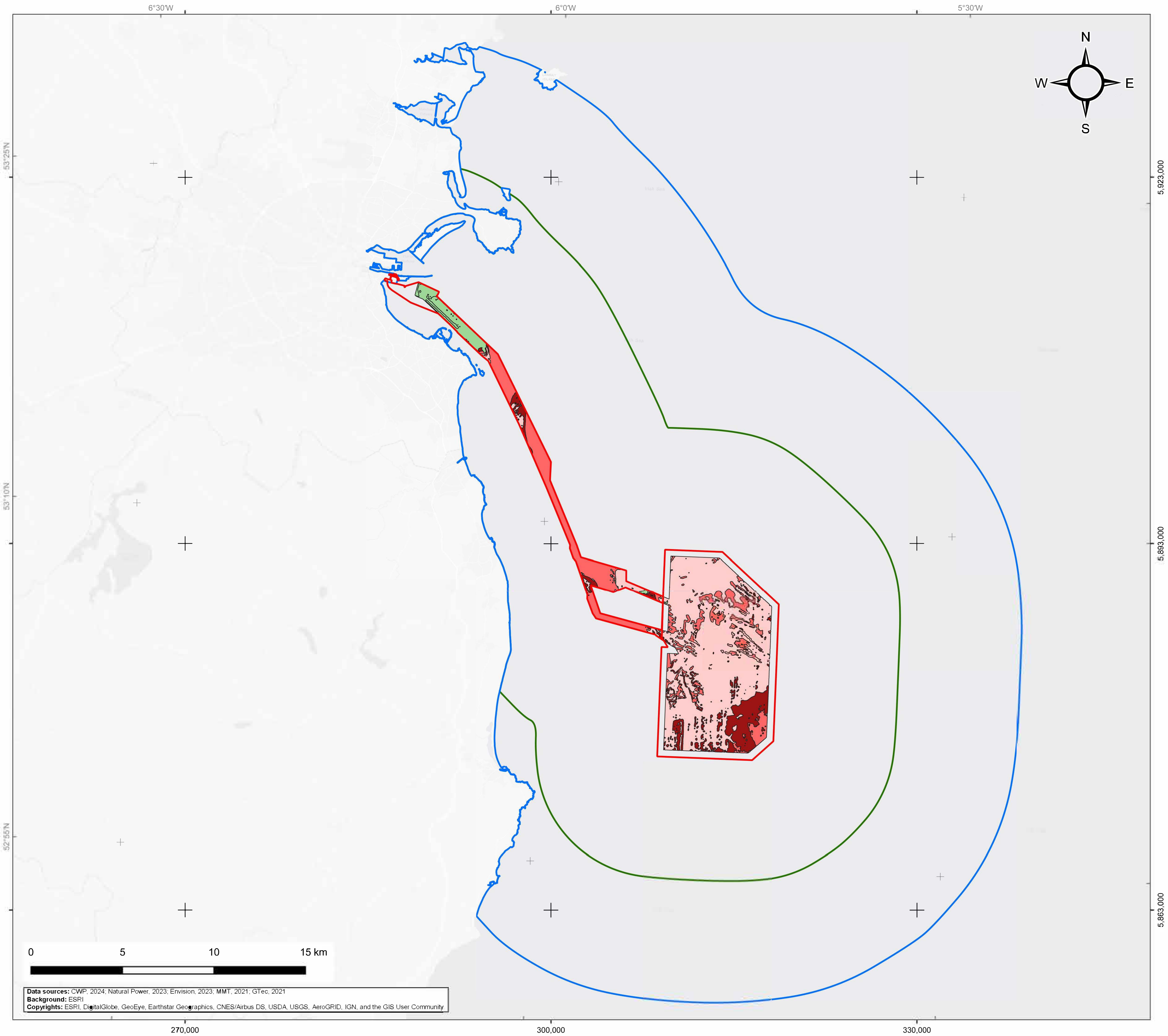
8.4 Impact assessment methodology

15. **Chapter 5 EIA Methodology** provides a summary of the general impact assessment methodology applied to the CWP Project, including the approach to the assessment of transboundary and inter-related effects. The approach to the assessment of cumulative impacts is provided in **Chapter 5, Appendix 5.1 CEA Methodology**.

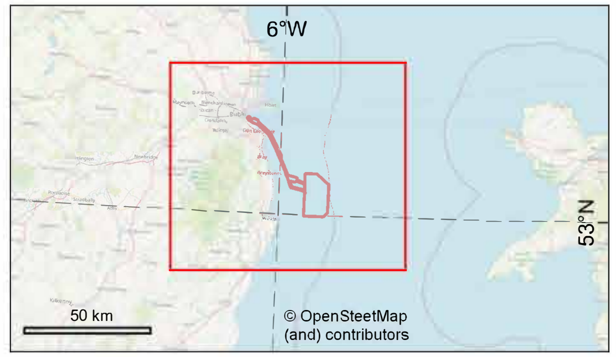
16. The following sections confirm the methodology used to assess the potential impacts on subtidal and intertidal ecology.

8.4.1 Study area

17. The study area for the subtidal and intertidal ecology assessment has been informed by the modelling presented in **Appendix 6.3 Modelling Report**. Modelling was undertaken to identify the greatest extent of potential sediment plumes dispersion, level of dispersion above background levels (mg/L), and accumulated level of deposited material. The modelling identified the greatest direction and distance of dispersion of disturbed material was 9–10 km to the east, although one scenario showed dispersion to the south east reaching 6–7 km and to the west reaching 3–4 km. The model underwent calibration and validation and was deemed fit-for-purpose; however it is a predictive model, and with a view to applying the precautionary principle, the study area has been defined as a 20 km radius **(Figure 8-1).** The study area with EU predicted seabed habitats is available in **Figure 8-2** and in relation to Special Areas of Conservation (SACs) in **Figure 8-2**



Data sources: CWP, 2024; Natural Power, 2023; Envision, 2023; MMT, 2021; GTec, 2021
Background: ESRI



Legend

- Planning Application Boundary (PAB)
- 10 km predicted sediment plume extent
- 20 km seawards buffer from PAB

Site specific MNCR benthic habitat map created from site specific benthic and geophysical survey data

- SS.SCS.CCS
- SS.SCS.CCS.MedLumVen
- SS.SCS.CCS.SpiB
- SS.SSa.IMuSa.FfabMag

codling wind park

Project: Codling Wind Park

Contractor: www.naturalpower.com natural power

Figure 8.1
Benthic and intertidal ecology study area with site specific habitat mapping

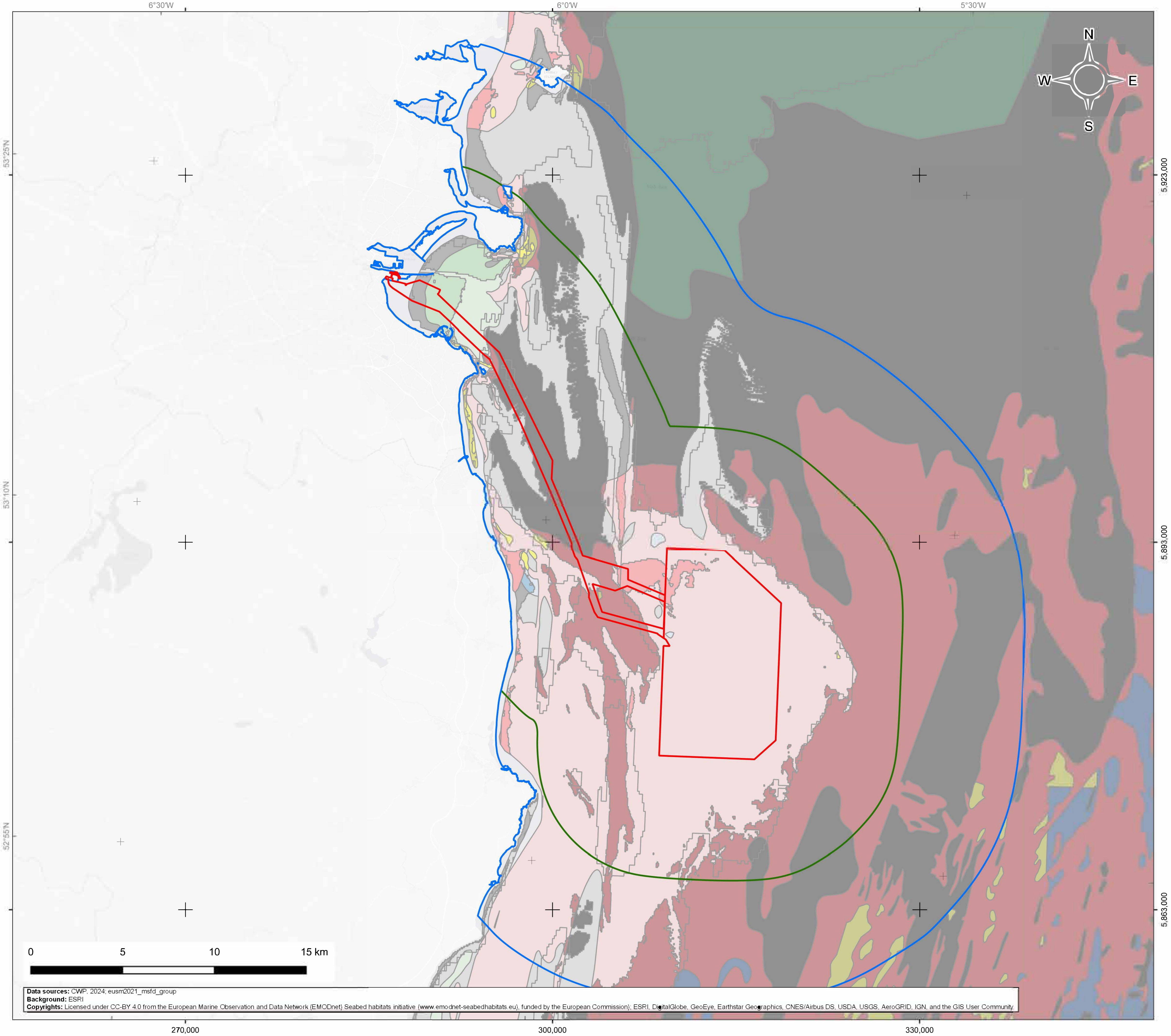
CWP doc. number: CWP-NPC-ENG-08-01-MAP-0746

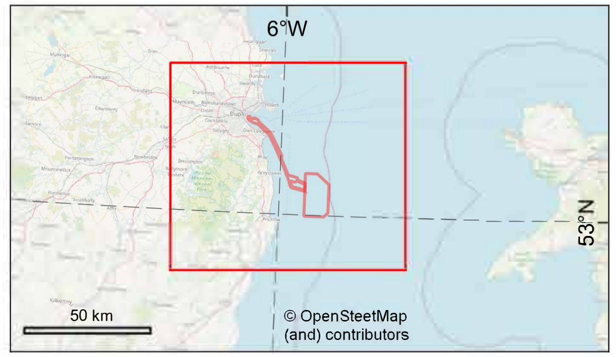
Internal descriptive code: OFFSH.ALL - PAB..BUFFs.10km.20km.S - BENTHIC HABITATS.MMT21.GTEC21 - EIAR.FIG.08.01

Size: A3
Scale: 1:300,000

CRS: EPSG 25830

Rev.	*Updates*	*Date*	*By*	*Chk'd*	*App'd*
00	Final for issue	2024/06/24	AC	ME/EA	SM





Legend

- Planning Application Boundary (PAB)
- 10 km predicted sediment plume extent
- 20 km seawards buffer from PAB

MSFD benthic broad habitat type from desktop study

- Circalittoral coarse sediment
- Infralittoral coarse sediment
- Offshore circalittoral coarse sediment
- Circalittoral mixed sediment
- Infralittoral mixed sediment
- Offshore circalittoral mixed sediment
- Circalittoral mud
- Infralittoral mud
- Offshore circalittoral mud
- Circalittoral rock and biogenic reef
- Infralittoral rock and biogenic reef
- Offshore circalittoral rock and biogenic reef
- Circalittoral sand
- Infralittoral sand
- Offshore circalittoral sand

codling wind park | *Project:* Codling Wind Park | *Contractor:* www.naturalpower.com natural power

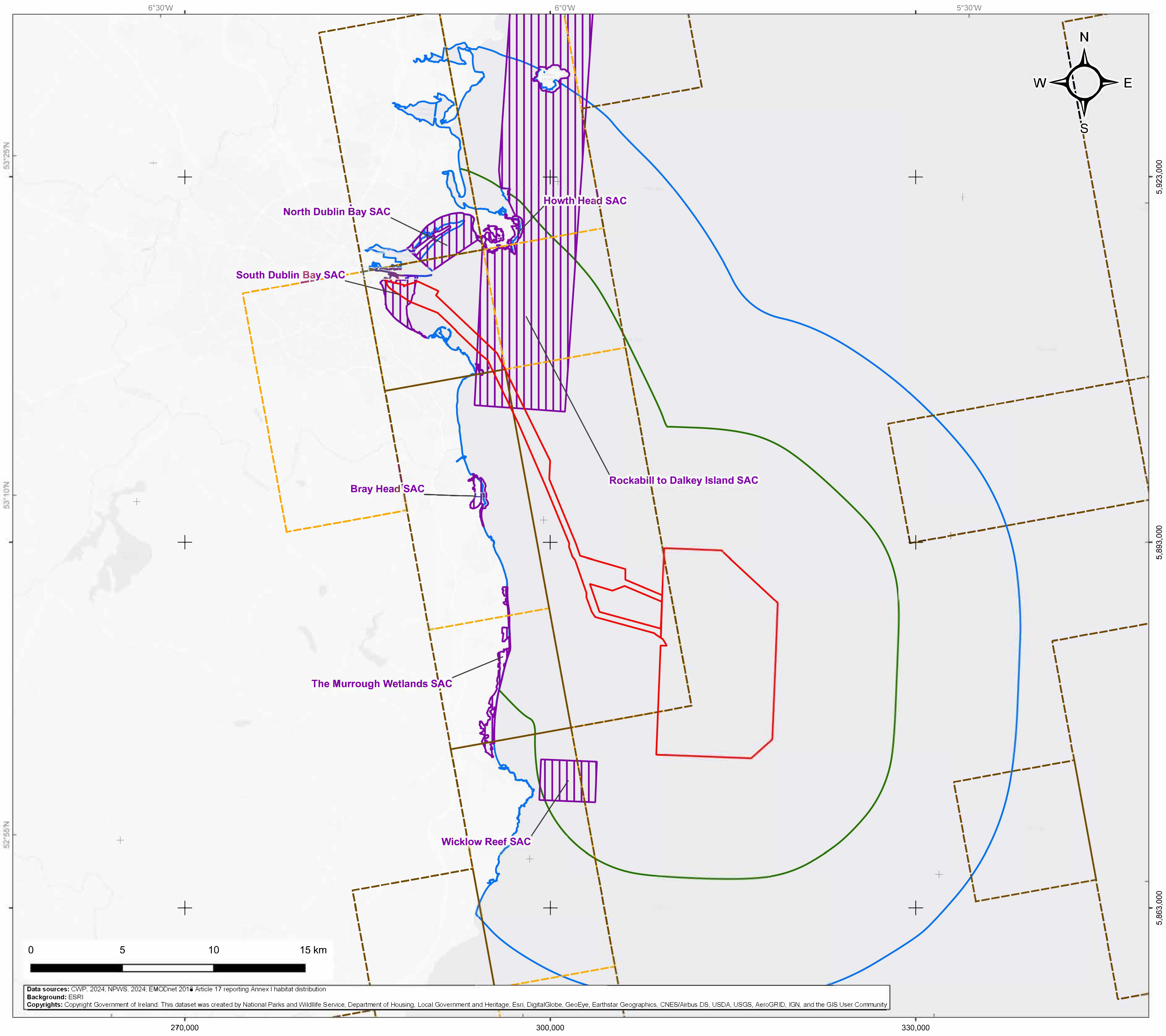
Figure 8.2
Benthic and intertidal ecology study area with EU predicted seabed habitats

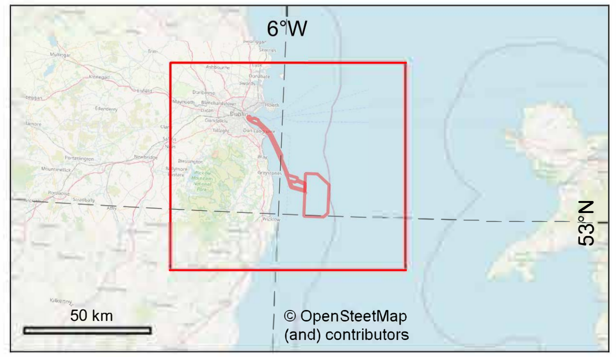
CWP doc. number: CWP-NPC-ENG-08-01-MAP-0747

Internal descriptive code: OFFSH.ALL - PAB..BUFFs.10km.20km.S -BENTHIC. HABITATS.EUSM - EIAR.FIG.08.02

Size: A3
Scale: 1:300,000
CRS: EPSG 25830

Rev.	*Updates*	*Date*	*By*	*Chk'd*	*App'd*
00	Final for issue	2024/06/24	AC	ME/EA	SM





Legend

- Planning Application Boundary (PAB)
- 10 km predicted sediment plume extent
- 20 km seawards buffer from PAB
- Special Area of Conservation (SAC)

Predicted Annex I habitats

- Reefs
- Sandbanks

Project: Codling Wind Park

Contractor: www.naturalpower.com

Figure 8.3
Special areas of conservation within the benthic and intertidal ecology study area

CWP doc. number: CWP-NPC-ENG-08-01-MAP-0748

Internal descriptive code: OFFSH.ALL - PAB..BUFFs.10km.20km.S -REEFS.. SACs..SANDBANKS - EIAR.FIG.08.03

Size: A3
Scale: 1:300,000

CRS: EPSG 25830

Rev.	Updates	Date	By	Chk'd	App'd
00	Final for issue	2024/06/24	AC	ME/EA	SM

8.4.2 Data and information sources

Site specific surveys

18. In order to provide site specific and up-to-date information on which to base the impact assessment, the following site characterisation surveys were conducted: benthic subtidal and intertidal survey and ecological assessment were conducted in 2021 at stations positioned across the array site and offshore export cable corridor (OECC) and near to landfall in the intertidal area (**Figure 8-4**, **Figure 8-5, Figure 8-6, Figure 8-7** and **Figure 8-8**). The survey design and methodology for these surveys was agreed in consultation with regulators prior to the surveys being conducted (**Table 8-1**). Full details are provided in **Section 8.6 Existing environment** and **Appendix 8.3 Benthic Baseline Report**.

Desk study

19. In addition to the site specific surveys, a comprehensive desk-based review was undertaken to inform the baseline for subtidal and intertidal ecology. Key data sources used to inform the assessment are set out in **Table 8-2**.

Table 8-2 Data sources

Data	Source	Date	Notes
INFOMAR (2019) Seabed mapping in Irish waters.	Joint venture between the Geological Survey of Ireland and the Marine Institute. Available from: http://www.infomar.ie/data/	2019	Modelled sediment type data.
EUSeamap (2021) Substrate habitat descriptor and Broad-scale predictive habitat map.	https://ows.emodnet-seabedhabitats.eu/geoserver/emodnet_view/wms	2021	Modelled sediment type and broad benthic habitat type data.
The Irish Sea Pilot – Report on the identification of nationally important marine features in the Irish Sea.	Lieberknecht, Vincent & Connor (2004). http://www.jncc.gov.uk/irishseapilot/	2004	Information on nationally important marine features in the Irish Sea.
Benthic surveys of sandbanks in the Irish Sea.	Roche, Lyons, Fariňas Franco, & O'Connor (2007). Irish Wildlife Manuals, No. 29. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin, Ireland.	2007	Benthic survey data and resulting biotopes form two grab surveys carried out on Blackwater and Kish Banks in 2005.
Benthos monitoring in the marine environment.	Marine Institute – Benthos Ecology Group (2017).	2017	Benthic flora and fauna data from the Ireland coastline, Irish Sea, Celtic Sea, Saint Georges

Data	Source	Date	Notes
			Channel and North Atlantic Ocean.
Biogenic reefs of Europe and temporal variability.	Theseus Project (2013). http://www.theseusproject.eu/wiki/Biogenic_reefs_of_Europe_and_temporal_variability	2013	Technologies for the promotion of the preservation and enhancement of coastal ecosystems.
Wicklow Reef SAC site synopsis.	National Parks and Wildlife Service. https://www.npws.ie/protected-sites/sac/002274	2001	Details on the SAC Qualifying Interests and their occurrence within the protected area.
North Dublin Bay SAC synopsis.	National Parks and Wildlife Service. https://www.npws.ie/sites/default/files/protected-sites/synopsis/SY000206.pdf	2013	Details on the SAC Qualifying Interests and their occurrence within the protected area.
South Dublin Bay SAC synopsis.	National Parks and Wildlife Service. https://www.npws.ie/sites/default/files/protected-sites/synopsis/SY000210.pdf	2015	Details on the SAC Qualifying Interests and their occurrence within the protected area.
Rockabill to Dalkey Island SAC.	National Parks and Wildlife Service. https://www.npws.ie/sites/default/files/protected-sites/synopsis/SY003000.pdf	2014	Details on the SAC Qualifying Interests and their occurrence within the protected area.
Quality Status Report of the Marine and Coastal Areas of the Irish Sea 2010.	OSPAR Commission, London: Department of the Environment Trade and the Regions.	2010	Report summarising 10 years of joint OSPAR monitoring in the North-East Atlantic.
Irish Sea Marine Assessment (ISMA), RV Celtic Voyager – Survey CV0926 (Legs 1 & 2).	Wheeler A.J., Dorschel B. and shipboard party (2009).	28 Sept.–18 Oct. 2009	Sediment and biological sample data from Celtic Voyager surveys in 2009.
Marine Species in Irish Coastal Waters	Biodiversity Ireland - Biodiversity Maps (biodiversityireland.ie)	19/10/2012–06/12/2022	Records of marine species encountered by divers in Irish coastal waters

8.4.3 Impact assessment

20. The significance of potential effects has been evaluated using a systematic approach based upon identification of the sensitivity and / value of receptors together with the predicted magnitude of each potential impact.

21. The terms used to define receptor sensitivity and magnitude of impact are based on Marine Evidence based Sensitivity Assessment (MarESA) approach (Tyler-Walters et al., 2023) and Guidelines for Ecological Impact Assessment in the UK and Ireland (CIEEM, 2022), respectively. These criteria have been adopted in order to implement a specific methodology for subtidal and intertidal ecology.

22. This impact assessment methodology is in line with the existing guidance for EcIA (**Section 8.3**).

The process for assessment follows the below stages:

- Describing the baseline within the study area;
- Identifying the receptors;
- Determining the nature conservation importance of the receptors present within the study area that may be affected by the CWP Project;
- Identifying and characterising the potential impacts, based on the nature of the installation, operation, maintenance and decommissioning activities associated with the CWP Project;
- Determining the significance of the impacts;
- Identifying the counter effect of any mitigation measures to be undertaken, that may be implemented in order to address significant adverse effects;
- Determining the residual impact significance after the effects of mitigation have been considered; and
- Assessing cumulative effects (with mitigation where applicable).

Sensitivity of receptor

23. For each effect, the assessment identifies receptors sensitive to that effect and implements a systematic approach to understanding the impact pathways and the level of impacts on given receptors.

24. As set out in the EIA Methodology chapter, the sensitivity of a receptor is a function of its capacity to accommodate change and reflects its ability to recover if it is affected. Sensitivity is quantified via a consideration of its tolerance, recoverability and value. **Table 8-3** sets out the criteria used in defining the sensitivity of the identified benthic and intertidal ecological receptors. All definitions of Tolerance and Recoverability, including timescales to recover, are informed by the Marine Evidence based Sensitivity Assessment (MarESA) approach (Tyler-Walters et al., 2023). Four defined levels of sensitivity have been determined (High, Medium, Low or Negligible). Where a receptor could reasonably be assigned more than one level of sensitivity, professional judgement has been used to determine which level is applicable.

Table 8-3 Criteria for determination of receptor sensitivity

Sensitivity	Criteria
High	Value: is high, i.e. rare or declining habitat or supports rare or declining species in Ireland and / or Annex I or OSPAR habitats within a designated site and cited as a feature of that site and / or habitats within a designated site but not cited as a feature of that site but which provide highly important ecosystem function / services.

Sensitivity	Criteria
	Tolerance: is none, whereby key functional, structural, characterising species severely decline, e.g. removal of habitats causing a change in habitat type. Recoverability: is very low or low (i.e. between 10 and 25 or at least 25 years to recover structure and function).
Medium	Value: is medium whereby habitats common to Ireland but are internationally important due to rare or declining status in Europe and / or Annex I and / or OSPAR habitats out with a designated site. Tolerance: is low, whereby significant mortality of key or characterising species has some effects on the character of a habitat. Recoverability: is medium (i.e. full recovery of structure and function within 10–25 years).
Low	Value: is low, whereby habitats which are common to Ireland and Europe and / or Habitats which have no conservation status in Ireland but have a conservation status elsewhere in Europe, e.g. FOCI or PMF OR habitats, which provide some ecosystem function / services important locally or nationally. Tolerance: is medium, whereby some mortality of species occurs (can be significant where these are not key structural / functional and characterising species) without change to habitat type. Recoverability: is medium (i.e. full recovery within 2–10 years). or high (i.e. full recovery in < 2 years).
Negligible	Value: habitat ubiquitous in the Irish Sea and internationally and no conservation status or unique ecosystem function / services. Tolerance: is high, whereby there are no significant effects on the habitat and no effect on the population viability of key / characterising species but may affect feeding, respiration and reproduction rates. Recoverability: is high (i.e. full recovery within 2 years). Value: habitat ubiquitous in the Irish Sea and internationally and no conservation status or unique ecosystem function / services.

Magnitude of impact

25. The scale or magnitude of potential impacts (both beneficial and adverse) depends on the degree and extent to which the CWP Project activities may change the environment, which usually varies according to project phase (i.e. construction, operation and maintenance and decommissioning).

26. Each impact has been characterised in accordance with Guidelines for Ecological Impact Assessment in the UK and Ireland (CIEEM, 2022) and the Guidelines on the information to be contained in

Environmental Impact Assessment Reports (Environmental Protection Agency, Ireland, 2022). Magnitude is quantified via a consideration of the impact extent, duration, frequency and consequences. The duration relates to the time period over which the impact will occur, and the timescales of which have been directly informed by the EPA (2022) guidelines. The impact duration is distinct and separate from the recoverability timescales which relate to the length of time taken for a given habitat type or species to recover from an impact which has ceased.

27. Where an impact could reasonably be assigned more than one level of magnitude, professional judgement has been used to determine which level is most appropriate for the impact. For example, while an impact may occur constantly throughout the O&M period it may be indiscernible and immeasurable in practice. Therefore, it would be concluded to be of a Negligible magnitude despite the frequency of the impact.

Table 8-4 Criteria for determination of magnitude of impact

Magnitude	Criteria[1]
High	Extent: impact occurs over a large spatial extent, or a large proportion of a given habitat type. Duration: impact is anticipated to be permanent (i.e. over 60 years) or long term (15–60 years). Frequency: impact occurs continuously or repeatedly. Consequences: impact results in a total change or major alteration to key characteristics or features of baseline habitats.
Medium	Extent: impact occurs over a moderate spatial extent or moderate proportion of a given habitat type. Duration: medium term (7–15 years) to long-term impact (15–60 years). Frequency: impact occurs continuously or repeatedly. Consequences: impact results in a partial change to key characteristics or features of baseline habitats.
Low	Extent: impact occurs over a small to moderate spatial extent or small proportion of a given habitat type. Duration: short (1–7 years) to medium (7–15 years) term impact. Frequency: impact will occur once or repeatedly. Consequences: impact results in a minor loss or alteration to key characteristics or features of baseline habitats.

[1] Determination of percentage of affected habitats will be based upon habitat areas defined within the study area.

Magnitude	Criteria[1]
Negligible	Extent: impact occurs over a small spatial extent or small proportion of a given habitat type. Duration: temporary (less than 1 year) to short term (1–7 years) term impact. Frequency: impact will occur once or infrequently. Consequences: impact results in very slight or imperceptible change to key characteristics or features of baseline habitats.

Significance of effect

28. As set out in **Chapter 5 EIA Methodology**, an Impact Assessment Matrix (IAM) is used to determine the significance of an effect. In basic terms, the potential significance of an effect is a function of the sensitivity of the receptor and the magnitude of the impact, as shown in **Table 8-5**.

29. The matrix provides a framework for the consistent and transparent assessment of predicted effects across all technical chapters. However, it is important to note that individual assessments are based on relevant guidance and the application of professional judgement.

30. The significance of effect can be determined by comparing the character of the predicted effect to the sensitivity of the receiving environment (EPA (2002); CIEEM (2022)). The matrix provides levels of effect significance ranging from imperceptible to very significant / profound. For the purposes of this assessment, potential effects identified to be of significance or above are considered to be significant in EIA terms and additional mitigation will be required. Effects identified as less than significant are generally considered to be not significant in EIA terms.

31. Primary mitigation and, where appropriate, additional mitigation measures have been identified and described where they will avoid, reduce and / or compensate for potentially significant effects. This includes avoidance through the design process. Mitigation measures may also be proposed to reduce negative effects that are not significant.

Table 8-5 Impact assessment matrix for determination of significance of effect

Sensitivity of Receptor	Magnitude of impact			
	High	Medium	Low	Negligible
High	Very Significant / Profound	Significant	Moderate / Slight	Slight
Medium	Significant	Moderate	Slight	Slight / Not significant
Low	Moderate / Slight	Slight	Not significant	Not significant
Negligible	Slight	Slight / Not significant	Not significant	Imperceptible

8.5 Assumptions and limitations

32. The assessment has been undertaken based on the information provided within **Chapter 4 Project Description** and using the representative scenario design parameters presented in **Table 8-12**. How these parameters are relevant for representative scenarios for benthic and intertidal ecology is presented in **Section 8.8 Assessment parameters**.

33. Data was gathered from a wide variety of data sources, using the most up-to-date data at the time of writing (**Table 8-2**). INFOMAR (2019) and EUSeaMap (2021) sediment type and benthic habitat type are modelled data and as such the limitations to this data are based upon the modelling assumptions made.

34. Site specific data were gathered in 2021 and as such survey data remain valid and provide an appropriate characterisation of the receiving environment at the point of application.

35. There is no data available on the sensitivity or recovery of benthic habitats from the impact of contaminated sediments in the MarLIN / MarESA sensitivity assessment. This impact has been assessed using the best available evidence from the literature and using the sediment plume modelling and impact size, frequency and duration to determine the potential for redistribution and resettlement of contaminated sediments alongside the results of the site specific contaminated sediment sampling.

36. The MarLIN / MarESA sensitivity assessments record no evidence for sensitivity of the benthic habitats / species to the impacts of EMF. This impact has been assessed using the best available evidence from the literature and based upon the CWP cable burial profile as outlined in **Chapter 4 Project Description**.

37. The approach to modelling of sediment deposition is described in **Appendix 6.3 Modelling Report**. Plume dispersion modelling was undertaken for the CWP Project, and the results of this have been used to inform the EIAR at this time.

38. The study areas for the identification of receptors are defined in **Section 8.4 Impact assessment methodology**. In principle the study area is defined by the greatest Zone of Influence (ZoI) of relevance for benthic ecology, which is defined by the maximum extent of SSC (10 km). However, on a precautionary basis the study area has been maintained at 20 km as the maximum extent of SSC of 10 km is derived from predictive modelling.

39. The ZoIs are defined per impact as each potential impact differs in spatial extent. The spatial extent of each impact is defined in **Section 8.10 Impact assessment**.

40. Further assumptions specific to the detail of a given assessment may be included in subsequent sections.

8.6 Existing environment

41. The following sections provide a description of the baseline conditions for subtidal and intertidal ecology.

42. Codling Bank forms part of a series of banks in the Irish Sea which runs approximately 10 km offshore parallel to the coast, standing in 20–30 m of water and rise to within metres of the water's surface. The banks reflect the principal tidal currents in the region and the strong currents and sediment movements have resulted in a series of punctuated banks from north to south: Dundalk Bank; Bray Bank; Kish Bank; Codling & Greater Codling Banks; Arklow Bank; Rusk Bank; Glasgorman Bank; Blackwater & Lucifer Bank and Long Bank. Regional data (INFOMAR) suggests that the most likely substrate type at the Codling Bank is coarse gravels, shell material with some sand in a patchy distribution surrounding the array site. All of which are exposed to the strong hydrodynamic movements in the

area. There is likely to be a low proportion of fine fractions within the sediment and low organic carbon content (Katrien et al., 2009). Wheeler et al. (2001) reported the findings of survey work and seabed mapping around the Kish and Bray Banks immediately to the north of the Codling Bank. Sediments recorded at the southern end of the Bray Bank were reported as coarse sand and gravel with finer sand recorded north along the Kish Bank. Sediment was coarser on top of sand banks with finer sediments observed off the banks.

8.6.1 Subtidal and Intertidal Ecology Study Area

43. Regional data (INFOMAR) suggests that the sediment types within 20 km of the offshore development area consist of coarse sediment, mixed sediment, rock, sand and sandy mud / muddy sand with rock and finer sediments nearshore, and coarse and sand sediments offshore. This is broadly consistent with EUSeamap (2021) substrate type data which includes the INFOMAR sediment types listed. Broad scale predictive habitat types suggests habitats within the 20 km study area are infralittoral circalittoral and offshore circalittoral; coarse sediment, mixed sediment, sand, mud and rock, and biogenic reef.

44. The intertidal habitats within the study area include areas of rocky coastline interspersed with sections of sandy beaches. In more sheltered areas, vegetated intertidal habitats such as seagrass beds and salt meadows can be present, in addition to extensive mudflats and sandflats such as those present in Dublin Bay.

8.6.2 CWP Array Site

45. INFOMAR Seabed Substrate (2019) data suggests the array site is homogenous with coarse sediment throughout This is supported by EUSeamap (2021) broad habitat data which also models the area as consisting of infralittoral and circalittoral coarse sediments with one small area of circalittoral mixed sediment (**Figure 8-4**).

46. The site specific benthic ecology survey broadly concurs with the publicly available data while also identifying habitats to a higher level. The sediment types at the stations sampled in the array site were gravel, gravel and cobbles, boulders and sand, gravelly sand, sandy gravel and slightly gravelly sand. The typical community structure is characterised by a range of species including polychaetes, bivalves, amphiphods, hydroids and bryozoans.

47. Benthic habitat mapping was performed whereby the site specific benthic ecology data was used to ground truth the geophysical survey data and map the benthic habitats across the offshore development area (**Figure 8-1**) (**Appendix 8.3 Benthic Baseline Report**).

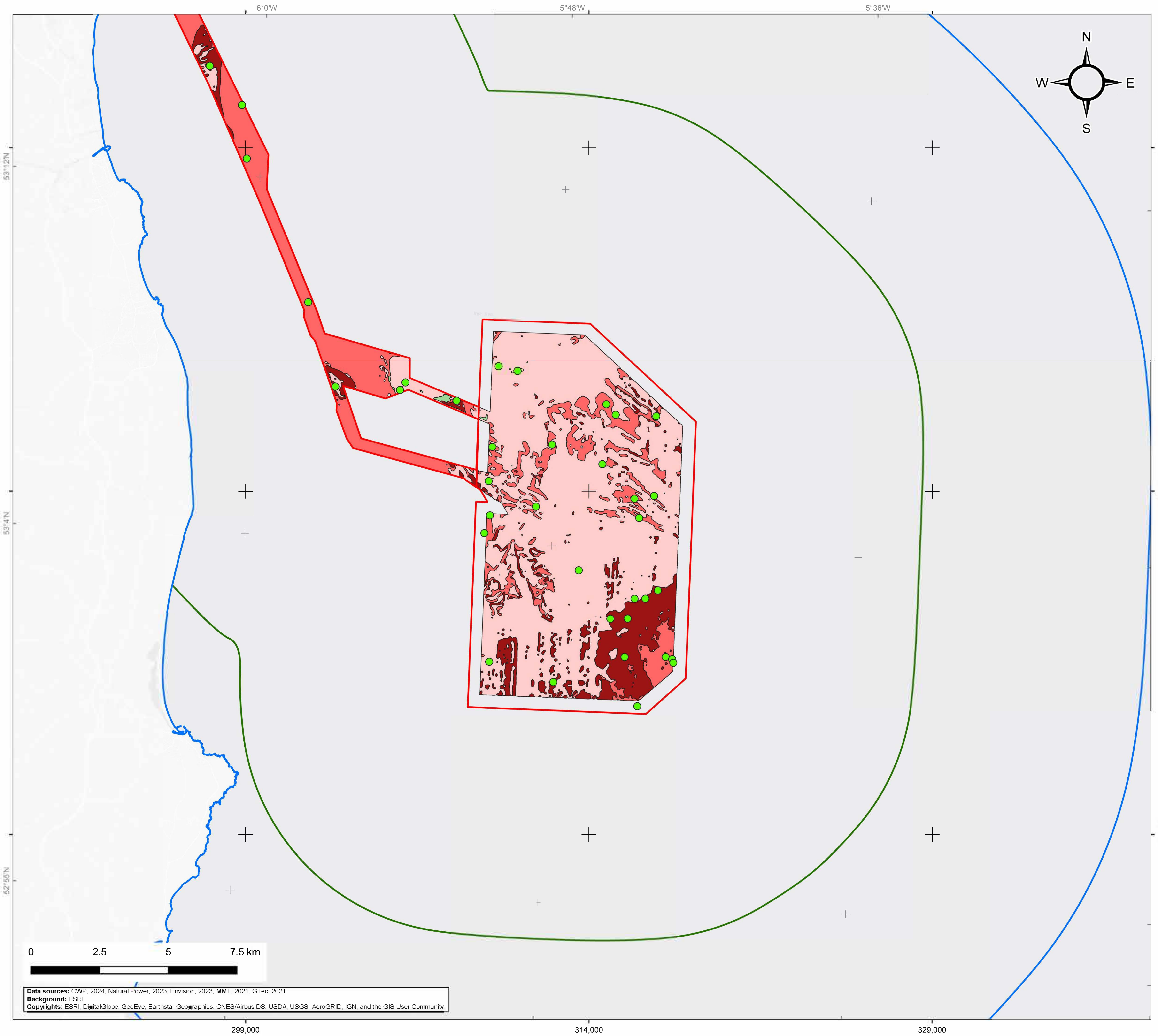
48. Three interspersed biotopes were identified in the CWP Project array site: Circalittoral Coarse Sediment (SS.SCS.CCS); *Mediomastus fragilis*, *Lumbrineris* spp. and venerid bivalves in circalittoral coarse sand or gravel (SS.SCS.CCS.MedLumVen); and *Spirobranchus triqueter* with barnacles and bryozoan crusts on unstable circalittoral cobbles and pebbles (SS.SCS.CCS.SpiB).

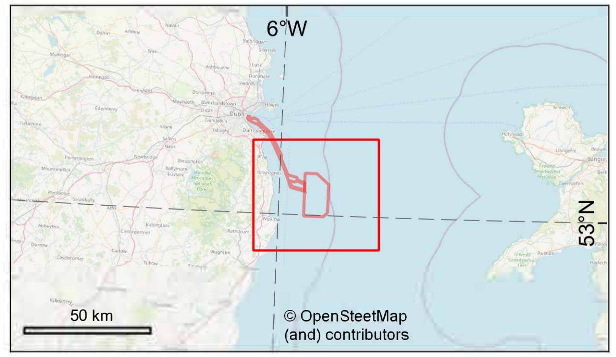
49. A mosaic of gravel and cobbles and varying degrees of sandy gravel and gravelly sand habitats are present throughout the array site and support biotopes dominated by bivalves and polychaetes.

50. The biotopes across the array site suggest it is subject to scour, likely to vary in intensity seasonally. All biotopes present in the array site are provided in **Table 8-6** and **Figure 8-4** and **Figure 8-5** below.

Table 8-6 Biotopes recorded within the CWP Project array site in the site specific survey.

Biotope code	Biotope name
SS.SCS.CCS	Circalittoral coarse sediment.
SS.SCS.CCS.SpiB	*Spirobranchus triqueter* with barnacles and bryozoan crusts on unstable circalittoral cobbles and pebbles.
SS.SCS.CCS.MedLumVen	*Mediomastus fragilis*, *Lumbrineris* spp. And venerid bivalves in circalittoral coarse sand or gravel.





Legend

- Planning Application Boundary (PAB)
- 10 km predicted sediment plume extent
- 20 km seawards buffer from PAB
- Site specific survey benthic sampling station

Site specific MNCR benthic habitat map created from site specific benthic and geophysical survey data

- SS.SCS.CCS
- SS.SCS.CCS.MedLumVen
- SS.SCS.CCS.SpiB
- SS.SSa.IMuSa.FfabMag

codling wind park

Project: Codling Wind Park

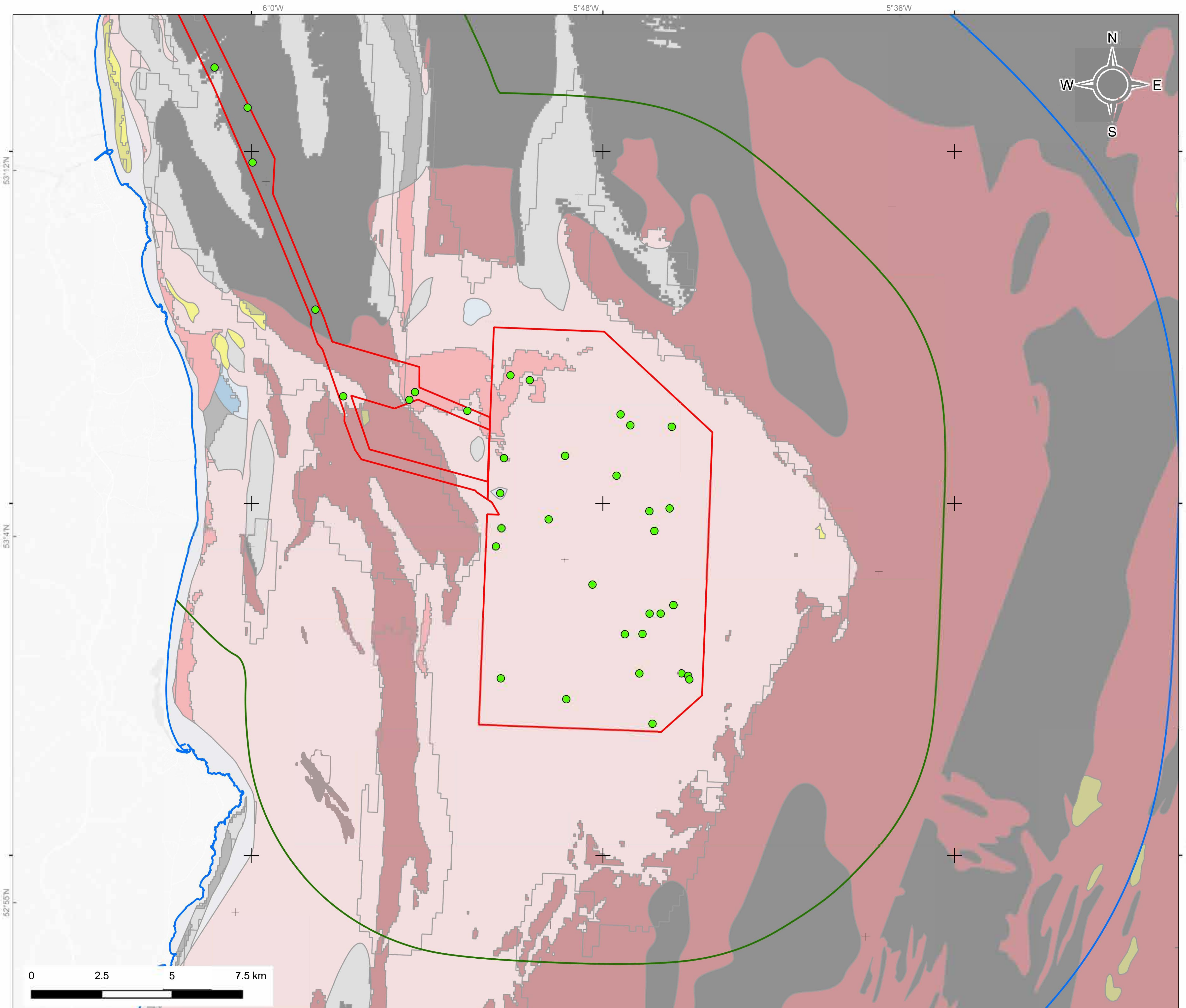
Contractor: www.naturalpower.com natural power

Figure 8.4
Array site impact assessment with site specific habitat mapping and sampling stations

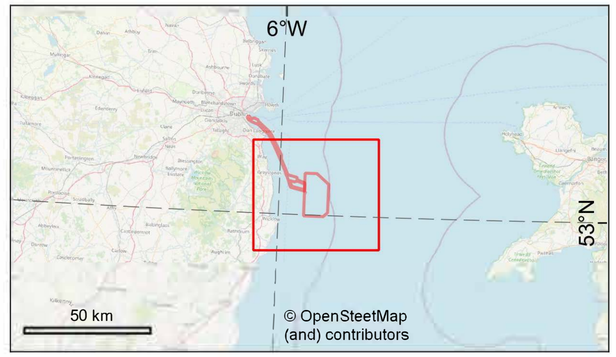
CWP doc. number: CWP-NPC-ENG-08-01-MAP-0749

Internal descriptive code:	*Size:* A3	*CRS:*
WF - PAB. BUFFs.10km.20km.S BENTHIC.HABITATS. MMT21.GTEC21..BSS - EIAR.FIG.08.04	*Scale:* 1:160,000	EPSG 25830

Rev.	*Updates*	*Date*	*By*	*Chk'd*	*App'd*
00	Final for issue	2024/06/24	AC	ME/EA	SM



Data sources: CWP, 2024; eusm2021_msfd_group
Background: ESRI



Legend

- Planning Application Boundary (PAB)
- 10 km predicted sediment plume extent
- 20 km seawards buffer from PAB
- Site specific survey benthic sampling station

MSFD benthic broad habitat type from desktop study

- Circalittoral coarse sediment
- Infralittoral coarse sediment
- Offshore circalittoral coarse sediment
- Circalittoral mixed sediment
- Infralittoral mixed sediment
- Offshore circalittoral mixed sediment
- Circalittoral mud
- Infralittoral mud
- Offshore circalittoral mud
- Circalittoral rock and biogenic reef
- Infralittoral rock and biogenic reef
- Offshore circalittoral rock and biogenic reef
- Circalittoral sand
- Infralittoral sand
- Offshore circalittoral sand

codling wind park	*Project:* Codling Wind Park	*Contractor:* www.naturalpower.com natural power

Figure 8.5
Array site impact assessment with site specific sampling stations and EU predicted seabed habitats

CWP doc. number: CWP-NPC-ENG-08-01-MAP-0750

Internal descriptive code:	*Size:* A3	*CRS:*
WF - PAB_BUFFs.10km.20km.S - BENTHIC HABITATS. EUSM..BSS - EIAR.FIG.08.05	*Scale:* 1:160,000	EPSG 25830

Rev.	*Updates*	*Date*	*By*	*Chk'd*	*App'd*
00	Final for issue	2024/06/24	AC	ME/EA	SM

8.6.3 CWP Project OECC area

51. INFOMAR Seabed Substrate (2019) data suggests sediments along the OECC is sand near to landfall, quickly graduating to sandy mud / muddy sand in the infralittoral followed by an area of mixed sediment then sand and coarse sediment on the approach to the array site. This is supported by EUSeamap (2021) broad habitat data which also models the OECC sediment types as infralittoral and circalittoral coarse sediment and circalittoral mixed sediment close to the array site. This is followed by a large area of offshore circalittoral and circalittoral sand along the OECC followed by an area of offshore circalittoral coarse sediment then circalittoral and infralittoral mud nearer to shore and infralittoral sand nearshore (**Figure 8-4**).

52. While Annex I Sandbanks (1110) are predicted to occur along the OECC by JNCC (Gridded distribution map for Annex I sandbanks as reported by EU member states for 2018 Habitats Directive Article 17 reporting) and in a small section on the nearshore side of the array site **Figure 8-4** site specific habitat mapping recorded no occurrences of sandbanks within the OECC.

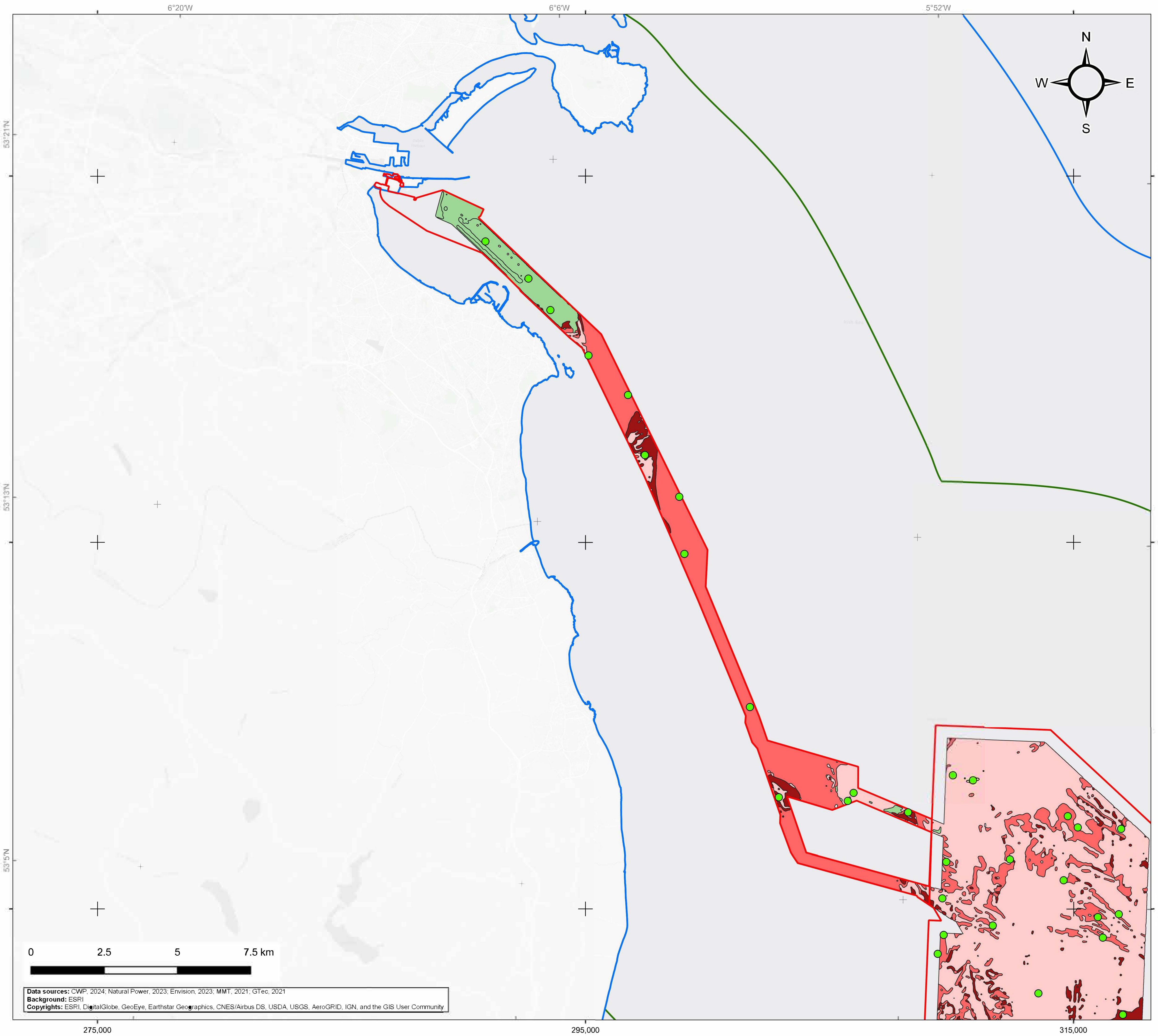
53. Other than for sandbanks, the site specific benthic ecology survey along the OECC broadly concurs with the publicly available data while also identifying habitats to a higher level. The sediment types at the stations sampled in the OECC were gravel and cobbles, sandy gravel, gravelly sand, slightly gravelly sand, and sand.

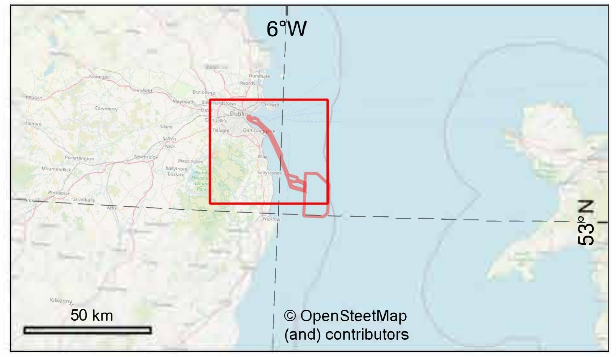
54. The biotopes identified in the OECC were the same as those of the array site: Circalittoral Coarse Sediment (SS.SCS.CCS); *Mediomastus fragilis*, *Lumbrineris* spp. and venerid bivalves in circalittoral coarse sand or gravel (SS.SCS.CCS.MedLumVen); and *Spirobranchus triqueter* with barnacles and bryozoan crusts on unstable circalittoral cobbles and pebbles (SS.SCS.CCS.SpiB). With the addition of the biotope *Fabulina fabula* and *Magelona mirabilis* with venerid bivalves and amphipods in infralittoral compacted fine muddy sand on approach to the intertidal area.

55. All biotopes present in the OECC are provided in **Table 8-7** and **Figure 8-6** and **Figure 8-7**.

Table 8-7 Biotopes recorded within the CWP Project OECC in the site specific survey

Biotope code	Biotope name
SS.SCS.CCS	Circalittoral coarse sediment.
SS.SCS.CCS.SpiB	*Spirobranchus triqueter* with barnacles and bryozoan crusts on unstable circalittoral cobbles and pebbles.
SS.SCS.CCS.MedLumVen	*Mediomastus fragilis*, *Lumbrineris* spp. And venerid bivalves in circalittoral coarse sand or gravel.
SS.SSa.IMuSa.FfabMag	*Fabulina fabula* and *Magelona mirabilis* with venerid bivalves and amphipods in infralittoral compacted fine muddy sand.





Legend

- Planning Application Boundary (PAB)
- 10 km predicted sediment plume extent
- 20 km seawards buffer from PAB
- Site specific survey benthic sampling station

Site specific MNCR benthic habitat map created from site specific benthic and geophysical survey data

- SS.SCS.CCS
- SS.SCS.CCS.MedLumVen
- SS.SCS.CCS.SpiB
- SS.SSa.IMuSa.FfabMag

codling wind park

Project: Codling Wind Park

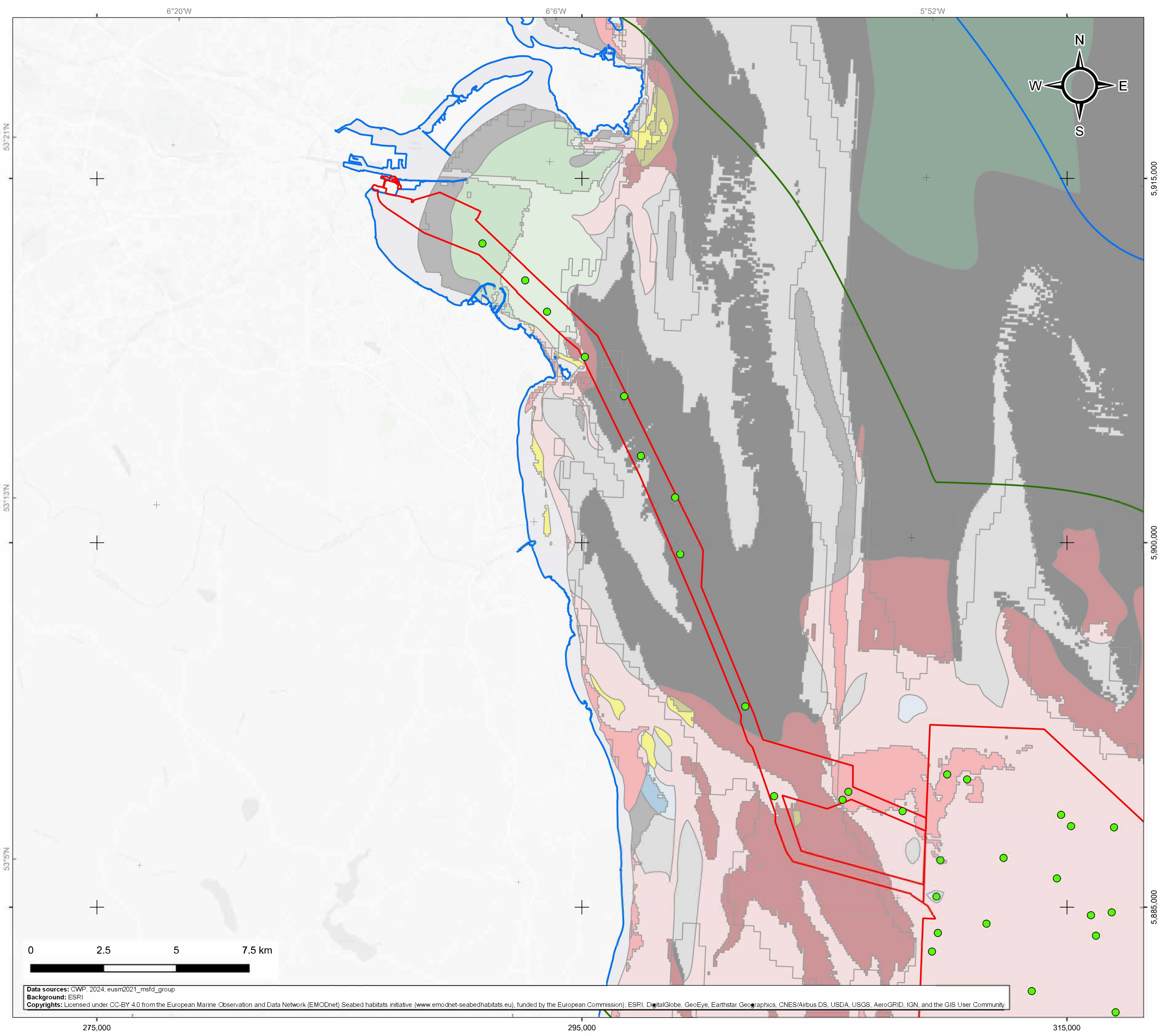
Contractor: www.naturalpower.com natural power

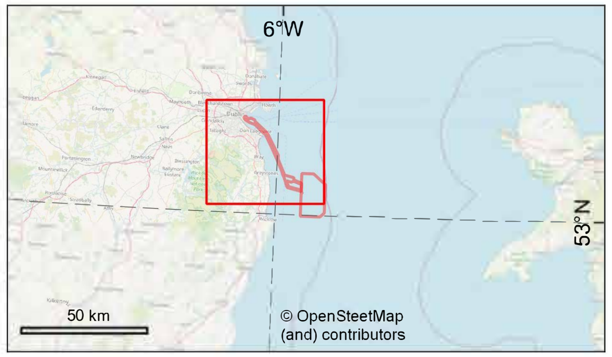
Figure 8.6
OECC impact assessment with site specific habitat mapping and sampling stations

CWP doc. number: CWP-NPC-ENG-08-01-MAP-1132

Internal descriptive code:	*Size:* A3	*CRS:*
OECC.PB - PAB. BUFFs.10km.20km.S - BENTHIC HABITATS.MMT21.GTEC21..BSS - EIAR.FIG.08.06	*Scale:* 1:150,000	EPSG 25830

Rev.	*Updates*	*Date*	*By*	*Chk'd*	*App'd*
00	Final for issue	2024/06/24	AC	ME/EA	SM





Legend

- Planning Application Boundary (PAB)
- 10 km predicted sediment plume extent
- 20 km seawards buffer from PAB
- Site specific survey benthic sampling station

MSFD benthic broad habitat type from desktop study

- Circalittoral coarse sediment
- Infralittoral coarse sediment
- Offshore circalittoral coarse sediment
- Circalittoral mixed sediment
- Infralittoral mixed sediment
- Offshore circalittoral mixed sediment
- Circalittoral mud
- Infralittoral mud
- Offshore circalittoral mud
- Circalittoral rock and biogenic reef
- Infralittoral rock and biogenic reef
- Offshore circalittoral rock and biogenic reef
- Circalittoral sand
- Infralittoral sand
- Offshore circalittoral sand

codling wind park

Project: Codling Wind Park

Contractor: natural power www.naturalpower.com

Figure 8.7
OECC impact assessment with site specific sampling stations and EU predicted seabed habitats

CWP doc. number: CWP-NPC-ENG-08-01-MAP-1133

Internal descriptive code:	*Size:* A3	*CRS:*
OECC.PB - PAB..BUFFs.10km.20km.S -BENTHIC. HABITATS.EUSM..BSS - EIAR.FIG.08.07	*Scale:* 1:150,000	EPSG 25830

Rev.	*Updates*	*Date*	*By*	*Chk'd*	*App'd*
00	Final for issue	2024/06/24	AC	ME/EA	SM

56. Within the OECC, eight stations were sampled for contaminants analysis during the site-specific survey (**Appendix 8.3 Benthic Baseline Report**). The potential for toxicity was compared to Irish levels published by the EPA (Cronin et al., 2006), and UK levels published by the Centre for Environment, Fisheries and Aquaculture Science (Cefas) (MMO, 2015) to determine the likelihood of biological impact. Levels below Irish Lower Action Levels (ALs) or Cefas Action Level (AL) 1 are generally of no concern and are unlikely to influence the licensing decision about sea disposal, whereas concentrations above Irish Upper ALs or Cefas AL2 are considered unsuitable for sea disposal. When assessed against Irish guidelines, stations 28, 30 and 77 had Arsenic levels above the Lower AL but below the Upper AL. Cadmium levels at station 59 were also between the Upper and Lower AL. When assessed against Cefas guidelines, levels of Cadmium, Chromium and Zinc at station 59 were slightly above AL1 but below AL2. No other contaminants assessed were above Irish Lower ALs or Cefas AL1.

57. Organotin compounds (tributyl tin (TBT), dibutyl tin (DBT) and monobutyltin (MBT)), were below the limits of detection and there was no exceedance of Irish or Cefas ALs at any of the sampling stations.

58. No Irish or Cefas Action Levels were exceeded for PCBs or PAHs. These results are in line with contaminant levels reported by OSPAR (2017).

8.6.4 CWP Project landfall and intertidal area

59. The proposed landfall is located in South Dublin Bay, directly south of Dublin Bay Power Plant and Poolbeg Power station. The habitat is reflective of a coastal system with extensive mudflats and sandflats and incipient dune formations. These habitats, along with saltmarsh habitats, are the qualifying features of South Dublin Bay SAC (**Table 8-9** and **Figure 8-3**).

60. Intertidal surveys in 2006 and 2011 to support the designation of South Dublin Bay SAC identified the Annex I habitat mudflats and sandflats not covered by seawater at low tide (1140) containing two community types: fine sands with *Angulus tenuis* community complex and *Zostera*-dominated community, the latter of which lies to the south of the bay at Merrion gates, and out with the proposed export cable corridor. An intertidal reef community occurs to the south of the SAC, dominated by algae species and the bivalve *Mytilus edulis*. The mudflats and sandflats were found to contain two communities: fine sand to sandy mud with *Pygospio elegans* and *Crangon crangon* community complex and fine sand with *Spio martineses* community complex.

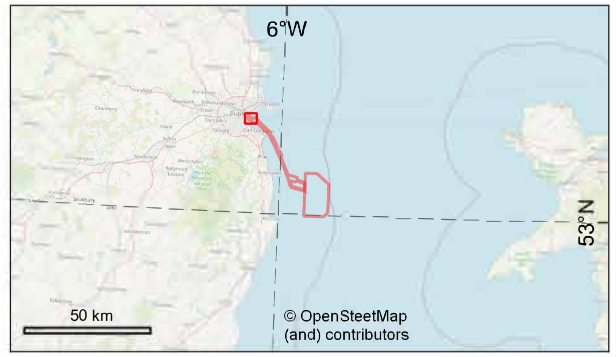
61. The site specific intertidal survey found the majority of the sediment type across the lower, middle and upper shore was fine sand or very fine sand, with two sites consisting of coarser sediment in the mid and upper shore. Faunal diversity was low across the majority of stations sampled, with the majority of taxa and individuals found in the mid to upper shore. The lower shore habitat was homogeneous fine sand with worm casts of *Arenicola marina*, patches of *Ulva* sp. and brown filamentous algae. Patches of *Ulva* sp. were frequent at the stations close to Landfall at the mid shore.

62. Biotopes at landfall were classified as Littoral Sand (LS.LSa) apart from two small areas which were classified as Littoral Coarse Sediment (LS.LCS) and Littoral Mixed Sediment (LS.LMx) (**Table 8-8** and **Figure 8-8**).

63. The mixed sediment was found at the top of the shore where more cobbles and boulders were present.

Table 8-8 Biotopes recorded in the CWP Project landfall and surrounding intertidal area in the site specific survey

Biotope code	Biotope name
LS.LSa	Littoral Sand
LS.LMx	Littoral Mixed Sediment
LS.LCS	Littoral Coarse Sediment



Legend

- Planning Application Boundary (PAB)
- River Liffey benthic sampling station

Site specific sampling stations and sediment type

- Coarse sediment
- Mixed sediment
- Sand

Site specific MNCR intertidal habitat map created from site specific intertidal survey data

- LS.LCS
- LS.LMx
- LS.LSa

codling wind park

Project: Codling Wind Park

Contractor: www.naturalpower.com natural power

Figure 8.8
Intertidal and River Liffey impact assessment with site specific habitat mapping and sampling stations

CWP doc. number: CWP-NPC-ENG-08-01-MAP-1134

Internal descriptive code:	*Size:* A3	*CRS:*
PB - PAB – BENTHIC.HABITATS.NP21 - EIAR.FIG.08.08	*Scale:* 1:15,000	EPSG 25830

Rev.	*Updates*	*Date*	*By*	*Chk'd*	*App'd*
00	Final for issue	2024/06/24	AC	ME/EA	SM

8.6.5 River Liffey

64. Opposite the proposed landfall location lies the proposed onshore substation location, on the south bank of the River Liffey. Dublin Port Company (DPC) conducted a benthic survey at four locations in the River Liffey on 15 December 2022 and a contaminated sediments survey at 24 locations on 28 September 2022 and 21 October 2022 (**Figure 8-5**).

65. The sediment type at all locations was sandy mud. The benthic community was dominated by polychaete *Capitella* sp. with other polychaete, nematode and bivalve species present. Diversity was low with the number of taxa per station ranging from three to thirteen. The dominance of *Capitella* sp. and low diversity may indicate some organic enrichment is present at these stations.

66. When compared to Irish and Cefas levels, contaminated sediment results showed that no contaminants were found at levels above those of Cefas AL1 or above Irish Lower Action Levels. Levels below Irish Lower Action Levels (ALs) or Cefas Action Level (AL) 1 are generally of no concern and are unlikely to influence the licensing decision about sea disposal, whereas concentrations above Irish Upper ALs or Cefas AL2 are considered unsuitable for sea disposal.

8.6.6 Identification of receptors

67. From the establishment of the baseline environment, the existing benthic and intertidal ecology receptors have been identified and are provided in **Table 8-9** below.

Table 8-9 Biotopes recorded in the offshore development area, landfall and surrounding intertidal area in the site specific survey

Broad habitat	Sub habitat type (biotope) description	MNCR code
Coarse sediment habitats	Circalittoral coarse sediment	SS.SCS.CCS
	Infralittoral coarse sediment	SS.SCS.ICS
	Offshore circalittoral coarse sediment	SS.SCS.OCS
	Spirobranchus triqueter with barnacles and bryozoan crusts on unstable circalittoral cobbles and pebbles	SS.SCS.CCS. MedLumVen
	Mediomastus fragilis, Lumbrineris spp. and venerid bivalves in circalittoral coarse sand or gravel	SS.SCS.CCS. SpiB
Sand habitats	Circalittoral sand	SS.SSa.CMuSa
	Infralittoral sand	SS.SSa.IMuSa
	Offshore circalittoral sand	SS.SSa.OSa
	Fabulina fabula and *Magelona mirabilis* with venerid bivalves and amphipods in infralittoral compacted fine muddy sand	SSa.IMuSa.FfabMag
Mixed sediment habitats	Circalittoral mixed sediment	SS.SMx.CMx
	Infralittoral mixed sediment	SS.SMx.IMx
	Offshore circalittoral mixed sediment	SS.SMx.OMx
Mud habitats	Circalittoral mud	SS.SMu.CSaMu
	Infralittoral mud	SS.SMu.ISaMu

Broad habitat	Sub habitat type (biotope) description	MNCR code
	Offshore circalittoral mud	SS.SMu.OMu
Rock and biogenic reef habitats	Infralittoral rock and biogenic reef	IR.HM / IR.MIR
	Circalittoral rock and biogenic reef	CR/HCR / CR.MCR
	Offshore circalittoral rock and biogenic reef	CR/HCR / CR.MCR
Intertidal habitats	Littoral sand	LS.LSa
	Littoral mixed sediment	LS.LMx
	Littoral coarse sediment	LS.LCS
	Littoral sandy mud	LS.LMu
River Liffey Habitats	*Capitella capitata* and *Tubificoides* spp. in reduced salinity infralittoral muddy sediment habitat	SS.SMu.SMuV S.CapTubi

8.6.7 Habitats / Species of Conservation Importance

68. No Annex I habitats or Annex II species were recorded during the site specific surveys of the offshore development area. While the reef-forming species *Sabellaria spinulosa* and *Sabellaria alveolata* were found in the array site and OECC, abundances were relatively low and no stations were classified as *Sabellaria* reef habitat (**Appendix 8.3 Benthic Baseline Report**). *Sabellaria r*eefs are present in the Wicklow Reef SAC to the south of the offshore development area (NPWS[3]).

69. All SACs and their qualifying interests, within 20 km of the offshore development area, are provided in **Table 8-10**. There are no protected areas for benthic habitats within the array site.

70. The offshore export cable corridor passes through Rockabill to Dalkey Island SAC, protected for reefs, and into South Dublin Bay SAC, protected for mudflats and sandflats, saltmarsh and dune habitats. Landfall is also situated within South Dublin Bay SAC.

71. Rockabill to Dalkey Island SAC is designated for intertidal and subtidal reef habitats that occur on the islands within the SAC and on the south coast of Howth and off the coast between Lambay Island and Rush Village. The substrate types include flat and sloping bedrock, vertical rock walls and cobbles and boulders.

72. Within the mudflats and sandflats Qualifying Interest of South Dublin Bay SAC, lies a *Zostera* sp. bed occurring in the south of the protected area and out with the OECC. This is an Annex I and OSPAR habitat.

Table 8-10 Protected areas and their Qualifying Interests, within the CWP Project subtidal and intertidal ecology study area

Site code	Name	Qualifying interests	Approximate closest distance to the offshore development area (km)[2]
003000	Rockabill to Dalkey Island SAC	Reefs [1170]	0
000210	South Dublin Bay SAC	Mudflats and sandflats not covered by seawater at low tide [1140] Annual vegetation of drift lines [1210] Salicornia and other annuals colonising mud and sand [1310] Embryonic shifting dunes [2110]	0
000206	North Dublin Bay SAC	Mudflats and sandflats not covered by seawater at low tide [1140] Annual vegetation of drift lines [1210] *Salicornia* and other annuals colonising mud and sand [1310] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Embryonic shifting dunes [2110] Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) [2120] Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130] Humid dune slacks [2190] *Petalophyllum ralfsii* (Petalwort) [1395]	1.28
002274	Wicklow Reef SAC	Reefs [1170]	5.49
002249	The Murrough Wetlands SAC	Annual vegetation of drift lines [1210] Perennial vegetation of stony banks [1220] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410]	5.87
000199	Baldoyle Bay SAC	Mudflats and sandflats not covered by seawater at low tide [1140]	6.98

0 km^2 denotes overlap with Designated site by CWP Project area

Site code	Name	Qualifying interests	Approximate closest distance to the offshore development area (km)[2]
		Salicornia and other annuals colonising mud and sand [1310] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410]	
000205	Malahide Estuary SAC	Mudflats and sandflats not covered by seawater at low tide [1140] *Salicornia* and other annuals colonising mud and sand [1310] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) [2120] Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130]	11.11
001766	Magherabeg Dunes SAC	Annual vegetation of drift lines [1210] Embryonic shifting dunes [2110] Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) [2120] Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130]	13.89
000729	Buckroney-Brittas Dunes and Fen SAC	Annual vegetation of drift lines [1210] Perennial vegetation of stony banks [1220] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Embryonic shifting dunes [2110] Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) [2120] Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130] Atlantic decalcified fixed dunes (*Calluno-Ulicetea*) [2150] Dunes with Salix repens ssp. argentea (*Salicion arenariae*) [2170] Humid dune slacks [2190]	17.52
000208	Rogerstown Estuary SAC	Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140]	17.74

Site code	Name	Qualifying interests	Approximate closest distance to the offshore development area (km)[2]
		Salicornia and other annuals colonising mud and sand [1310] Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410] Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) [2120] Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130]	
000000204	Lambay Island SAC	Reefs [1170] Vegetated sea cliffs of the Atlantic and Baltic coasts [1230]	18.55
003015	Codling Fault Zone SAC	Submarine structures made by leaking gases [1180]	18.83

Features of the MPA Sensitivity Assessment

73. In December 2022 the Marine Protected Area (MPA) advisory group conducted ecological sensitivity analysis of the Irish Sea (Marine Protected Area Advisory Group, 2023). A range of receptors were analysed and 40 features were shortlisted for protection, several of which are benthic and / or intertidal habitats and species. Several of the 40 features shortlisted for protection are present in the offshore development and intertidal areas (**Table 8-9**), and are as follows:

- Infralittoral, circalittoral, and offshore circalittoral coarse sediments, mixed sediments, mud and sand; and
- Offshore circalittoral rock and / or biogenic reef.

74. It should be noted that many of these habitats are ubiquitous in the Irish Sea. There is also little overlap between the CWP Project, and any areas selected for higher priority for potential protection, with the north-east corner of the array site overlapping with an area of low selection frequency for protection potential (Marine Protected Area Advisory Group, 2023).

75. Of the shortlisted features for protection that are benthic species, two of them were found in the baseline site specific surveys: *Mytilus edulis,* and *Sabellaria spinulosa.* All of which were found in low abundances and at few stations. No *Mytilus edulis* beds or *Sabellaria spinulosa reefs* were found in the baseline assessment and neither *Mytilus edulis* nor *Sabellaria spinulosa* are characterising species of any of the biotopes identified in the baseline site specific surveys (**Appendix 8.3 Benthic Baseline Report**).

8.6.8 Climate change and natural trends

76. Climate change is leading to increases in ocean temperature, changes to ocean chemistry, sea-level rise, changing salinities and oceanographic patterns and increased extreme events including storminess and marine heatwaves (IPCC, 2013).

77. During the lifetime of the CWP Project, it is likely that that climate change will result in increased storm events and more extreme weather events in general. It is reasonable to assume this may lead to increased sediment mobility and transportation. However, as described in **Section 8.6,** the CWP Project is situated in a highly dynamic environment and as such the benthic communities here are adapted to sediment movements. Whilst the impacts of climate change may result in slight changes to benthic habitats due to increased storm events, other impacts such as increased temperature and acidity will happen gradually and are unlikely to change baseline conditions over the lifetime of the CWP Project.

8.6.9 Predicted future baseline

78. In the event of the CWP Project not being developed, and no other developments occurring in the Irish Sea, no change in the baseline conditions would be expected beyond those resulting from climatic factors and natural trends (as detailed above).

8.7 Scope of the assessment

79. An EIA Scoping Report for the Offshore Infrastructure was published on 6 January 2021. The Scoping Report was uploaded to the CWP Project website and shared with regulators, prescribed bodies and other relevant consultees, inviting them to provide relevant information and to comment on the proposed approach being adopted by the Applicant in relation to the offshore elements of the EIA.

80. Based on responses to the Scoping Report, further consultation and refinement of the CWP Project design, potential impacts to subtidal and intertidal ecology scoped into the assessment are listed below in **Table 8-11**.

Table 8-11 Potential impacts scoped into the assessment

Impact no.	Description of impact	Notes
Construction		
Impact 1	Temporary habitat disturbance	The temporary disturbance relates to seabed preparation for foundations and cables, jack up and anchoring operations, and cable installation. Only habitats within the CWP Project have the potential to be impacted.
Impact 2	Temporary increase in suspended sediment concentration (SSC)	The temporary increase in SSC relates to seabed preparation for foundations and cables, jack up and anchoring operations, and cable installation.
Impact 3	Remobilisation of contaminated sediments	Remobilisation of contaminated sediments to sediments disturbed,

Impact no.	Description of impact	Notes
		mobilised and deposited elsewhere, during seabed preparation for foundations and cables, jack up and anchoring operations, and cable installation potentially containing contaminated sediments.
Impact 4	Introduction of INNS	There are no known INNS in the Project area; the potential for spreading of existing INNS is negligible. Therefore, the introduction of INNS relates to the potential transference from construction vessels into the offshore development area.
Impact 5	Accidental pollution events	This relates to the potential for accidental pollution such as oil and hydraulic fluids being introduced to the environment from vessels during construction activities.
Operation and maintenance		
Impact 1	Long-term habitat loss	The long-term habitat loss relates to the footprints of foundations and cable protection installations on the seabed that will remain for the operational lifetime of the CWP Project.
Impact 2	Habitat creation (increased hard substrate)	Habitat creation relates to increased hard substrate due to the introduction of turbine foundation and scour and cable protection which will become colonised by benthic epifaunal species and create hard substrate habitats.
Impact 3	Temporary habitat disturbance	Temporary habitat disturbance relates to maintenance activities such as cable repair, vessel jack-up operations and deployment of scour protection.
Impact 4	Presence of EMF and / or temperature changes	The presence of EMF and / or temperature changes relates to the electromagnetic frequency from the OECC and inter-array cables (IACs) during O&M.
Impact 5	Introduction of INNS	There are no known INNS in the Project area; the potential for spreading of existing INNS is negligible. Therefore, the introduction of INNS relates to the

Impact no.	Description of impact	Notes
		potential transference from the O&M activities vessels into the offshore development area.
Impact 6	Accidental pollution events	This relates to the potential for accidental pollution such as oil and hydraulic fluids being introduced to the environment from vessels during O&M activities.
Decommissioning		
Impact 1	Temporary habitat disturbance	Temporary habitat disturbance relates to the anticipated removal of CWP Project infrastructure and the end of the lifetime of the Project. However, no final decision has been made regarding decommissioning as yet.
Impact 2	Temporary increase in SSC	Temporary increase in SSC relates to the anticipated removal of CWP Project infrastructure and the end of the lifetime of the Project. However, no final decision has been made regarding decommissioning as yet.
Impact 3	Remobilisation of contaminated sediments	Remobilisation of contaminated sediments relates to the anticipated removal of CWP Project infrastructure and the end of the lifetime of the Project. However, no final decision has been made regarding decommissioning as yet.
Impact 4	Long-term habitat loss	Long-term habitat loss relates to the anticipated removal of hard substrate benthic habitats existing on CWP Project infrastructure at the end of the lifetime of the Project.
Impact 5	Introduction of INNS	Introduction of INNS relates to the activities of offshore vessels to decommission and remove CWP Project infrastructure and the end of the lifetime of the Project. However, no final decision has been made regarding decommissioning as yet.
Impact 6	Accidental pollution events	Accidental pollution relates to the activities of offshore vessels to decommission and remove CWP Project infrastructure and the end of the lifetime of the Project. However, no final decision has been made regarding decommissioning as yet.

8.8 Assessment parameters

8.8.1 Background

81. Complex, large-scale infrastructure projects with a terrestrial and marine interface such as the CWP Project, are consented and constructed over extended timeframes. The ability to adapt to a changing supply chain, policy or environmental conditions and to make use of the best available information to feed into project design, promotes environmentally sound and sustainable development. This ultimately reduces project development costs and therefore electricity costs for consumers and reduces CO_2 emissions.

82. In this regard the approach to the design development of the CWP Project has sought to introduce flexibility where required, among other things, to enable the best available technology to be constructed and to respond to dynamic maritime conditions, while at the same time to specify project boundaries, project components and project parameters wherever possible, having regard to known environmental constraints.

83. **Chapter 4 Project Description** describes the design approach that has been taken for each component of the CWP Project. Wherever possible the location and detailed parameters of the CWP Project components are identified and described in full within the EIAR. However, for the reasons outlined above, certain design decisions and installation methods will be confirmed post-consent, requiring a degree of flexibility in the planning consent.

84. Where necessary, flexibility is sought in terms of:

- Up to two options for certain permanent infrastructure details and layouts such as the wind turbine generator (WTG) layouts;
- Dimensional flexibility: described as a limited parameter range, i.e. upper and lower values for a given detail such as cable length; and
- Locational flexibility of permanent infrastructure described as limit of deviation (LoD) from a specific point or alignment.

85. The CWP Project had to procure an opinion from An Bord Pleanála to confirm that it was appropriate that this application be made and determined before certain details of the development were confirmed. An Bord Pleanála issued that opinion on 25 March 2024 (as amended in May 2024) and it confirms that the CWP Project could make an application for permission before the details of certain permanent infrastructure described in Section 4.3 of **Chapter 4 Project Description** is confirmed.

86. In addition, the application for permission relies on the standard flexibility for the final choice of installation methods, and O&M activities.

87. Notwithstanding the flexibility in design and methods, the EIAR identifies, describes and assesses all the likely significant impacts of the CWP Project on the environment.

8.8.2 Options and dimensional flexibility

88. Where the application for permission seeks options or dimensional flexibility for infrastructure or installation methods, the impacts on the environment are assessed using a representative scenario approach. A ‘representative scenario’ is a combination of options and dimensional flexibility that has been selected by the author of this EIAR chapter to represent all of the likely significant effects of the project on the environment. Sometimes, the author will have to consider several representative scenarios to ensure all impacts are identified, described and assessed.

89. For subtidal and intertidal ecology this analysis is presented in **Appendix 8.2** which identifies one or more representative scenario for each impact with supporting text to demonstrate that no other scenarios would give rise to new or materially different effects. This takes into consideration the potential impact of other scenarios on the magnitude of the impact or the sensitivity of the receptor(s) that is being considered.

90. **Table 8-12** presents a summarised version of **Appendix 8.2** and describes the representative scenarios on which the construction and O&M phase subtidal and benthic ecology assessment has been based. Where options exist, for each receptor and potential impact, the table identifies the representative scenario and provides a justification for this.

8.8.3 Limit of deviation (LoD)

91. Where the application for permission seeks locational flexibility for infrastructure, the impacts on the environment are assessed using a LoD. The LoD is the furthest distance that a specified element of the CWP Project can be constructed.

92. This chapter assesses the specific preferred location for permanent infrastructure. However, **Appendix 8.2** provides further analysis to determine if the proposed LoD for permanent infrastructure may give rise to any new or materially different effects, taking into consideration the potential impact of the proposed LoD on the magnitude of the impact.

93. For subtidal and intertidal ecology, this analysis is summarised in **Table 8-13**.

94. Where the potential for LoD to cause a new or materially different effect is identified, then this is noted in **Table 8-13** and is considered in more detail within **Section 8.10** of this chapter.

Table 8-12 Representative scenario summary

Impact	Representative scenario details	Value	Notes / assumptions
Construction			
Impact 1: Temporary habitat disturbance	Installation methods and effects (array site and offshore export cable corridor) (WTG Layout Option A)		Temporary disturbance relates to seabed preparation for foundations and cables, jack up and anchoring operations, cable installation and to geotechnical survey. It should be noted that where boulder clearance overlaps with sand wave clearance, the boulder clearance footprint will be within the sand wave clearance footprint. Offshore, WTG Option A forms the representative scenario as this represents the greatest level of temporary habitat disturbance, and therefore Option A forms the presentational basis of the assessment for Impact 1. Option B would result in a lower level of disturbance and would not introduce new impacts, or an impact of materially different magnitude.
	Boulder clearance: array site seabed clearance area (m^2)	2,556,000–2,934,000	
	Sand wave clearance: array site seabed clearance area (m^2)	205,250–259,250	
	IAC and interconnector cable installation: Total seabed disturbed (m^2)	1,911,000–2,214,000	
	Boulder clearance: OECC seabed clearance area (m^2)	2,220,000–2,616,000	
	Sand wave clearance: OECC seabed clearance area (m^2)	198,550	
	Offshore export cable installation: total seabed disturbed (m^2)	1,890,000–2,187,000	
	JUV operations total impact area (m^2)	240,000	
	WTGs and OSS anchoring operations total impact area (m^2)	280,800	
	IAC and interconnector cable anchoring operations total impact area (m^2)	371,520	
	Offshore export cable anchoring operations total impact area (m^2)	630,720	

Impact	Representative scenario details	Value	Notes / assumptions
	Total area of disturbed sediment for offshore construction activities (m^2)	**11,931,840**	
	Installation methods and effects (Landfall)		
	Total seabed disturbed by cofferdam (m^2)	6,100	There is only one installation method being proposed at Landfall, open cut trenching. Therefore, the open cut method to install the cable ducts forms the presentational basis of this assessment.
	Total seabed disturbed by intertidal cable duct installation (m^2)	36,000	
	Total area of seabed in transition zone affected by support structures (m^2)	6,900	
	Total area of seabed in transition zone affected by installation of cables using either open cut trenching or a shallow water trenching tool (m^2)	108,000	
	Total area of disturbed sediment for landfall construction activities (m^2)	**157,000**	
Impact 2: Temporary increase in suspended sediment concentration (SSC)	Representative scenario parameters are the same as those above for Impact 1 above. Sediment plume modelling suggests that the greatest direction and distance of dispersion of disturbed material was 9–10 km to the east, although one scenario showed dispersion to the southeast reaching 6–7 km and to the west reaching 3–4 km.	As above	Temporary increase in SSC relates to seabed preparation for foundations and cables, jack up and anchoring operations, and cable installation. It should be noted that where boulder clearance overlaps with sand wave clearance, the boulder clearance footprint will be within the sand wave clearance footprint. Increases in SSC occur as a result of temporary disturbance to the seabed. Offshore, WTG Option A forms the representative scenario as this represents the greatest level of

Impact	Representative scenario details	Value	Notes / assumptions
			temporary increase in SSC, and therefore Option A forms the presentational basis of the assessment for Impact 2. Option B would result in a lower level of disturbance and would not introduce new impacts, or an impact of materially different magnitude.
Impact 3: Remobilisation of contaminated sediments	Representative scenario parameters are the same as those above for Impact 1 above. Sediment plume modelling suggests that the greatest direction and distance of dispersion of disturbed material was 9–10 km to the east, although one scenario showed dispersion to the south-east reaching 6–7 km and to the west reaching 3–4 km.	As above	Remobilisation of contaminated sediments relates to seabed preparation for foundations and cables, jack up and anchoring operations, and cable installation. It should be noted that where boulder clearance overlaps with sand wave clearance, the boulder clearance footprint will be within the sand wave clearance footprint. Remobilisation of contaminated sediments occur as a result of temporary disturbance to the seabed. Offshore, WTG Option A forms the representative scenario as this represents the greatest level of temporary disturbance, and therefore Option A forms the presentational basis of the assessment for Impact 3. Option B would result in a lower level of disturbance and would not introduce new impacts, or an impact of materially different magnitude.

Impact	Representative scenario details	Value	Notes / assumptions
Impact 4: Introduction of INNS	Total construction vessels (round trips)	2,409	There are no known INNS in the offshore development area, therefore this impact relates to the potential transference of INNS from construction vessels or plant into the CWP Project Offshore. WTG Option A forms the representative scenario as this represents the greatest number of vessels required, and therefore Option A forms the presentational basis of the assessment for Impact 4. Option B would result in a lower potential for the introduction of INNS and would not introduce new impacts, or an impact of materially different magnitude.
Impact 5: Accidental pollution	Total construction vessels (round trips)	As above	Accidental pollution relates to the oils and fluids which may be used during construction activities, including: • Grease • Hydraulic oil • Gear oil • Nitrogen • Transformer silicon / ester oil • Diesel fuel • Glycol / coolants • Batteries • Drill fluid The requirement for use of oils and fluids during construction will be the same regardless of the WTG option

Impact	Representative scenario details	Value	Notes / assumptions
			selected. Therefore, there is only one scenario for this potential impact, and this represents the representative scenario.
Operations and maintenance			
Impact 1: Long-term habitat loss	Permanent infrastructure		The long-term habitat loss relates to the footprints of foundations including scour protection and areas of cable protection installations on the seabed that will remain for the operational lifetime of the CWP Project. Option A forms the representative scenario as this represents the greatest level of long-term habitat loss, and therefore Option A forms the presentational basis of the assessment for Impact 1 long-term habitat loss, in this chapter. Option B would result in a lower level of disturbance and would not introduce new impacts, or an impact of materially different magnitude.
	Total WTG monopile seabed area take (with scour protection) across the array site (m^2)	273,000	
	Total OSS monopile seabed area take (with scour protection) across the array site (m^2)	10,920	
	Interconnector and inter-array cabling – total area of seabed covered by cable protection (m^2)	208,600	
	Offshore export cables –total area of seabed covered by cable protection (m^2)	105,000	
	Substation reclamation (m2)	1,800	
	Total area of potential long-term habitat loss (m^2)	**599,320**	

Impact	Representative scenario details	Value	Notes / assumptions
Impact 2: Habitat creation (increased hard substrate).	Permanent infrastructure		Habitat creation relates to increased hard substrate due to the introduction of turbine foundation and scour and cable protection which will become colonised by benthic epifaunal species and create hard substrate habitats during the lifetime of the CWP Project. Option A forms the representative scenario as this represents the greatest level of habitat creation, and therefore Option A forms the presentational basis of the assessment for Impact 2 habitat creation, in this chapter. Option B would result in a lower level of disturbance and would not introduce new impacts, or an impact of materially different magnitude.
	Representative scenario parameters are the same as those for Impact 1 above.	As above for Impact 1.	

Impact	Representative scenario details	Value	Notes / assumptions
Impact 3: Temporary habitat disturbance	Scheduled operation and maintenance activities will not result in any temporary habitat disturbance. Unscheduled maintenance activities of WTGs will be required should a component fail or break. If a component requires replacing this may be done from a JUV and would result in some temporary habitat disturbance, however this is likely to be one location at a time and therefore the potential impact is much less than that of JUV operations during construction. Anticipated JUV requirements during operation and maintenance are for two JUVs making three round trips annually equating to 150 round trips over an anticipated CWP Project lifetime of 25 years. Unscheduled maintenance activities of IAC, interconnector and export cables include cable repair. Should it be required, this may involve a faulty section of cable to be removed from the seabed, repaired, relaid and reburied. Therefore, resulting in an increase in temporary habitat disturbance. As repair is likely to only ever be required for a section of cable at a time the impacts will be less than the construction phase cable lay and burial. As temporary habitat disturbance during O&M activities will arise due to unscheduled maintenance activities the values of these activities are unknown. However, reliability and ease of maintenance have been carefully considered in the CWP Project design to minimise maintenance requirements and although maintenance activities will be carried out over a longer period of time than construction activities. The amount of habitat disturbed during repair activities is likely to be less than those of the installation of the infrastructure, as maintenance activities will be conducted in discrete locations while construction activities cover the whole CWP Project area. Given this, it is anticipated that for the purposes of a representative scenario, the impacts will be no greater than those identified for the construction phase.		
Impact 4: Presence of EMF and / or temperature changes resulting from presence of electrical infrastructure	Permanent infrastructure		The presence of EMF and / or temperature changes relates to the electromagnetic frequency from the OECC, interconnectors and IACs during the operational phase. Option A forms the representative scenario as this represents the greatest length of cable with the potential to emit EMF and / or temperature changes, and therefore
	Interconnector and IAC length (km)	127.4–147.6	
	Interconnector and IAC minimum depth of cover (m)	1	
	Interconnector and IAC voltage (kV)	66	
	OECC length (km)	126–146	
	OECC minimum depth of cover (m)	1.4	
	OECC voltage (kV)	220	

Impact	Representative scenario details	Value	Notes / assumptions
	Total length of cables with the potential to emit EMF and/or Temperature changes	**253.4 – 293.6**	Option A forms the presentational basis of the assessment for Impact 4: EMF and / or potential temperature changes in this chapter. Option B would result in a shorter cable length and therefore smaller area with the potential to be impacted by EMF and / or temperature changes and would not introduce new impacts, or an impact of materially different magnitude.
Impact 5: Introduction of INNS	Number of vessels on site x round trips	1,209	There is the potential that Invasive non-native species (INNS) could be introduced by O&M related activities, through methods such as the release of contaminated ship's ballast. The estimated number of vessels required during operation and maintenance are the same regardless of the WTG option selected. Therefore, there is only one scenario for this potential impact, and this represents the representative scenario.
Impact 6: Accidental pollution	Oils and fluids which may be used during construction activities include: • Grease • Hydraulic oil • Gear oil • Nitrogen • Transformer silicon / ester oil • Diesel fuel	As above	Accidental pollution relates to the oils and fluids which may be used during O&M activities, including: • Grease • Hydraulic oil • Gear oil • Nitrogen • Transformer silicon / ester oil

Impact	Representative scenario details	Value	Notes / assumptions
	• Glycol / coolants • Batteries • Drill fluid		• Diesel fuel • Glycol / coolants • Batteries • Drill fluid The requirement for use of oils and fluids during O&M will be the same regardless of the WTG option selected. Therefore, there is only one scenario for this potential impact, and this represents the representative scenario.
Decommissioning			
Impact 1: Temporary habitat disturbance **Impact 2**: Temporary increase in Suspended Sediment Concentrations (SSC) **Impact 3**: Remobilisation of contaminated sediments	It is recognised that legislation and industry best practice change over time. However, for the purposes of the EIA, at the end of the operational lifetime of the CWP Project, all offshore infrastructure will be rehabilitated. In this regard, for the purposes of a representative scenario for decommissioning impacts, the following assumptions have been made: • The WTGs and OSS topsides shall be completely removed. Following WTG and OSS topside decommissioning and removal, the monopile foundations will be cut below the seabed level, to a depth that will ensure the remaining foundation is unlikely to become exposed. This is likely to be approximately one metre below seabed, although the exact depth will depend upon the sea-bed conditions and site characteristics at the time of decommissioning. • All cables and associated cable protection in the offshore environment shall be wholly removed. It is likely that equipment similar to that which is used to install the cables may be used to reverse the burial process and expose them. Therefore, the area of seabed impacted during the removal of the cables is anticipated to be the same as the area impacted during the installation of the cables. • Generally, decommissioning is anticipated to be a reverse of the construction and installation process for the CWP Project and the assumptions around the number of vessels on site, and vessel round trips is therefore the same as described for the construction phase of the offshore components.		

<table>
<tr><th>Impact</th><th>Representative scenario details</th><th>Value</th><th>Notes / assumptions</th></tr>
<tr><td>Impact 4: Long-term habitat loss</td><td colspan="3">Given the above it is anticipated that for the purposes of a representative scenario, the impacts will be no greater than those identified for the construction phase.</td></tr>
<tr><td>Impact 5: Introduction of INNS</td><td colspan="3" rowspan="2">It is recognised that legislation and industry best practice change over time. However, for the purposes of the EIA, at the end of the operational lifetime of the CWP Project, all offshore infrastructure will be rehabilitated. In this regard, for the purposes of a representative scenario for decommissioning impacts, the following assumptions have been made:
• Generally, decommissioning is anticipated to be a reverse of the construction and installation process for the CWP Project and the assumptions around the number of vessels on site, and vessel round trips is therefore the same as described for the construction phase of the offshore components.

Given the above it is anticipated that for the purposes of a representative scenario, the impacts will be no greater than those identified for the construction phase.</td></tr>
<tr><td>Impact 6: Accidental pollution events</td></tr>
</table>

Table 8-13 LoD Assessment summary

Project component	Limit of deviation	Conclusion from Appendix 8.2
WTGs / OSSs / monopile foundation/ scour protection	100 m from the centre point of each WTG and OSS location is proposed to allow for small adjustments to be made to the structure locations.	No potential for new or materially different effects.
Inter-array cables (IACs) / interconnector cables	100 m either side of the preferred alignment of each IAC and interconnector cable is proposed to allow for small adjustments to be made to the cable alignments. 200 m from the centre point of each WTG location.	No potential for new or materially different effects.
Offshore export cables in the OECC	250 m either side of the preferred alignment within the array site. The OECC outside of the array site.	No potential for new or materially different effects.
Intertidal cable ducts and intertidal offshore export cables (non ducted sections)	The OECC.	No potential for new or materially different effects.
Location of onshore substation revetment perimeter structure	Defined LoD boundary.	No potential for new or materially different effects.

8.9 Primary mitigation measures

95. Throughout the evolution of the CWP Project, measures have been adopted as part of the evolution of the project design and approach to construction, to avoid or otherwise reduce adverse impacts on the environment. These mitigation measures are referred to as 'primary mitigation'. They are an inherent part of the CWP Project and are effectively 'built in' to the impact assessment.

96. Primary mitigation measures relevant to the assessment of subtidal and intertidal ecology are set out in **Table 8-14**. Where additional mitigation measures are proposed, these are detailed in the impact assessment (**Section 8.10**). Additional mitigation includes measures that are not incorporated into the design of the CWP Project and require further activity to secure the required outcome of avoiding or reducing impact significance.

Table 8-14 Primary mitigation measures

Project element	Description
All offshore infrastructure (Construction and Operation)	Positions of WTGs and OSSs have been informed by a wide range of site specific data, including metocean data (e.g. wind speed and direction), geophysical and geotechnical survey data (e.g. bathymetry), environmental data (e.g. benthic surveys and archaeological assessment) and stakeholder consultation. Designing and optimising the layout of the WTGs has considered multiple constraints identified from analysis of these datasets, alongside the consideration of layout principles taken from relevant guidance on the design of OWFs. A summary of the key actions taken to avoid or otherwise reduce impacts is provided below: • The WTG layout options include Search and Rescue (SAR) access lanes to allow a SAR resource to fly on the same orientation continuously through the array site. This is provided to minimise risks to surface vessels and / or SAR resource transiting through the array site. • Archaeological exclusion zones (AEZs) around known features of archaeological interest have been avoided. No works that impact the seabed will be undertaken within the extent of an AEZ during the construction, operational or decommissioning phases. • The locations of offshore infrastructure have been developed to avoid known sensitive ecological habitats, including areas with suitable conditions for *Sabellaria spinulosa* which can form reefs under some circumstances. Whilst reefs were not identified during the characterisation surveys, as an ephemeral feature it will be necessary to validate the results in advance of construction. A pre-construction geophysical survey will therefore be undertaken to facilitate the micrositing around sensitive habitats such as *Sabellaria* spinulosa. • The WTG layout options have been developed to avoid or minimise interaction with known areas of high fishing density, where possible. As avoidance is not always possible, the layouts have also been developed to increase the potential for coexistence.

Project element	Description
	• A paleochannel (the remnants of a river or stream channel that flowed in the past) in the centre west of the array site has been avoided.
All offshore infrastructure (Construction)	Bedform clearance operations will be undertaken only where necessary, thereby minimising sediment disturbance and alteration to seabed morphology.
Offshore cables (Operation)	Cables will be suitably buried or protected by other means where burial is not practicable. This will reduce the potential for effects relating to the presence of EMF.
All offshore infrastructure (Construction and Operation)	A Construction Environmental Management Plan (CEMP) has been prepared to provide a management framework, to ensure appropriate controls are in place to manage environmental risks associated with the construction of the CWP Project. It outlines environmental procedures that require consideration throughout the construction process, in accordance with legislative requirements and industry best practice. In summary, the CEMP includes details of: • The Environmental Management Framework for the CWP Project including environmental roles and responsibilities (i.e. ecological clerk of works) and contractor requirements (i.e. method statements for specific construction activities); • Mitigation measures and commitments made within the EIAR, Natura Impact Statement (NIS) and supporting documentation for the CWP Project; • Measures proposed to ensure effective handling of chemicals, oils and fuels including compliance with the MARPOL convention; • A Marine Pollution Prevention and Contingency Plan to address the procedures to be followed in the event of a marine pollution incident originating from the operations of the CWP Project; • An Emergency Response Plan adhered to in the event of discovering unexploded ordnance; • Offshore biosecurity and invasive species management detailing how the risk of introduction and spread of invasive non-native species will be minimised; and • Offshore waste management and disposal arrangements. The CEMP will be implemented by the Applicant and its appointed contractor(s) and will be secured through conditions of the development consent. It will be a live document which will be updated and submitted to the relevant authority, prior to the start of construction.
All offshore infrastructure (Decommissioning)	A Rehabilitation Schedule is provided as part of the planning application. This has been prepared in accordance with the MAP Act (as amended by the Maritime and Valuation (Amendment) Act 2022) to provide preliminary information on the approaches to

Project element	Description
	decommissioning the offshore and onshore components of the CWP Project. A final Rehabilitation Schedule will require approval from the statutory consultees prior to the undertaking of decommissioning works. This will reflect discussions held with stakeholders and regulators to determine the exact methodology for decommissioning, taking into account available methods, best practice and likely environmental effects.

8.10 Impact assessment

8.10.1 Construction phase

97. The potential environmental impacts arising from the construction of the CWP Project are listed in **Table 8-11** along with the representative scenario parameters against which each construction phase impact has been assessed. A description of the potential effect on subtidal and intertidal ecology receptors caused by each identified impact is given below.

Impact 1: Temporary habitat disturbance

98. Habitats within the CWP Project are likely to be affected by temporary disturbance. A number of activities may affect various locations across the offshore development area, including sand wave and boulder clearance and cable route preparation, installation and burial. JUV and anchoring operations are also likely to cause some habitat disturbance and are included in the assessment below.

99. The impact of temporary habitat disturbance relates to physical disturbance of the seabed including penetration and abrasion. Noise and vibration are another aspect of temporary habitat disturbance which may occur from some construction activities such as impact piling, drilling and vibropiling activities in the array site and at River Liffey. Noise is classified as not relevant, and vibration is not assessed as a pressure for benthic intertidal habitats under the MarLIN / MarESA sensitivity assessment as there is not considered to be direct interaction between the impact and the habitat (Tyler-Walters et al., 2023). A recent literature review of the impacts of anthropogenic vibration on marine epibenthos concluded that, whilst there is a lack of evidence on the impact of vibration on benthic invertebrates, responses in some species due to vibration from activities such as pile driving are detectable (Roberts & Elliott, 2017). The hermit crab *P. bernhardus* was found to display some, not significant, behavioural changes and bivalve *Mytilus edulis* exhibited variation in valve gape and oxygen demand when exposed to vibration, at simulated levels of vibration from pile driving, in laboratory and semi-field conditions (Roberts et al., 2016). While some evidence exists as to the impact of noise and vibration on benthic invertebrates at an individual level, any impacts on benthic communities are not well understood. Furthermore, any impacts of noise and vibration would be short term and very localised. Given this, the potential impact of noise and vibration would not adversely impact the subtidal and intertidal habitats within the offshore development area.

100. The deployment of construction buoyage within the Marine Safety Demarcation Area (MSDA) has the potential to result in some minor temporary habitat disturbance from the construction buoy anchorage and mooring chains. However, the extent and size of the impact is negligible in scale and temporary (as the buoyage is anticipated to be removed following the completion of construction).

101. Habitat types within the offshore development area (and its immediate vicinity for buoyage, for which it is considered that habitats are equivalent) are considered relevant to this direct impact as the activities which may cause temporary habitat disturbance are confined to within the CWP Project.

102. The effects of this impact are assessed on a habitat level, with habitats grouped according to common traits. The habitat groups assessed are:

- Subtidal coarse sediment habitats;
- Subtidal sand habitats; and
- Intertidal habitats.

103. Overall, the total percentage of the offshore development area affected by temporary habitat disturbance is c. 5%.

Subtidal coarse sediment habitats

104. The majority of benthic habitats within the offshore development area are the subtidal coarse sediment habitats: *Mediomastus fragilis, Lumbrineris* spp. and venerid bivalves in circalittoral coarse sand or gravel, and *Spirobranchus triqueter* with barnacles and bryozoan crusts on unstable circalittoral cobbles and pebbles.

105. Circalittoral and infralittoral variants of these habitats are present in the wider study area.

Receptor sensitivity

106. The habitats *Mediomastus fragilis, Lumbrineris* spp. and venerid bivalves in circalittoral coarse sand or gravel and *Spirobranchus triqueter* with barnacles and bryozoan crusts on unstable circalittoral cobbles and pebbles, have no conservation status in Ireland but some conservation status elsewhere in Europe as they are listed as Habitats of Principal Importance (HPI), Features of Conservation Interest (FOCI) and UK BAP habitats.

107. However, this habitat group is ubiquitous in the area and the habitat *Mediomastus fragilis, Lumbrineris* spp. and venerid bivalves in circalittoral coarse sand or gravel and its variants, make up a significant proportion of the offshore Irish Sea benthos (Mackie, Oliver & Rees 1995).

108. Tolerance of the *Spirobranchus triqueter* with barnacles and bryozoan crusts on unstable circalittoral cobbles and pebbles habitat to temporary habitat disturbance, is assessed as low due many of the characterising species occurring on rocks and pebbles and therefore vulnerable to abrasion. However, several studies have shown epifaunal communities dominated by *Spirobranchus triqueter* decrease with winter storms and recolonised in spring (Hiscock ,1983; Warner 1985; Riley & Ballerstedt, 2005).

109. Tolerance of the *Mediomastus fragilis*, *Lumbrineris* spp. and venerid bivalves in circalittoral coarse sand or gravel habitat is assessed as medium as some of the characterising species may be susceptible to disturbance such a venerid bivalves, which live close to the surface while burrowing polychaetes such as *Lumbrineris* spp. are largely unaffected (Gittenberger & Van Loon, 2011).

110. The subtidal coarse sediment habitats within the offshore development area occur in areas of strong tidal or wave movements and are subject to scour. The characterising species of habitat *Spirobranchus triqueter* with barnacles and bryozoan crusts on unstable circalittoral cobbles and pebbles are short lived, fast growing, colonising species. The characterising species of *Mediomastus fragilis, Lumbrineris* spp. and venerid bivalves in circalittoral coarse sand or gravel may recover from disturbance via in-situ repair of damaged individuals and adults may also be transported in the water column following washout from sediments. Most bivalves will be able to reposition within the sediment and some, such as *Glycymeris glycymeris*, are also able to move and to relocate following

displacement and disturbance (Thomas, 1975). These habitats will likely recover quickly (1–2 years) from any impact of temporary habitat disturbance due to the wide availability of similar habitat containing the same community as that affected. The recoverability of these habitats is assessed as high to temporary habitat disturbance (Tyler-Walters& Tillin, 2023; Tillin and Watson, 2023).

111. Given the low value, low to medium tolerance and high level of recoverability of the coarse sediment habitats and based on the sensitivity criteria set out in **Table 8-3**, the sensitivity of coarse sediment habitats is considered to be low.

Magnitude of impact

112. Coarse sediment habitats cover c.153 km^2 of the offshore development area and c.1,339 km^2 of the wider study area.

113. The duration of this impact is short (no more than three years in duration), however disturbance events will not persist for this entire period, instead acting as discreet events throughout the construction phase. It is recognised that some areas may see repeated disturbance within the construction period, however the consideration of resilience above are considered relevant, and recovery is assessed from the point of cessation of the impacting activities in the area.

114. Within the array site, coarse sediments make up 99.997% of the habitats present. Based upon a proportional distribution of impacts within this habitat (considered to represent the representative scenario including Project design LoD), up to 3.3% of the coarse sediments within the array site may be affected by temporary habitat disturbance. Should only coarse sediments in the array site be impacted by temporary habitat disturbance, the percentage affected will not change due to the large proportion of the area they make up.

115. Within the OECC, coarse habitats make up approximately 80% of the habitats present, primarily in the offshore portion of the OECC. Based upon a proportional distribution of impacts within this habitat, up to 9% of the coarse sediments within the OECC may be affected by temporary habitat disturbance. In the unlikely event that only the coarse sediments habitats within the OECC were impacted by temporary habitat disturbance, this would result in c. 11% of this habitat with the potential to be impacted.

116. Within the offshore development area, coarse sediment habitats make up c. 94% of the habitats present. Based upon a proportional distribution of impacts within this habitat, up to 4.4% of the coarse sediments within the offshore development area may be affected by temporary habitat disturbance.

117. In the wider study area, coarse sediments cover around 1,339 km^2. Overall, the total area of coarse sediment habitat potentially affected within the wider study area is 0.04% of the available coarse sediment habitats.

118. The consequences of temporary habitat disturbance on subtidal coarse sediments are considered to be low as it is anticipated only a minor loss or alteration of key characteristics of the habitats are expected to occur as a result of the impact and the habitats will recover quickly.

119. Based on the criteria set out in **Table 8-4** the potential magnitude of impact from temporary habitat disturbance to the coarse sediment habitat group is considered to be low.

Subtidal sand habitats

120. The habitat, *Fabulina fabula* and *Magelona mirabilis* with venerid bivalves and amphipods in infralittoral compacted fine muddy sand is the only sand biotope within the offshore development area and the vast majority of this lies within the OECC, nearshore and within Dublin Bay (**Figure 8-4**) Offshore,

circalittoral and infralittoral sand habitats are present within the study area, though these are mainly located in nearshore areas such as Dublin Bay.

Receptor sensitivity

121. The habitat *Fabulina fabula* and *Magelona mirabilis* with venerid bivalves and amphipods in infralittoral compacted fine muddy sand has some conservation status within the UK, as it is listed as a HPI, FOCI and UK BAP habitat.

122. Sand habitats are common along the coastlines of Ireland and occur widely on the Atlantic coasts of north-west Europe.

123. The species that are present in the *Fabulina fabula* and *Magelona mirabilis* with venerid bivalves and amphipods in infralittoral compacted fine muddy sand habitat, can be broadly characterised as either opportunist species that rapidly colonise disturbed habitats and increase in abundance, or species that are larger and longer-lived and that may be more abundant in an established, mature assemblage.

124. The tolerance of this habitat to the impact of temporary habitat disturbance is assessed as medium and recoverability is assessed as high as opportunistic species are likely to recruit rapidly and any damaged characterising species may recover or recolonise (Tillin & Rayment, 2023). Although tolerance is assessed as medium, it is noted in the sensitivity assessment that trawling studies showed the characterising species of this habitat to be relatively tolerant of habitat disturbance (Capasso et al., 2010) Given the recoverability of these species and the wide availability of similar habitat nearby, it is likely this habitat will recover quickly (less than two years) from any temporary disturbance event.

125. Given the low value, medium tolerance and high recoverability of the sand habitats to this impact and based on the sensitivity criteria set out in **Table 8-3**, the sensitivity of the subtidal sand habitat group is considered to be low.

Magnitude of impact

126. *Fabulina fabula* and *Magelona mirabilis* with venerid bivalves and amphipods in infralittoral compacted fine muddy sand cover c. 7.6 km^2 of the offshore development area, the vast majority of which is present within the OECC, and broader sand habitats cover c. 965 km^2 of the wider study area.

127. The duration of this impact is short (no more than three years in duration), however disturbance events will not persist for this entire period, instead acting as discreet events throughout the construction phase. It is recognised that some areas may see repeated disturbance within the construction period, however the consideration of resilience above are considered relevant, and recovery is assessed from the point of cessation of the impacting activities in the area.

128. Within the array site, subtidal sand habitats make up just c.0.003% of the habitats present. Based upon a proportional distribution of impacts within this habitat, 3.3% of the sand sediments within the array site may be affected by temporary habitat disturbance. However, considering the discreet and patchy nature of this habitat's distribution within the array site, it is considered possible that all areas of this habitat type may be affected by temporary habitat disturbance.

129. Due to the hydrodynamic regime and the mobile nature of sand sediments in the area, it is likely that this habitat is relatively ephemeral, and appears in pockets within the more widely abundant coarse habitats, and that the extent and distribution of this habitat within the array site vary naturally. As such, any areas of sand habitat within the array site are considered to be transient in nature, and species present are likely to be early colonisers that are able to recover abundances rapidly after any period of disturbance (natural or anthropogenic). Within the OECC, subtidal sand habitats make up approximately 20% of the habitats present, primarily in the nearshore portion of the OECC. Based

upon a proportional distribution of impacts within this habitat (considered to represent the representative scenario including Project design LoD), up to 9% of the sand habitats within the OECC may be affected by temporary habitat disturbance.

130. Overall, within the offshore development area, subtidal sand habitats make up 4.5% of the habitats present. Based upon a proportional distribution of impacts within the Project area, up to c. 7% of the subtidal sand habitats within the offshore development area may be affected by temporary habitat disturbance.

131. In the wider study area, subtidal sands cover 965 km^2. Overall, the total area of sand sediment habitat affected within the wider study area is up to 0.01% of the available area of subtidal sand habitats.

132. The consequences of temporary habitat disturbance on subtidal sand sediments are considered to be medium as there is some potential for the impact to result in a partial change to key characteristics or features of the baseline sand habitats.

133. Based on the criteria set out in **Table 8-4** the potential magnitude of impact from temporary habitat disturbance to the sand habitats is considered to be medium.

Intertidal habitats

134. The intertidal sections of the OECC and landfall consist mainly of littoral sand with a small section of littoral coarse sediment near landfall and a small section of mixed sediment at the top of the shore.

Receptor sensitivity

135. The intertidal sections of the OECC and landfall lie within South Dublin Bay SAC, a qualifying feature of which is the Annex I habitat, mudflats and sandflats not covered by seawater at low tide (1140). The site specific intertidal survey showed that sediments are predominantly sands within the OECC / Landfall intertidal area.

136. Mudflats and sandflats not covered by sea water at low tide occur widely throughout Ireland.

137. The Conservation Objectives for South Dublin Bay SAC (NPWS, 2013) states that for intermittent or episodic activities for which the receiving environment would have some resilience and may be expected to recover within a reasonable timeframe relative to the six-year reporting cycle (as required under Article 17 of the Directive), such activities can be assessed in a context specific manner giving due consideration to the particular resilience of the receiving habitat.

138. The tolerance of the littoral sand habitat to the impact of temporary habitat disturbance is assessed as medium and recoverability as high as it is characterised by opportunistic polychaetes and mobile amphipods that are indicative of, and adapted to, biotopes subject to natural and / or anthropogenic disturbance and recover quickly, < 1 year (Ashley, 2016).Given the recoverability of these species and the wide availability of similar habitat nearby, it is likely this habitat will recover within several months from any temporary disturbance.

139. Given the high value, medium levels of tolerance and high recoverability of the Annex I habitat and based on the sensitivity criteria set out in **Table 8-3**, the sensitivity of the intertidal habitats to temporary habitat disturbance is considered to be medium.

Magnitude of impact

140. Activities within the intertidal area that may impact on intertidal habitats include open cut trenching and preparatory works such as installation of a cofferdam, and installation and burial of the offshore export cable. Following all work in the intertidal area, the intertidal habitats will be reinstated.

141. The duration of this impact is short (no more than one year in duration), however disturbance events will not persist for this entire period, instead acting as discreet events throughout the construction phase. It is recognised that some areas may see repeated disturbance within the construction period, however the consideration of resilience above are considered relevant, and recovery is assessed from the point of cessation of the impacting activities in the area.

142. Based on the PD and representative scenario the intertidal area with potential to be impacted by temporary disturbance during construction activities is confined to the offshore development area and accounts for c. 6.8% of the total area with the potential to be impacted, and c. 2% of the tidal mudflats and sandflats Annex I habitat within the SAC.

143. The impact of temporary habitat disturbance may have the potential to result in a minor loss or alteration of key features of baseline sand habitats and as such the consequences are considered to be low.

144. Given the short-term duration of the impact and the sensitivity of the receptor and based on the criteria set out in **Table 8-4** the potential magnitude of impact from temporary habitat disturbance to the intertidal habitats is considered to be low.

Habitats within the River Liffey

145. Activities within the River Liffey that may impact on the sandy mud habitat are the excavation of some of the existing revetment and the installation of a combi-wall and new revetment. A section of 150 m of the 230 m combi-wall will be installed into the seabed.

146. The marine habitat within the River Liffey consists of a slightly impoverished sandy mud habitat dominated by the polychaete *Capitella capitata*. Most likely the biotope, *Capitella capitata* and *Tubificoides* spp. in reduced salinity infralittoral muddy sediment.

Receptor sensitivity

147. This habitat does not lie within a protected area and has no national or international conservation status. The habitat is situated in an industrialised section the River Liffey and is subject to maintenance dredging by Dublin Port Company (DPC).

148. *Capitella capitata* and *Tubificoides* spp. in reduced salinity infralittoral muddy sediment habitat is an impoverished habitat with very low species richness. It is considered to have medium tolerance and high recoverability to temporary habitat disturbance as many individuals of the characterising species are likely to be buried deeply and can migrate to the surface following disturbance (Tillin & Watson, 2023).

149. Given the low value, medium levels of tolerance and high recoverability of the River Liffey habitats to temporary habitat disturbance and given the low ecological value of this habitat and based on the sensitivity criteria set out in **Table 8-3**, the sensitivity of the sandy mud habitat within River Liffey to temporary habitat disturbance is considered to be negligible**.**

Magnitude of impact

150. The extent of the intertidal area at River Liffey with the potential to be impacted by temporary habitat disturbance is 1800 m^2.

151. The duration of this impact is short (no more than one year in duration), however disturbance and piling events will not persist for this entire period, instead acting as discreet events throughout the construction phase.

152. The impact of temporary habitat disturbance is assessed to have negligible consequences to the River Liffey habitats as it is only likely to result in very slight changes to the baseline features of the habitat.

153. Based on the criteria set out in **Table 8-4** and given the very small extent of the impact and the negligible consequences for the baseline habitat characteristics, the potential magnitude of impact from temporary habitat disturbance to the River Liffey habitats is considered to be negligible.

Significance of the effect

154. The sensitivity of benthic habitat receptors and magnitude of impact of temporary habit disturbance, in the study area, is considered to be negligible, low or medium for all habitats (**Table 8-15** below). Therefore (as per the matrix in **Table 8-5**), an effect of **not significant** adverse impact on subtidal and intertidal ecology receptors is predicted for all habitats.

Table 8-15 Significance assignment for temporary habitat disturbance

Receptor group	Sensitivity	Magnitude	Significance
Subtidal coarse sediment habitats	Low	Low	**Not significant** (not significant)
Subtidal sand habitats	Low	Medium	**Slight** (not significant)
Intertidal habitats	Medium	Low	**Slight** (not significant)
River Liffey habitats	Negligible	Negligible	**Imperceptible** (not significant)

155. Where flexibility in the proposed design exists there is no other scenario which would lead to a more significant effect.

156. Based on the predicted level of effect it is concluded that no additional mitigation is required beyond the primary mitigation measures described in **Section 8.9**.

Impact 2: Temporary increase in SSC

157. Activities associated with seabed preparation such as the deposit of dredged material within the array site and OECC and cable installation activities in the OECC have the potential to lead to local increases in SSC.

158. Whilst construction activities in the intertidal and landfall areas such as open cut trenching will disturb the sediment, the works will be conducted at low tide and as such have no potential to lead to increases in SSC.

159. The two activities that will result in the largest levels of SSC and associated deposition are dredging and trenching, as described in **Chapter 6 Marine Geology, Sediments and Coastal Processes**.

160. During dredge disposal and trenching activities, SSCs local to the release locations are predicted to be enhanced to up to c. 150 mg \ L.

161. Enhanced SSCs are transient, and concentrations are predicted to reduce to baseline levels no more than 15 days after the release activity.

Dredging and dredge disposal

162. Suspended sediment plumes created during dredge disposal operations are predicted to enhance SSC levels in the near field (i.e. to the point of release) and far field (i.e. up to circa 10 km) from the point of release).

163. The predicted transport of sediment plumes and subsequent deposition during dredge disposal activities within the offshore development area can be summarised as follows:

Modelled representative scenarios of dredge disposal activities within the array site indicated the predominant direction of travel for SSC plumes is eastward (away from shore). In one scenario, a maximum transient increase in SSC of 150 mg/L was predicted to travel a maximum of 4 km over c.10 days resulting in a cumulative sediment deposition thickness of c. 6 cm. In another, a maximum increase of 100 mg/L was predicted to travel up to 6 km over c. 15 days resulting in a cumulative sediment deposition thickness of c. 3 cm. Modelled representative scenarios of dredge disposal activities within the OECC predicted: a maximum transient increase in SSC of 80 mg/L, travelling 4 km westward resulting in a cumulative sediment deposition thickness of c. 2 cm, near the disposal location. In a final scenario, a maximum increase in SSC of 50 mg/L, travelling a maximum of 5 km south eastward resulting in a cumulative sediment deposition thickness of c. 4 cm, near the disposal location.

Trenching

164. A consequence of cable installation will be the liberation of sediment into suspension within the water column, just above the seabed. Jetting results in greater sediment suspension, introducing the potential for distribution of greater volumes of material over a larger spatial area than other cable laying techniques which may be employed during construction and thus is assessed as the representative scenario. This method involves fluidising the material to form a narrow trench into which the cable is laid.

165. Based upon the representative scenario, the predicted transport of sediment plumes generated during cable installation activities across the array site indicates the finest sediments will potentially be transported eastward up to 10 km at an increase of 20 mg/L, resulting in a cumulative sediment deposition thickness of < 1 cm, near the release location. Maximum SSC values of up to 40 mg/L were predicted to be transported up to 4 km eastward, resulting in a cumulative sediment deposition thickness of c. 1 cm, near the release location. However these plumes are transient, rapidly decreasing as sand sized sediments deposit to the bed and finer sediments are dispersed.

166. The predicted transport of sediment plumes generated during cable installation activities across the OECC were for a maximum increase in SSC of 50 mg/L being transported for up to 7 km eastward resulting in a cumulative sediment deposition thickness of c. 2 cm, near the release location and southward and a maximum increase in SSC of 80 mg/L being transported for < 1 km eastward resulting in a cumulative sediment deposition thickness of < 1 cm, near the release location.

167. Therefore, the maximum thickness of the deposit on the seabed away from the trenching activities were predicted to be c. 2 cm; deposited sediments would be reworked and rapidly integrated into the prevailing sediment transport regime, and thus would have negligible impact on the prevailing environment. Consequently, enhanced SSC and the predicted deposition thickness would not be discernible above natural variation observed during storm events, with SSCs predicted, in the representative scenario, to reduce to baseline levels within c. 15 days following trenching operations.

168. Background levels of SSC are considered to be between 5–15 mg/L within the offshore development area. Parameters associated with the representative scenario for this impact are provided in **Table 8-10**.

169. All habitat types within the study area are considered to have the potential to be impacted by increased SSC.

170. Where percentages of habitats with the potential to be impacted are provided, this percentage impact area assumes the impact is distributed evenly across the study area.

Subtidal coarse sediment habitats

Receptor sensitivity

171. The habitats *Mediomastus fragilis, Lumbrineris* spp. and venerid bivalves in circalittoral coarse sand or gravel and *Spirobranchus triqueter* with barnacles and bryozoan crusts on unstable circalittoral cobbles and pebbles, have some conservation status within the UK, although not in Europe, as they are listed as Habitats of Principal Importance (HPI), Features of Conservation Interest (FOCI) and UK BAP habitats.

172. However, this habitat group is ubiquitous in the area and the habitat *Mediomastus fragilis, Lumbrineris* spp. and venerid bivalves in circalittoral coarse sand or gravel and its variants, make up a significant proportion of the offshore Irish Sea benthos (Mackie, Oliver & Rees 1995).

173. The *Spirobranchus triqueter* with barnacles and bryozoan crusts on unstable circalittoral cobbles and pebbles habitat, is naturally subject to sedimentation and scour (which removes deposited sediment) with characterising species able to re-establish quicky. As such, tolerance, and recoverability to increases in SSC and a fine sediment deposition of up to 5 cm, are classified as high and tolerance to deposition of up to 30cm is classified as medium (Tyler-Walters et al., 2023)..

174. The *Mediomastus fragilis, Lumbrineris* spp. and venerid bivalves in circalittoral coarse sand or gravel habitat, is exposed to tidal streams which may remove some sediments, but the bivalves and polychaetes are likely to be able to survive short periods under sediments and to reposition in a short duration. Recoverability to SSC and smothering is assessed as high and tolerance as medium to the levels of SSC and majority of levels of deposition predicted to arise as a result of the CWP Project (Tillin & Watson, 2023). The characterising bivalves of this habitat have been shown to be able to migrate through 20–50 cm in sand and some of the characterising polychaetes through 90 cm of sand (Bijerk, 1988). Tolerance is assessed as medium for a sediment deposition rate of up to 5 cm, as it concerns fine sediments which may be cohesive and could clog gill structures reducing respiration rates or feeding efficiency for the characterising species who are adapted to coarse sand or gravel habitats. In one dredge disposal scenario, deposition of up to 6 cm is predicted to occur; in this circumstance, recoverability is assessed as medium as is tolerance.

175. Based on the low value and medium to high levels of tolerance and recoverability of the receiving habitats and based on the sensitivity criteria set out in **Table 8-3**, the sensitivity of coarse sediment habitats to increases in SSC and smothering is considered to be low.

Magnitude of impact

176. Coarse sediment habitats cover c.153 km^2 of the offshore development area and c.1339 km^2 of the wider study area.

177. Peak levels of SSC from the proposed activities only persist for a very short period of time (hours) and will affect only a very small area around the location of the activity (< 1 km). Beyond this, a discreet plume of elevated SSC, at a maxim enhanced level of 150 mg/L will be present for a maximum of 15 days, though levels will quickly fall to those experienced by the majority of habitats during the normal course of the year, i.e. through storm events or periods of high wave or tidal action. Due to the coarse nature of much of the sediments, out with the area directly below the disposal sites, < 2 cm of sediment is likely to be deposited, which will quickly be remobilised and integrated into the natural sediment transport regime.

178. In the array site the increased SSC is predicted to be dispersed up to a maximum of 10 km, predominantly in an easterly direction and therefore further offshore, where the majority of habitats are coarse sediment habitats.

179. In the OECC the increased SSC is predicted to be dispersed up to a maximum of 7 km from the source with dispersion predominantly in an easterly direction further offshore where the majority of habitats are coarse sediment habitats.

180. The impact has the potential to occur several times over the course of the construction period (three years), with each period of elevated SSC and associated sediment deposition persisting for a maximum of 15 days before returning to background levels.

181. The duration of this impact is short, and levels of predicted sediment deposition are low (maximum of 2 cm). Although the majority of habitats in the areas of potential impact are coarse sediment habitats, given the hydrodynamic regime in the area, low levels of increase in SSC and sediment deposition, any effects of this impact on the coarse sediment habitats are likely to be localised and short term in nature.

182. The impact of increased SSC on the coarse sediment habitats is considered to be low as it has the potential to result in a minor loss or alteration to key characteristics or features of baseline coarse sediment habitats.

183. Based on the criteria set out in **Table 8-4** the potential magnitude of impact from increased SSC to the coarse sediment habitats is considered to be low.

Subtidal sand habitats

Receptor sensitivity

184. The habitat *Fabulina fabula* and *Magelona mirabilis* with venerid bivalves and amphipods in infralittoral compacted fine muddy sand has some conservation status within the UK, as it is listed as a HPI, FOCI and UK BAP habitat.

185. Broader sand habitats are common along the coastline of the east coast of Ireland. There is the potential for Annex I habitat: Sandbanks, which are covered by sea water at all times, to be present within the study area.

186. The characterising species of the *Fabulina fabula* and *Magelona mirabilis* with venerid bivalves and amphipods in infralittoral compacted fine muddy sand habitat are likely able to survive short periods under sediments and reposition following deposition and the recoverability of this habitat to increased SSC and sediment deposition up to 5 cm is classified as high (Tillin & Rayment, 2023). Tolerance is classified as medium as increases in SSC, to a level of > 250 mg/L, can impair the growth of suspension feeders (Widdows et al., 1979). It should be noted that these levels of SSC are above the

predicted levels of SSC that may arise during CWP Project construction activities. In one dredge disposal scenario, deposition of up to 6 cm is predicted to occur; in all other dredge disposal and in all trenching scenarios, sediment deposition is modelled to be < 5 cm. However, it should be noted that for deposition up to 30 cm, recoverability is assessed as medium and tolerance is assessed as low (Tillin & Rayment, 2023).

187. Based on the low value, medium tolerance and high recoverability of sand sediment habitats to the impact of increases in SSC and on the sensitivity criteria set out in **Table 8-3**, the sensitivity is considered to be medium.

Magnitude of impact

188. Sand sediment habitats cover 9.8 km^2 of the offshore development area and 965 km^2 of the wider study area.

189. Peak levels of SSC from the proposed activities only persist for a very short period of time (hours) and will affect only a very small area around the location of the activity (< 1 km). Beyond this, a discreet plume of elevated SSC will be present for a number of days, though levels will quickly fall to those experienced by the majority of habitats during the normal course of the year, i.e. through storm events or periods of high wave or tidal action. Due to the coarse nature of much of the sediments, out with the area directly below the disposal sites, < 1 cm of sediment is likely to be deposited, which will quickly be remobilised and integrated into the natural sediment transport regime.

190. In the array site the increased SSC is predicted to be dispersed, a maximum of 10 km with dispersion predominantly to the east and therefore further offshore. There is an area of sand habitats within 10 km, which lies northeast of the predicted sediment plumes from the proposed dredge disposal locations and therefore is unlikely to be impacted by increases in SSC or sediment deposition arising from construction activities within the array site or OECC. Sand habitats account for only c.0.003% of the habitats present within the array site and have the potential to be impacted by increases in SSC and sediment deposition arising from construction activities within the offshore development area.

191. In the OECC the increased SSC is predicted to be dispersed, a maximum of 7 km with dispersion predominantly eastward towards and within the array site, where small areas of sand habitats exist and have the potential to be impacted. In one modelled scenario, increased SSC and sediment deposition (at a maximum enhanced level of 80 mg/L) is predicted to be dispersed up to 4 km westward, further inshore and in an area dominated by sand habitats.

192. This impact has the potential to occur several times over the course of the construction period (three years), with each period of elevated SSC and associated sediment deposition persisting for a maximum of 15 days before returning to background levels.

193. The duration of this impact is short, and levels of predicted sediment deposition are low (maximum of 6 cm). Some small areas of sand habitats occur in the areas of potential impact; however, given the hydrodynamic regime in the area and the low levels of predicted increases in SSC and sediment deposition, any effects of this impact on the sand sediment habitats are likely to be localised and short term in nature.

194. Although sand habitats make up a relatively small proportion of offshore development area, they cover a large area of the wider study area and as such, the impact is considered to have potential to result in a minor loss or alteration to key characteristics or features of baseline sand habitats.

195. Given the short duration of the impact and low levels of predicted increases in SSC from construction activities and based on the criteria set out in **Table 8-4** the potential magnitude of impact from increased SSC to the sand habitats is considered to be low.

Subtidal mud habitats

196. While these habitats are not contained within the offshore development area (according to the site specific habitat mapping) they are present within the 20 km study area and present within the area which has the potential to be impacted by increases in SSC, modelled to be a maximum of 10 km from the source of the impact within the offshore development area.

Receptor sensitivity

197. Mud habitats extend from the extreme lower shore to offshore circalittoral habitats. These habitats are common around the coasts of Ireland and the UK.

198. The broad habitat types of offshore, circalittoral and infralittoral mud habitats have no conservation status in Ireland.

199. Circalittoral and infralittoral mud habitats occur in a depositional environment, where sedimentation is likely due to the low energy of the habitat (De-Bastos & Watson, 2023.). As such, these habitats and the communities they support are highly tolerant of, and have a high recoverability from, the levels of SSC and deposition predicted to arise as a result of the CWP Project construction activities.

200. Given the negligible value and high levels of tolerance and recoverability of mud habitats to the impact of increases in SSC and based on the sensitivity criteria set out in **Table 8-3**, the sensitivity is considered to be negligible.

Magnitude of impact

201. Mud habitats cover c. 106 km^2 of the wider study area. The only area of offshore mud habitats within the study area lies c. 12 km northwest of the OECC and 19 km north of the array site and is therefore unlikely to be impacted by increases in SSC and sediment deposition arising from CWP Project construction activities. Areas of circalittoral and infralittoral mud habitats lie around the OEEC, nearshore on approach to Dublin Bay, and these mud habitats have the potential to be impacted by increased SSC and sediment deposition.

202. The frequency of this impact will occur several times over the course of c. three years, with each impact resulting in increased SSC and sediment deposition for a maximum of 15 days before returning to background levels.

203. Given the short duration of impact and low levels of increased SSC and sediment deposition, any effects of this impact on the mud habitats are likely to be localised and short term in nature.

204. These mud habitats have very low sensitivity to the impact of increased SSC, which will be temporary and localised in nature. As such, the consequences of this impact are assessed as negligible as only slight or imperceptible changes to features of the baseline mud habitats are expected as a result of the predicted increases in SSC.

205. Based on the criteria set out in **Table 8-4**, the potential magnitude of impact from increased SSC to the sand habitats is considered to be negligible.

Subtidal rock habitats

206. While these Annex I habitats are not contained within the offshore development area (according to the site specific habitat mapping) they are present within the 20 km study area and within 10 km (which has the potential to be impacted by increases in SSC and sediment deposition) of the offshore development area.

Receptor sensitivity

207. Reef habitat is uncommon along the eastern seaboard of Ireland; expansive surveys of the Irish coast have indicated that the greatest resource of this habitat within the Irish Sea is found fringing offshore islands which are concentrated along the Dublin coast (NPWS[2]). However, reefs occur widely around the coasts of Europe and the UK (JNCC[1]).

208. Areas of Wicklow Reef SAC and Rockabill to Dalkey Island SAC, both of which have the Annex I reef habitat as a qualifying feature, are within 10 km of the offshore development area. Rockabill to Dalkey Island SAC contains intertidal and subtidal reef habitats that occur on the islands within the SAC and on the south coast of Howth and off the coast between Lambay Island and Rush Village. The substrate types include flat and sloping bedrock, vertical rock walls and cobbles and boulders. The intertidal reef habitats support fucoid algae communities and the subtidal reef habitats support kelp and red algal species and epifaunal communities with barnacles and anemones such as *Alcyonium digitatum*.

209. Rocky reef habitats, such as those around the islands and on the south coast of Howth are assessed to have high tolerance and recoverability to increased SSC and sediment deposition rates up to 5 cm, and medium tolerance and high recoverability to sediment deposition rates up to 30 cm, as although some smaller individuals of characterising species could be smothered, the high energy environment in which this habitat occurs means that any sediment deposition is likely to be removed quickly (Stamp et al., 2023).

210. Wicklow Reef SAC contains areas of current-swept subtidal reef comprised of cobbles and boulders and an area of sloping bedrock. Characterising species are *Spirobranchus triqueter* and the hydroids *Tubularia indivisa* and *Sertularia argentea* and other epifaunal species. While records exist for reef forming *Sabellaria aveolata* within the SAC, it is thought that the highly dynamic nature of the area is unlikely to support a stable biogenic reef (NPWS[3]). A similar habitat type, faunal and algal crusts with *Spirobranchus triqueter* and sparse *Alcyonium digitatum* on exposed to moderately wave-exposed circalittoral rock, is assessed as having high tolerance and recoverability to increased SSC and sediment deposition up to 5 cm (Stamp, 2016).

211. While tolerance and recoverability of the subtidal rock habitats to increases in SSC are high, given the high value of this habitat and based on the sensitivity criteria set out in **Table 8-3**, the sensitivity is considered to be medium.

Magnitude of impact

212. The closest area of reef habitat within Rockabill to Dalkey Island SAC is 6 km to the north of the offshore development area. Based upon the modelling of sediment transport arising from the CWP Project activities, there is no potential for increases in SSC to affect the protected habitats within the Rockabill to Dalkey SAC. Sediment transport is predicted to travel in a predominantly easterly direction, with no increases in SSC moving in a northward direction.

213. The nearest reef feature within Wicklow Reef SAC lies c. 8 km from the closest point of the CWP Project. The sediment plume modelling showed that increases in SSC arising in the southern portion

of the CWP Project may travel up to 4 km in a westerly direction (with minimal deposition (c. 2 cm) within that 4 km distance). As such, it is considered that there will be no effects on the features of the Wicklow Reef SAC from increases in SSC or smothering arising from the CWP Project.

214. Given the short duration of impact and low levels of increased SSC and sediment deposition, any effects of this impact that were to reach rock habitats within the study area would be localised and short term in nature.

215. Given the low predicted levels of increases in SSC and deposition and the temporary nature of this impact it is considered the consequences to the rock habitats will be negligible as the impact will only result in slight or imperceptible changes to characteristics of baseline habitats.

216. Based on the criteria set out in **Table 8-4,** the potential magnitude of impact from increased SSC to the sand habitats is considered to be negligible.

Subtidal mixed sediment habitats

217. While these habitats are not contained within the offshore development area (according to the site specific habitat mapping), they are present within the 20 km study area and within 10 km (which has the potential to be impacted by increases in SSC and sediment deposition) of the offshore development area.

Receptor sensitivity

218. Sublittoral mixed sediments are found from the extreme low water mark to deep offshore circalittoral habitats often found in moderately exposed areas subject to strong to weak tidal streams.

219. The broad habitat types of circalittoral and infralittoral mixed sediment habitats have no conservation status in Ireland.

220. Circalittoral and infralittoral mixed sediment habitats are common in the marine environment around Ireland and the UK.

221. These habitats can support filter and suspension feeding species for which increases in SSC can cause adhesion of fine particles leading to smothering of such species. However, these habitats exist in areas of strong to weak tidal streams and moderately exposed wave conditions, meaning that fine sediment particles will be removed quickly from such species. The habitats tend to be dominated by deposit feeding polychaetes and bivalves which can survive short periods of sediment deposition of up to 5 cm. As such, the tolerance and recoverability of these habitats to increases in SSC and smothering up to 5cm are considered to be high. For sediment deposition rates up to 30 cm, tolerance is considered medium and recoverability high (Tyler-Walters & Watson, 2023).

222. Given the negligible value, and high recoverability and tolerance of the mixed sediment habitats to the impact of increases in SSC and based on the sensitivity criteria set out in **Table 8-3**, the sensitivity is considered to be negligible.

Magnitude of impact

223. Mixed sediment habitats cover c.10 km^2 of the wider study area.

224. There are two areas of mixed sediment predicted to be present within 10 km of the CWP Project, one of which lies c. 1.5 km north west of the array site and the other c.3.5 km west of the OECC.

225. No increases in SSC or deposition are predicted to travel north of the offshore development area. In one modelled dredge and disposal scenario, increased SSC is predicted to travel up to 4 km westward, at an increase of 80 mg/L. Given the modelled distances and directions of sediment plume transportation and the low level of increases in SSC predicted, it is considered unlikely that these mixed sediment habitats will be impacted from increased SSC and sediment deposition arising from construction activities in the offshore development area.

226. In the unlikely event that this impact does reach the mixed sediment habitats, then given the short duration of impact and low levels of increased SSC and sediment deposition, any effects of this impact on the mixed sediment habitats are likely to be localised and short term in nature.

227. Given the low predicted levels of increases in SSC and deposition and the temporary nature of this impact it is considered the impact will only result in slight or imperceptible changes to characteristics of baseline mixed sediment habitats and the consequences will therefore be negligible.

228. Based on the criteria set out in **Table 8-4**, the potential magnitude of impact from increased SSC to the mixed sediment habitats is considered to be negligible.

Intertidal habitats

229. The intertidal sections of the OECC and landfall consist mainly of littoral sand with a small section of littoral coarse sediment near landfall and a small section of mixed sediment at the top of the shore.

Receptor sensitivity

230. The intertidal sections of the OECC and landfall lie within South Dublin Bay SAC, a qualifying feature of which is the Annex I habitat, mudflats and sandflats not covered by seawater at low tide (1140) of which this instance comprises the clean sands as the sediments are predominantly sands within the OECC / landfall intertidal area. A small area of *Zostera* bed is also present inshore near Merrion Gate. This habitat is c. 1.5 km from the closest point of the OECC and landfall and is c.3 km from any activity that will result in high levels of SSC (i.e. trenching activities or dredge disposal).

231. Mudflats and sandflats not covered by sea water at low tide occur widely throughout Ireland and the UK.

232. Due to the tidal movements, intertidal habitats experience sediment resuspension and deposition naturally and the habitats present are characterised by opportunistic polychaetes and mobile amphipods that are characteristic of habitats subject to regular (i.e. daily) increases in SSC and smothering that arise through natural tidal forces (Ashley, 2016).

233. Intertidal mudflat and sandflat habitats are predominantly found in sheltered bays where the reduced influence of wave and / or tidal action allow finer sediments to settle. As such, the communities have high tolerance and recoverability to sedimentation and smothering to the levels of SSC and deposition greater than the majority of those predicted to arise as a result of the CWP Project. In one dredge disposal scenario, deposition of up to 6 cm is predicted to occur; for deposition up to 30 cm, recoverability is assessed as high and tolerance is assessed as low (Ashley, 2016).

234. There is an area of *Zostera noltei* habitat within South Dublin Bay. Intertidal seagrass beds are considered to have medium tolerance and recoverability to increases in SSC and sediment deposition of a level of 5 cm (d'Avack et al., 2014). This is above the predicted level of deposition resulting from CWP Project construction activities and only persist for a short duration and therefore do not affect light attenuation for an extended period (Han et al., 2012).

235. While tolerance and recoverability of the intertidal habitats to increases in SSC are high, given the high value of this habitat and based on the sensitivity criteria set out in **Table 8-3**, the sensitivity is considered to be medium.

Magnitude of impact

236. Peak levels of SSC from the proposed activities only persist for a very short period of time (hours) and therefore it is assumed will affect only a very small area around the location of the activity (< 1 km). Increases in SSC and sediment deposition arising from construction activities in both the array site and OECC are mainly predicted to be transported eastward, away from the intertidal area. In one modelled dredging and disposal scenario, increases in SSC are predicted to travel inshore (westward) at an enhanced level of 80 mg/L for 4 km resulting in a cumulative sediment deposition of c. 2 cm and may impact the intertidal habitats.

237. The *Zostera* habitat is considered out with the area over which increased SSC and associated deposition will arise from trenching or dredge disposal, and as such will not be affected by these activities. Nevertheless, some minimal increases in SSC may present in this area, through other activities such as intertidal preparatory works. It is considered that such activities will only result in very occasional and short-term changes in SSC, and will not increase levels of SSC or deposition above that naturally experienced by the habitats in the intertidal area, e.g. increases in SSC arising naturally through storm events. The frequency of this impact will occur several times over the course of construction (c. three years), with each impact resulting in increased SSC and sediment deposition for a maximum of 10 days before returning to background levels.

238. The duration of this impact is short, and levels of predicted sediment deposition are low (maximum of 1 cm). Given the low predicted levels of increase in SSC and sediment deposition, any effects of this impact on the intertidal habitats are likely to be localised and short term in nature.

239. The consequences are assessed to be low as the temporary and localised nature of this impact will likely only result in a minor loss or alteration to key characteristics or features of the baseline intertidal habitats.

240. Based on the criteria set out in **Table 8-4,** the potential magnitude of impact from increased SSC / smothering to the intertidal habitats is considered to be Low.

Habitats within the River Liffey

241. The marine habitat within the area of the River Liffey potentially affected consists of a slightly impoverished sandy mud habitat dominated by the polychaete *Capitella capitata*. Most likely the biotope, *Capitella capitata* and *Tubificoides* spp. in reduced salinity infralittoral muddy sediment.

Receptor sensitivity

242. This habitat does not lie within a protected area and has no national or international conservation status. The habitat is situated in an industrialised section of the River Liffey and is subject to maintenance dredging by Dublin Port Company (DPC).

243. *Capitella capitata* and *Tubificoides* spp. in reduced salinity infralittoral muddy sediment habitat is an impoverished habitat with very low species richness. It is considered to have low tolerance to and high recoverability from increases in SSC and sediment deposition up to 30 cm, as the characterising

species are sedentary and unlikely to have mechanisms to escape large amounts of deposition, however their populations recover quickly and can even benefit from fluctuations in sedimentation (Tillin & Watson, 2023).

244. Despite the low levels of tolerance of the River Liffey habitats to increases in SSC and smothering, the recoverability is high. Given the negligible ecological value of this habitat and based on the sensitivity criteria set out in **Table 8-3**, the sensitivity of the River Liffey habitat to this impact is considered to be negligible**.**

Magnitude of impact

245. Sediment transportation modelling indicates that any increases in SSC from construction activities from within the array site and OECC are highly unlikely to be transported near, and therefore will not impact, the habitats within the River Liffey.

246. Constructions activities in the River Liffey area will be conducted at low water and therefore will not result in any increases in SSC.

247. The impact is short term and will occur as discrete events over the course of construction. However, the habitats within River Liffey are unlikely to be impacted by increases in SSC from CWP Project construction activities and as such the consequences will be negligible.

248. Given the above, and based on the criteria set out in **Table 8-4**, the potential magnitude of impact from increased SSC / smothering to the River Liffey habitats is considered to be negligible.

Significance of the effect

249. The sensitivity of subtidal and intertidal ecology receptors in the study area is considered to be negligible, low or medium for all habitats and the magnitude of the impact for all habitats is assessed as negligible or low. Therefore (as per the matrix in **Table 8-5**), an effect of **Not Significant** adverse impact on subtidal and intertidal ecology is predicted for all habitats.

Table 8-16 Significance assignment for increased SSC

Receptor group	Sensitivity	Magnitude	Significance
Subtidal coarse sediment habitats	Low	Low	**Not Significant** (not significant)
Subtidal sand habitats	Medium	Low	**Slight** (not significant)
Subtidal mud habitats	Negligible	Negligible	**Imperceptible** (not significant)
Subtidal rock habitats	Medium	Negligible	**Slight / Not Significant** (not significant)
Subtidal mixed habitats	Negligible	Negligible	**Imperceptible** (not significant)
Intertidal habitats	Medium	Low	**Slight** (not significant)
River Liffey habitats	Negligible	Negligible	**Imperceptible** (not significant)

250. Where flexibility in the proposed design exists there is no other scenario which would lead to a more significant effect.

251. In addition to the primary mitigation measures described in **Section 8.9**, additional mitigation measures will be in place and are described below.

Additional mitigation

252. Installation of the landfall cable ducts using open cut methods will require the excavation of a single swathe with three cable trenches between the TJBs and the intertidal area, within which cable ducts for each of the three cable circuits will be laid and buried. Prior to the commencement of open cut cable duct installation, a temporary cofferdam will be installed to act as a barrier to tidal inundation while the existing stone covered foreshore is temporarily removed, and the ducts installed. The type of cofferdam that is used will be determined post consent once a cable installation contractor has been appointed, however a water or sand filled cofferdam is likely to be a viable option, taking into account the low tidal pressures. Other options include a berm created using existing sediment or temporary sheet piling.

253. The cofferdam will be installed in such a way as to permit open cut trenching from the onshore area to the intertidal area, allowing a dry working area below the HWM. As well as providing a temporary flood defence structure, the cofferdam will act as a barrier to prevent the transport of sediment and any associated contaminants from the onshore works area into the marine environment.

254. After installation of the temporary cofferdam, open cut trenching and cable duct installation will commence between the repositioned footpath and the intertidal area (within the cofferdam). A trench for each of the three No. circuits (up to 3 m in depth) will be excavated using a backhoe and / or 360° excavator, with access provided via the haul road.

255. Based on water level monitoring, groundwater levels are c.3.5 to 4m bgl, therefore limited groundwater is expected to be encountered during the excavation. However, any water encountered within the open trenching will be collected at sumps, treated on site and discharged to the existing sewerage network. There will be no discharge of surface water or groundwater to the intertidal area.

Residual effect

256. Following the additional mitigation measures, the residual effect will remain **Not Significant** on all subtidal and intertidal ecology receptors.

Impact 3: Remobilisation of contaminated sediments

257. Activities associated with seabed preparation such as deposit of dredged material and cable installation activities have the potential to remobilise sediments which may contain levels of chemical contaminants (**Chapter 6 Marine Geology, Sediments and Coastal Processes**).

258. In the baseline site specific survey, contaminated sediment results showed low levels of chemical contaminants at stations sampled within the offshore development area. The majority of contaminants levels at sampled stations were below the Irish Lower AL and Cefas AL1 (**Appendix 8.3 Benthic Baseline Report**).

259. Remobilisation of contaminated sediments can occur when such sediments are disturbed and enter the water column and are transported and redeposited elsewhere. As such, the area over which this may apply, and the subtidal and intertidal habitat receptors, are considered analogous to that described above for Impact 2: Temporary increase in SSC.

Receptor sensitivity

260. Benthic habitats are not assessed for the impact of remobilisation of contaminant sediments under MarLIN / MarESA due to the current evidence being extremely limited or completely absent for these receptors (Tyler-Walters et al., 2023). Habitats present in the study area, which may be affected by remobilised contaminated sediments are therefore considered to have the same sensitivity to this impact as that of Impact 2: Temporary increase in SSC, as their response to deposition of sediment, in absence of evidence to the contrary, is considered analogous with that of their response to deposition of contaminated sediments.

261. Given this, the sensitivity of the subtidal and intertidal benthic habitats to the remobilisation of contaminated sediments are considered to be negligible to medium.

Magnitude of impact

262. The extent over which over which remobilisation of contaminated sediment has the potential to impact the subtidal and intertidal habitat receptors is considered the same as that described above for Impact 2: Temporary increase in SSC.

263. The frequency of this impact will occur several times over the course of c. three years, with each impact resulting in increased SSC and sediment deposition for a maximum of 10 days before returning to background levels.

264. Considering the low levels of contamination within the sediments within the offshore development area, the relatively low predicted levels of sediment deposition, the consequences are considered to be negligible, having the potential to cause only very slight or imperceptible changes to key features of the baseline habitats.

265. Given the above, and based upon the criteria set out in **Table 8-4,** the potential magnitude of impact from the remobilisation of contaminated sediments it is considered negligible to low.

Significance of effect

266. The sensitivity of subtidal and intertidal ecology receptors in the study area is considered to be negligible, low or medium for all habitats and the magnitude of the impact for all habitats is assessed as negligible or low. Therefore (as per the matrix in **Table 8-5**), an effect of **Not Significant** adverse impact on benthic and intertidal ecology is predicted for all habitats. Where flexibility in the proposed design exists there is no other scenario which would lead to a more significant effect.

Table 8-17 Significance assignment for remobilisation of contaminated sediments

Receptor group	Sensitivity	Magnitude	Significance
Subtidal coarse sediment habitats	Low	Low	**Not Significant** (not significant)
Subtidal sand habitats	Low	Low	**Not Significant** (not significant)
Subtidal mud habitats	Negligible	Negligible	**Not Significant** (not significant)
Subtidal rock habitats	Medium	Negligible	**Slight** (not significant)
Subtidal mixed habitats	Negligible	Negligible	**Not Significant** (not significant)
Intertidal habitats	Medium	Low	**Slight** (not significant)

Receptor group	Sensitivity	Magnitude	Significance
River Liffey habitats	Negligible	Negligible	**Not Significant** (not significant)

267. Based on the predicted level of effect it is concluded that no additional mitigation is required beyond the embedded mitigation described in **Section 8.9**.

Impact 4: Introduction of INNS

268. There are no known INNS in the offshore development area, therefore this impact relates to the potential transference of INNS from construction vessels or plant into the offshore development area.

Receptor sensitivity

269. Of the subtidal sediments in the offshore development area and wider study area, coarse and sand sediments are considered of low value, mixed sediments and River Liffey sediments of negligible value and rock and intertidal habitats of high value (**Table 8-3**).

270. Many of the habitats present across the subtidal extents of the offshore development area are subject to high levels of scour and water and natural sediment movement which will limit the establishment of all but the most scour-resistant invasive non-indigenous species and as such tolerance is assessed as high while recoverability is assessed as low, due to the lack of natural predators. Two potential colonising INNS may be able to colonise such habitats, the slipper limpet *Crepidula fornicata* which may settle on stones in substrates and hard surfaces such as bivalve shells, and the colonial ascidian *Didemnum vexillum* which has the potential to colonise and smother offshore gravel habitats (Valentine et al., 2007). Of those habitats where scour and hydrodynamic forces are less severe, such as the sublittoral mud habitats, the potential for colonisation of such habitats by INNS is still considered to be low as the INNS that are already recorded as present within Irish waters (e.g. as the slipper limpet *Crepidula fornicata,* the carpet sea squirt *Didemnum vexillum* and the Japanese skeleton shrimp *Caprella mutica*) are not known to colonise such areas.

271. Intertidal muddy sands may be exposed to invasive species which can alter the character of the habitat (primarily *Crepidula fornicata* at the sublittoral fringe, and *Magallana gigas*), leading to re-classification of this biotope and as such tolerance of this habitat is assessed as medium and recoverability of this habitat to the introduction of INNS is considered very low respectively (Tyler-Walters & Marshall, 2006).

272. The subtidal habitats are of negligible, low or high value, while tolerance is assessed high recoverability is low. The intertidal habitats have high value, medium tolerance and very low recoverability to the introduction of INNS. Given this, and based on the sensitivity criteria set out in **Table 8-3**, subtidal habitats present in the study area, that may be affected by introduction of INNS, are considered to be of low or medium receptor sensitivity, while the intertidal habitats are considered to be of high receptor sensitivity.

Magnitude of impact

273. Primary project mitigation is outlined in **Section 8.9** and states that all vessels working on the CWP Project will be subject to a CEMP, which will contain an offshore biosecurity and invasive species management detailing how the risk of introduction and spread of invasive non-native species will be

minimised. Implementation of this plan will reduce the potential for introduction of any INNS to as low as reasonably practicable.

274. As such, and based on the criteria set out in **Table 8-4**, the potential magnitude of impact from the introduction of INNS to the offshore development area is considered to be negligible.

Significance of effect

275. The sensitivity of subtidal and intertidal ecology receptors in the study area is considered to be low, or high for all habitats and the magnitude the of impact for all habitats is assessed as negligible. Therefore (as per the matrix in **Table 8-5**), an effect of **Not Significant** adverse impact on subtidal and intertidal ecology is predicted for all habitats. Where flexibility in the proposed design exists, there is no other scenario which would lead to a more significant effect.

Table 8-18 Significance assignment for introduction of INNS

Receptor group	Sensitivity	Magnitude	Significance
Subtidal coarse sediment habitats	Low	Negligible	**Not Significant** (not significant)
Subtidal sand habitats	Low	Negligible	**Not Significant** (not significant)
Subtidal mud habitats	Low	Negligible	**Not Significant** (not significant)
Subtidal rock habitats	Medium	Negligible	**Slight / Not Significant** (not significant)
Subtidal mixed habitats	Low	Negligible	**Not Significant** (not significant)
Intertidal habitats	High	Negligible	**Slight** (not significant)
River Liffey habitats	Low	Negligible	**Not Significant** (not significant)

276. Based on the predicted level of effect it is concluded that no additional mitigation is required beyond the primary mitigation described in **Section 8.9**.

Impact 5: Accidental pollution events

277. Accidental spills during construction have the potential to have a negative effect on benthic and intertidal habitats. Potential pollutants are outlined in **Table 8-10** in **Section 8.8 Assessment parameters**, and are as follows: grease, hydraulic oil, gear oil, nitrogen, transformer silicon / ester oil, diesel fuel, SF6, glycol / coolants, drill fluid and batteries.

Receptor sensitivity

278. Annex I reef habitats occur in the wider subtidal study area and Annex I mudflats and sandflats not covered by seawater at low tide occur in the intertidal study area and are of high value. Coarse and sand sediment habitats are considered of low value, mixed sediment habitats and the River Liffey habitat of negligible value.

279. Benthic habitats are not assessed for the impacts of litter, hydrocarbon and PAH and synthetic compound contamination, which could occur as a result of an accidental pollution event, under MarLIN

/ MarESA due to the current evidence being extremely limited or completely absent for these receptors (Tyler-Walters et al., 2023).

280. Accidental pollution events occurring in the subtidal area will be subject to some dilution and dispersion reducing any impact on these benthic habitats, while accidental pollution events occurring in the intertidal area may result in a more concentrated impact on habitats that cover a smaller proportion of the study area.

281. As such, subtidal habitats present in the study area, that may be affected by accidental pollution events, are considered to be of low or medium receptor sensitivity while intertidal habitats present in the study area are considered to be of high receptor sensitivity.

Magnitude of impact

282. Primary project mitigation outlined in **Section 8.9** includes a CEMP to provide a management framework, to ensure appropriate controls are in place to manage environmental risks associated with the construction of the CWP Project. It outlines environmental procedures that require consideration throughout the construction process, in accordance with legislative requirements and industry best practice. In summary, the CEMP includes details of: measures proposed to ensure effective handling of chemicals, oils and fuels including compliance with the MARPOL convention; a Marine Pollution Prevention and Contingency Plan to address the procedures to be followed in the event of a marine pollution incident originating from the operations of the CWP Project; and offshore waste management and disposal arrangements.

283. The CEMP will be implemented by the Applicant and its appointed contractor(s) and will be secured through conditions of the development consent. It will be a live document which will be updated and submitted to the relevant authority, prior to the start of construction. Through the application of primary mitigation measures, the risk of occurrence of significant accidental pollution events will be reduced to as low as is reasonably practical. As a result, subtidal and intertidal receptors are extremely unlikely to be adversely affected by any such incident.

284. Given this, and based on the criteria set out in **Table 8-4**, the magnitude of impact is considered to be negligible, as mitigation will reduce to as low as reasonably practical, any route to impact.

Significance of effect

285. The sensitivity of subtidal and intertidal ecology receptors in the study area is considered to be low or high for all habitats and the magnitude the of impact for all habitats is assessed as negligible. Therefore (as per the matrix in **Table 8-5**), an effect of **Not Significant** adverse impact on benthic and intertidal ecology is predicted for all habitats. Where flexibility in the proposed design exists there is no other scenario which would lead to a materially different effect.

Table 8-19 Significance assignment for accidental pollution events

Receptor group	Sensitivity	Magnitude	Significance
Subtidal coarse sediment habitats	Low	Negligible	**Not Significant** (not significant)
Subtidal sand habitats	Low	Negligible	**Not Significant** (not significant)
Subtidal mud habitats	Low	Negligible	**Not Significant** (not significant)
Subtidal rock habitats	Medium	Negligible	**Slight / Not Significant** (not significant)
Subtidal mixed habitats	Low	Negligible	**Not Significant** (not significant)

Receptor group	Sensitivity	Magnitude	Significance
Intertidal habitats	High	Negligible	**Slight** (not significant)
River Liffey habitats	Low	Negligible	**Not Significant** (not significant)

286. Based on the predicted level of effect, it is concluded that no additional mitigation is required beyond the primary mitigation described in **Section 8.9**.

8.10.2 Operation and maintenance

287. The potential environmental impacts arising from the operation and maintenance of the CWP Project are listed in **Table 8-10** along with the parameters against which each operation and maintenance phase impact has been assessed. A description of the potential effect on subtidal and intertidal ecology receptors caused by each identified impact is given below.

Impact 1: Long-term habitat loss

288. Some habitats within the offshore development area will be affected by long-term habitat loss, from the installation of structures in the seabed such as OSS and WTG monopile foundations, including scour protection, and in areas where IAC and OECC cable protection is required.

289. The Applicant will, where practicable, bury all cables to a minimum depth of cover. In cases where depth of cover is inadequate due to unforeseeable seabed conditions, cable protection will be implemented as mitigation to avoid risks to other marine operations. A preliminary cable burial risk assessment, involving a peer review of environmental considerations, ground conditions and anticipated installation considerations, has been undertaken to identify locations that may require cable protection. This exercise has determined an anticipated maximum extent and volume of cable protection within those identified locations within the array site and OECC, which has been used as a basis for the EIA.

290. Only habitat types within the offshore development area and Pigeon Park area of the River Liffey are considered to have the potential to be impacted by long-term habitat loss and no activities will lead to long-term habitat loss in the intertidal as all intertidal areas affected will be reinstated following construction, and cables will be protected via burial.

291. Overall, the total percentage of the offshore development area affected by long-term habitat loss is up to 0.37%.

Subtidal coarse sediment habitats

Receptor sensitivity

292. The habitats *Mediomastus fragilis, Lumbrineris* spp. and venerid bivalves in circalittoral coarse sand or gravel and *Spirobranchus triqueter* with barnacles and bryozoan crusts on unstable circalittoral cobbles and pebbles, have some conservation status within the UK as they are listed as HPI, FOCI and UK BAP habitats.

293. However, this habitat group is ubiquitous in the area and the habitat *Mediomastus fragilis, Lumbrineris* spp. and venerid bivalves in circalittoral coarse sand or gravel and its variants, make up a significant proportion of the offshore Irish Sea benthos (Mackie, Oliver and Rees, 1995).

294. Tolerance and recoverability of these habitats to long-term habitat loss is assessed as none and very low respectively (Tillin & Watson, 2023.)

295. While the value of the coarse sediment habitats is considered low, given the low levels of tolerance to and recoverability from this impact and based upon the sensitivity criteria set out in **Table 8-3**, the sensitivity is considered to be high.

Magnitude of impact

296. Coarse sediment habitats cover c.153 km^2 of the offshore development area (95%). Based on the PD and representative scenario parameters and intended locations of the offshore infrastructure, the maximum area of coarse sediment habitats with potential to be impacted by long-term habitat loss during the operational phase accounts for c. 0.36%, and when considering LoD accounts for c. 0.37%, of the coarse sediment habitats within the offshore development area.

297. Within the array site, coarse sediment habitats cover c. 0.99% of the habitats present. Based upon the intended locations of the WTGs and OSSs including scour protection and IACs including cable protection, 0.39% of the coarse sediment habitats within the array site have the potential to be impacted by long-term habitat loss. However, considering the LoD for the location of WTGs and OSSs including scour protection and IACs including cable protection, it is considered that 0.40% of the coarse sediment habitats within the array site have the potential to be impacted by long-term habitat loss. Coarse sediment habitats cover c. 80% of the OECC and based on the PD and representative scenario parameters, and assuming cable protection is installed in the specific locations identified, the maximum area of coarse sediment habitats with potential to be impacted by long-term habitat loss during the operational phase accounts for c. 0.25% of the OECC. When considering the LoD for the offshore export cables, as set out in the PD, 0.28% of the coarse sediments in the OECC have the potential to be impacted by long-term habitat loss.

298. Over the wider study area, the impact of long-term habitat loss will affect up to 0.01% of the available coarse sediment habitats present.

299. Though this impact is long term, occurring over the full lifetime of the CWP Project, the proportion of this widely distributed habitat affected is negligible and its loss over this period will not affect in any way any ecosystem functions that are provided due to the abundance of the habitat in the surrounding areas, therefore the consequences are considered to be low.

300. Based on the very small proportion of coarse sediment habitats with the potential to be impacted and on the criteria set out in **Table 8-4** the potential magnitude of impact from long-term habitat loss to the coarse habitats is considered to be negligible.

Subtidal sand habitats

Receptor sensitivity

301. The habitat, Fabulina fabula and Magelona mirabilis with venerid bivalves and amphipods in infralittoral compacted fine muddy sand is the only sand biotope within the offshore development area and the vast majority of this lies within the OECC, nearshore and within Dublin Bay (**Figure 8-4** to **Figure 8-5**). Offshore, circalittoral and infralittoral sand habitats are present within the study area and are mainly located in nearshore areas such as Dublin Bay.

302. The habitat *Fabulina fabula* and *Magelona mirabilis* with venerid bivalves and amphipods in infralittoral compacted fine muddy sand has some conservation status within the UK, as it is listed as a HPI, FOCI and UK BAP habitat.

303. Tolerance and recoverability of these habitats to long-term habitat loss is assessed as low and very low respectively (Tillin& Rayment, 2023).

304. While the value of the coarse sediment habitats is considered low, given the low levels of tolerance to and recoverability from this impact and based on the sensitivity criteria set out in **Table 8-3**, the Sensitivity is considered to be high.

Magnitude of impact

305. *Fabulina fabula* and *Magelona mirabilis* with venerid bivalves and amphipods in infralittoral compacted fine muddy sand cover c. 7.6 km^2 of the offshore development area. Based on the PD and representative scenario parameters, and intended locations of the offshore infrastructure, the maximum area of this habitat with potential to be impacted by long-term habitat loss during the operational phase accounts for c. 0.2% of this habitat within the offshore development area and 0.37% when considering the LoD, as set out in the PD.

306. Within the array site, sand habitats make up < 0.003% of the habitats present. Based upon the intended locations of the WTGs and OSSs including scour protection and IACs including cable protection, no impacts of long-term habitat loss would occur within the sand sediment habitat. When, considering the LoD for the location of WTGs and OSSs including scour protection and IACs including cable protection, it is considered possible that up to 5.7% of the sand habitat may be affected by long-term habitat loss.

307. Due to the hydrodynamic regime and the mobile nature of sand sediments in the area, it is likely that this habitat is relatively ephemeral, and appears in pockets within the more widely abundant coarse habitats, and that the extent and distribution of this habitat within the array site vary naturally.

308. Within the OECC, subtidal sand habitats make up approximately 20% of the habitats present, primarily in the nearshore portion of the OECC, as set out in the PD and representative scenario parameters, and assuming cable protection is installed in the specific locations identified, up to 0.20% of the sand habitats within the OECC may be affected by long-term habitat loss. When considering the LoD for the offshore export cables, as set out in the PD, 0.28% of the sand habitats within the OECC may be affected by long-term habitat loss.

309. In the wider study area, subtidal sands cover 965 km^2. Overall, the total area of sand sediment habitat affected within the wider study area is 0.01% of the available area of subtidal sand habitats.

310. Though this impact is long term, occurring over the full lifetime of the CWP Project, the proportion of this widely distributed habitat affected is negligible and its loss over this period will not affect in any way any ecosystem functions that are provided due to the low proportion affected by this impact in relation to the presence of the habitat in the surrounding areas. Therefore the consequences of this impact are considered to be low.

311. Based on a small proportion of this habitat with the potential to be impacted and on the criteria set out in **Table 8-4**, the potential magnitude of impact from long-term habitat loss to the sand habitats is considered to be negligible.

Habitats within the River Liffey

312. Activities within the River Liffey area that may impact on the sandy mud habitat are the installation of a combi-wall and new revetment.

313. The marine habitat within the River Liffey area consists of a slightly impoverished sandy mud habitat dominated by the polychaete *Capitella capitata*. Most likely the biotope, *Capitella capitata* and *Tubificoides* spp. in reduced salinity infralittoral muddy sediment.

Receptor sensitivity

314. This habitat does not lie within a protected area and has no national or international conservation status. The habitat is situated in an industrialised section of the River Liffey at Pigeon Park and is subject to maintenance dredging by Dublin Port Company (DPC).

315. *Capitella capitata* and *Tubificoides* spp. in reduced salinity infralittoral muddy sediment habitat is an impoverished habitat with very low species richness. It is considered to have no tolerance and very low recoverability to long-term habitat loss (Tillin & Watson, 2023).

316. Although the value of this habitat is negligible, given the low levels of tolerance and recoverability of the River Liffey habitats to long-term habitat loss and based on the sensitivity criteria set out in **Table 8-3**, the sensitivity of the sandy mud habitat within River Liffey habitat to long-term habitat loss is considered to be high**.**

Magnitude of impact

317. The extent of the habitat area at River Liffey with the potential to be impacted by long-term habitat loss is 1800 m^2.

318. The duration of this impact is long term, throughout the lifetime of the CWP Project.

319. The impact of long-term habitat loss is assessed to have negligible consequences to the River Liffey habitats as it is only affects a very small area of the habitat and therefore is likely to result in very slight changes to the baseline features of the habitat.

320. Based on the criteria set out in **Table 8-4** and given the very small area with the potential to be impacted, the potential magnitude of impact from long-term habitat loss to the River Liffey habitats is considered to be negligible.

Significance of effect

321. The sensitivity of subtidal and intertidal ecology receptors in the study area is considered to be high for all habitats and the magnitude the of impact for all habitats is assessed as negligible. Therefore (as per the matrix in **Table 8-5**), an effect of slight adverse impact on benthic and intertidal ecology is predicted for all habitats, which is **Not Significant**. Where flexibility in the proposed design exists there is no other scenario which would lead to a more significant effect.

Table 8-20 Significance assignment for long-term habitat loss

Receptor group	Sensitivity	Magnitude	Significance
Subtidal coarse sediment habitats	High	Negligible	**Slight** (not significant)
Subtidal sand habitats	High	Negligible	**Slight** (not significant)
River Liffey habitats	High	Negligible	**Slight** (not significant)

322. Based on the predicted level of effect it is concluded that no additional mitigation is required beyond the embedded mitigation described in **Section 8.9**.

Impact 2: Habitat creation (increase in hard substrate)

323. Habitat creation relates to an increase in hard substrate to the environment by the introduction of turbine foundations, scour protection and cable protection which will likely become colonised by benthic epifaunal species and create hard substrate habitats.

324. Only habitat types within the offshore development area and Pigeon Park area of the River Liffey are considered to have the potential to be impacted by habitat creation as all intertidal areas affected will be reinstated following construction.

325. The Applicant will, where practicable, bury all cables to a minimum depth of cover. In cases where depth of cover is inadequate due to unforeseeable seabed conditions, cable protection will be implemented as mitigation to avoid risks to other marine operations. A preliminary cable burial risk assessment, involving a peer review of environmental considerations, ground conditions, and anticipated installation considerations, has been undertaken to identify locations that may require cable protection. This exercise has determined an anticipated maximum extent and volume of cable protection within those identified locations within the array site and OECC, which has been used as a basis for the EIA.

326. Overall, the total percentage of the offshore development area with the potential to be positively impacted by habitat creation is up to 0.37%.

327. The habitats within the offshore development area which are adversely affected by long-term habitat loss of soft sediments, are likely to be positively impacted by habitat creation through the colonisation on the hard substrates introduced. Recent studies on the effects of OWFs on benthic communities have demonstrated that the newly created hard substrate area, provided by structures such as turbines and scour protection, is usually larger than the habitat lost (Wilson & Elliott, 2009) and enables the establishment of benthic communities similar to that of rocky habitats which are species rich (Karlson, R. et al., 2022). Patterns of zonation are exhibited on the submerged turbines with plumose anemones (*Metridium senile*) and tube building fan worms (*Spirobranchus* sp.) in the bottom region of the structures and filter feeding species such as the mussel *Mytilus edulis* and barnacle species such as *Semibalanus balanoides* occurring closer to the water level and in the splash zone (Tillin & Tyler-Walters, 2015). Given this, the impact assessment is the same for both the negative impact of long-term habitat loss and the positive impact of habitat creation, in terms of sensitivity and magnitude and therefore for significance.

Significance of effect

328. The sensitivity of subtidal and intertidal ecology receptors in the study area is considered to be high for all habitats and the magnitude of the impact for all habitats is assessed as negligible. Therefore (as per the matrix in **Table 8-5**), an effect of slight positive impact on Benthic and intertidal ecology is predicted for all habitats, which is **Not Significant**. Where flexibility in the proposed design exists there is no other scenario which would lead to a more significant effect.

Table 8-21 Significance assignment for habitat creation

Receptor group	Sensitivity	Magnitude	Significance
Subtidal coarse sediment habitats	High	Negligible	**Slight** (positive) (not significant)
Subtidal sand habitats	High	Negligible	**Slight** (positive) (not significant)
River Liffey habitats	High	Negligible	**Slight** (positive) (not significant)

329. Based on the predicted level of effect it is concluded that no additional mitigation is required beyond the embedded mitigation described in **Section 8.9**.

Impact 3: Temporary habitat disturbance

330. Habitats within the offshore development area are likely to be affected by temporary disturbance arising from maintenance and repair activities required during the operation and maintenance phase of the CWP Project.

331. It is anticipated that the level of temporary habitat disturbance caused by the maintenance and repair activities during operation and maintenance activities will be no greater than that generated by the installation during construction. Given this, the potential effects of this impact on the subtidal and intertidal habitats will be less than, or equal to, those of temporary habitat disturbance during construction which have been assessed as not significant.

332. Therefore, an effect of **Not Significant** adverse impact on subtidal and intertidal ecology receptors is predicted for all habitats.

Significance of the effect

333. The sensitivity of benthic habitat receptors and magnitude of impact of temporary habit disturbance, in the study area, is considered to be negligible, low or medium for all habitats (**Table 8-22** below). Therefore (as per the matrix in **Table 8-5**), an effect of **Not Significant** adverse impact on Benthic and intertidal ecology receptors is predicted for all habitats.

Table 8-22 Significance assignment for temporary habitat disturbance

Receptor group	Sensitivity	Magnitude	Significance
Subtidal coarse sediment habitats	Low	Low	**Not Significant** (not significant)
Subtidal sand habitats	Low	Medium	**Slight** (not significant)
Intertidal habitats	Medium	Low	**Slight** (not significant)
River Liffey habitats	Negligible	Negligible	**Imperceptible** (not significant)

334. Where flexibility in the proposed design exists there is no other scenario which would lead to a more significant effect.

335. Based on the predicted level of effect it is concluded that no additional mitigation is required beyond the primary mitigation measures described in **Section 8.9**.

Impact 4: Presence of EMF and / or temperature changes

336. Transmission of electricity through subsea cables will lead to the generation of electric (E) and magnetic (B) fields (Gill et al., 2009). The manufacturing process for modern cables shields against the emission of any E field, and as such it is only magnetic fields that are detectable out with the cables shielding. These B fields can generate induced E fields in a conductor, in the event that the conductor moves through the B field.

337. Cables installed in the marine environment, can also produce a low level of heat emissions, as a result of the resistance of the cable as electricity flows through it. However, heat losses reduce the efficiency of a cable, and as a result the cables will be designed to minimise thermal losses.

Receptor sensitivity

338. Habitats with the potential to be impacted by EMF and temperature changes are those within the offshore development area, namely, coarse sediment and sand sediment habitats, both of which have low value and intertidal habitats which are of high value.

339. There is a lack of evidence of the impacts of EMF on benthic invertebrate species (Albert et al., 2020) and the MarLIN sensitivity assessments states there is not enough evidence to assess the sensitivity of the specific receptor / impact combination for benthic habitats including those habitats found within the offshore development area (Tyler-Walters et al., 2023).

340. However, Love et al. (2017) used submersible surveys of energised cables (35 kV) to compare the invertebrate colonising community and the fish assemblages present in southern California (U.S.). Magnetic fields of energised cables reached background levels within 1 m and no statistical differences in the faunal communities were found. While some research has shown measurable effects and responses to E- and / or B-fields on a small number of individual species (behavioural, physiological, developmental and genetic levels), these effects are only observed at significantly elevated field strengths (by orders of magnitude) compared to those associated with Marine Renewable Energy (Gill & Desender, 2020). The field strengths predicted to arise from the CWP Project are orders of magnitude lower than those where any measurable effect has been observed in invertebrate species, and well within the levels experienced by all species as a result of the earth's background B fields. It is therefore considered reasonable to assume the habitats within the offshore development area have high levels of tolerance and recoverability to the impact of EMF.

341. Marine benthic fauna are considered sensitive to acute increases in temperature, though they can tolerate an increase of 2°C. Increases of 5°C can however have lethal effects, particularly in summer conditions (Tillin & Tyler-Walters, 2014). Marine organisms are capable of acclimating to long-term, stable increased temperature (Menon, 1972), such as would be produced by a generating cable (Tillin, 2016a; Tillin 2016b; Tillin & Rayment, 2001; De-Bastos & Hill, 2016). The minimum depth of cover for the export cable is 1.4 m and inter-array cables is 1.0 m and is expected to be consistent with these predictions for the majority of the route. At this depth, temperature increases can be expected to remain between 0°C and 2°C in most circumstances, with no discernible increase in water temperature anticipated.

342. Temperature increases have the potential to cause an initial disturbance to infaunal assemblages, however the impact will become less pronounced as individuals acclimate, and the presence of the cables is not considered likely to affect marine benthic organism abundances or distribution in the long term. Infaunal organisms may potentially be exposed to increases in temperatures, however epifaunal organisms are unlikely to be affected. It should be noted that the majority of organisms in sediment do not exceed a burrowing depth of 0.2 m, with 95 to 99% remaining in the top 5 cm (Kingston, 2001),

and as such are unlikely to be affected by the greatest levels of temperature change which are expected to be only found close to the cable.

343. Coarse sediment habitats *Mediomastus fragilis*, *Lumbrineris* spp. and venerid bivalves in circalittoral coarse sand or gravel and *Spirobranchus triqueter* with barnacles and bryozoan crusts on unstable circalittoral cobbles and pebbles and sand habitat *Fabulina fabula* and *Magelona mirabilis* with venerid bivalves and amphipods in infralittoral compacted fine muddy sand are all assessed as having medium tolerance to and high recoverability from temperature increase (Tillin & Watson, 2023; Tyler-Walters & Tillin, 2023;Tillin& Rayment, 2023).

344. Intertidal habitats within the OECC and landfall areas are assessed as having high tolerance to and recoverability from temperature increases (Ashley, 2016).

345. The value of the coarse and sand sediment habitats is low whilst that of the intertidal habitats is high. However, given the high levels of tolerance and recoverability of the coarse sediment, sand sediment and intertidal habitats to the presence of EMF and temperature changes and based on the sensitivity criteria set out in **Table 8-3**, the Sensitivity of the habitats to the impact is considered to be low.

Magnitude of impact

346. The extent of the potential impact of the presence of EMF and temperature changes will only impact habitats in the close vicinity of the export cable and inter-array cables, which accounts for a small proportion of the subtidal and intertidal habitats within the offshore development area and a smaller proportion of these habitats within the wider study area.

347. The duration of the impact will be long term, through the lifetime of the CWP Project.

348. Where possible, cables within the array site and OECC will have a minimum depth of cover of between 1.0 m and 1.4 m. In cases where burial is inadequate due to unforeseeable seabed conditions, additional cable protection will be installed, reducing the potential for impact of EMF and temperature changes on the surrounding habitats.

349. Primary project mitigation outlined in **Section 8.9** ensures that cables will be suitably buried or protected by other means where burial is not practicable. This will reduce the potential for effects relating to the presence of EMF and temperature increases on the subtidal and intertidal habitats.

350. The consequences of the presence of EMF and temperature increases on the coarse sediment, sand sediment and intertidal habitats is considered to be low as it is only likely to result in very slight or imperceptible change to key characteristics or features of baseline habitats, given the low levels of sensitivity of the receptors and the primary mitigation measures.

351. Based on the above assessment and the criteria set out in **Table 8-4**, the potential magnitude of impact from EMF to the above habitats is considered to be low.

Significance of effect

352. The sensitivity of subtidal and intertidal ecology receptors in the study area is considered to be low for all habitats and the magnitude of the impact for all habitats is assessed as low. Therefore (as per the matrix in **Table 8-5**), an effect of **Not Significant** adverse impact on benthic and intertidal ecology is predicted for all habitats. Where flexibility in the proposed design exists there is no other scenario which would lead to a more significant effect.

Table 8-23 Significance assignment for EMF or temperature changes.

Receptor group	Sensitivity	Magnitude	Significance
Subtidal coarse sediment habitats	Low	Low	**Not Significant** (not significant)
Subtidal sand habitats	Low	Low	**Not Significant** (not significant)
Intertidal habitats	Low	Low	**Not Significant** (not significant)

353. Based on the predicted level of effect it is concluded that no additional mitigation is required beyond the embedded mitigation described in **Section 8.9**.

Impact 5: Introduction of INNS

354. There are no known INNS in the offshore development area; the potential for spreading of existing INNS is negligible. Therefore, the introduction of INNS relates to the potential transference from construction vessels or plant into the offshore development area.

Receptor sensitivity

355. Of the subtidal sediments in the offshore development area and wider study area, coarse and sand sediments are considered of low value, mixed sediments and River Liffey sediments of negligible value and rock and intertidal habitats of high value (**Table 8-3**).

356. Many of the habitats present across the subtidal extents of the offshore development area are subject to high levels of scour and water and natural sediment movement which will limit the establishment of all but the most scour-resistant invasive non-indigenous species and as such tolerance is assessed as high while recoverability is assessed as low, due to the lack of natural predators. Two potential colonising INNS may be able to colonise such habitats: the slipper limpet *Crepidula fornicata* which may settle on stones in substrates and hard surfaces such as bivalve shells, and the colonial ascidian *Didemnum vexillum* which has the potential to colonise and smother offshore gravel habitats (Valentine et al., 2007). Of those habitats where scour and hydrodynamic forces are less severe, such as the sublittoral mud habitats, the potential for colonisation of such habitats by INNS is considered to be lower as the INNS that are already recorded as present within Irish waters (e.g. as the slipper limpet *Crepidula fornicata,* the carpet sea squirt *Didemnum vexillum* and the Japanese skeleton shrimp *Caprella mutica*) are not known to colonise such areas.

357. Intertidal muddy sands may be exposed to invasive species which can alter the character of the habitat (primarily *Crepidula fornicata* at the sublittoral fringe, and *Magallana gigas*), leading to re-classification of this biotope and as such tolerance of this habitat is assessed as medium and recoverability of this habitat to the introduction of INNS is considered very low respectively (Tyler-Walters & Marshall, 2006).

358. The subtidal habitats are of negligible, low or high value, while tolerance is assessed high recoverability is low. The intertidal habitats have high value, medium tolerance and very low recoverability to the introduction of INNS. Given this, and based on the sensitivity criteria set out in **Table 8-3,** habitats present in the study area, that may be affected by introduction of INNS, are considered to be of low, medium or high receptor sensitivity.

Magnitude of impact

359. Primary project mitigation is outlined in **Section 8.9**. All vessels working on the CWP Project will be subject to a CEMP, which will contain an offshore biosecurity and invasive species management detailing how the risk of introduction and spread of invasive non-native species will be minimised. Implementation of this plan will reduce the potential for introduction of any INNS to as low as reasonably practicable.

360. As such, and based on the criteria set out in **Table 8-4**, the potential magnitude of impact from the introduction of INNS to the offshore development area is considered to be negligible.

Significance of effect

361. The sensitivity of subtidal and intertidal ecology receptors in the study area is considered to be low or high for all habitats and the magnitude of the impact for all habitats is assessed as negligible.

362. Therefore (as per the matrix in **Table 8-5**), an effect of **Not Significant** adverse impact on subtidal and intertidal ecology is predicted for all habitats.

363. Where flexibility in the proposed design exists, there is no other scenario which would lead to a more significant effect.

Table 8-24 Significance assignment for Introduction of INNS

Receptor group	Sensitivity	Magnitude	Significance
Subtidal coarse sediment habitats	Low	Negligible	**Not Significant** (not significant)
Subtidal sand habitats	Low	Negligible	**Not Significant** (not significant)
Subtidal mud habitats	Low	Negligible	**Not Significant** (not significant)
Subtidal rock habitats	Medium	Negligible	**Slight / Not Significant** (not significant)
Subtidal mixed habitats	Low	Negligible	**Not Significant** (not significant)
Intertidal habitats	High	Negligible	**Slight** (not significant)
River Liffey habitats	Low	Negligible	**Not Significant** (not significant)

364. Based on the predicted level of effect it is concluded that no additional mitigation is required beyond the embedded mitigation described in **Section 8.9**.

Impact 6: Accidental pollution events

Receptor sensitivity

365. Annex I reef habitats occur in the wider subtidal study area and Annex I mudflats and sandflats not covered by seawater at low tide occur in the intertidal study area and are of high value. Coarse and sand sediment habitats are considered of low value, mixed sediment habitats and the River Liffey habitat of negligible value.

366. Benthic habitats are not assessed for the impacts of litter, hydrocarbon and PAH and synthetic compound contamination, which could occur as a result of an accidental pollution event, under MarLIN / MarESA due to the current evidence being extremely limited or completely absent for these receptors (Tyler-Walters et al., 2023).

367. Accidental pollution events occurring in the subtidal area will be subject to some dilution and dispersion reducing any impact on these benthic habitats. While accidental pollution events occurring in the intertidal area may result in a more concentrated impact on habitats that cover a smaller proportion of the study area.

368. As such, subtidal habitats present in the study area, which may be affected by accidental pollution events, are considered to be of low receptor sensitivity while intertidal habitats present in the study area are considered to be of high receptor sensitivity.

Magnitude of impact

369. Primary project mitigation outlined in **Section 8.9** includes a CEMP to provide a management framework, to ensure appropriate controls are in place to manage environmental risks associated with the construction of the CWP Project. It outlines environmental procedures that require consideration throughout the construction process, in accordance with legislative requirements and industry best practice. In summary, the CEMP includes details of: measures proposed to ensure effective handling of chemicals, oils and fuels including compliance with the MARPOL convention; a Marine Pollution Prevention and Contingency Plan to address the procedures to be followed in the event of a marine pollution incident originating from the operations of the CWP Project; and Offshore waste management and disposal arrangements.

370. The CEMP will be implemented by the Applicant and its appointed contractor(s) and will be secured through conditions of the development consent. It will be a live document which will be updated and submitted to the relevant authority prior to the start of construction. Through the application of primary mitigation measures, the risk of occurrence of significant accidental pollution events will be reduced to as low as is reasonably practical. As a result, subtidal and intertidal receptors are extremely unlikely to be adversely affected by any such incident.

371. Given this, and based on the criteria set out in **Table 8-4**, the magnitude of impact is considered to be negligible as mitigation will reduce to as low as reasonably practical, any route to impact.

Significance of effect

372. The sensitivity of subtidal and intertidal ecology receptors in the study area is considered to be low or high for all habitats and the magnitude of the impact for all habitats is assessed as negligible. Therefore (as per the matrix in **Table 8-5**), an effect of **Not Significant** adverse impact on subtidal and intertidal ecology is predicted for all habitats.

373. Where flexibility in the proposed design exists, there is no other scenario which would lead to a more significant effect.

Table 8-25 Significance assignment for accidental pollution events

Receptor group	Sensitivity	Magnitude	Significance
Subtidal coarse sediment habitats	Low	Negligible	**Not Significant** (not significant)
Subtidal sand habitats	Low	Negligible	**Not Significant** (not significant)
Subtidal mud habitats	Low	Negligible	**Not Significant** (not significant)
Subtidal rock habitats	Medium	Negligible	**Slight / Not Significant** (not significant)
Subtidal mixed habitats	Low	Negligible	**Not Significant** (not significant)
Intertidal habitats	High	Negligible	**Slight** (not significant)
River Liffey habitats	Low	Negligible	**Not Significant** (not significant)

8.10.3 Decommissioning phase

374. The potential environmental impacts arising from the decommissioning of the CWP Project are listed in **Table 8-10**.

375. It is recognised that legislation and industry best practice change over time. However, for the purposes of the EIA, at the end of the operational lifetime of the CWP Project, all offshore infrastructure will be rehabilitated. Primary mitigation measures set out in **Section 8.9** include a Rehabilitation Schedule provided as part of the planning application. This has been prepared in accordance with the MAP Act (as amended by the Maritime and Valuation (Amendment) Act 2022) to provide preliminary information on the approaches to decommissioning the offshore and onshore components of the CWP Project.

376. A final Rehabilitation Schedule will require approval from the statutory consultees prior to the undertaking of decommissioning works. This will reflect discussions held with stakeholders and regulators to determine the exact methodology for decommissioning, taking into account available methods, best practice and likely environmental effects.

377. A description of the potential effect on subtidal and intertidal ecology receptors caused by each identified impact is given below.

Impact 1: Temporary habitat disturbance

378. Habitats within the offshore development area are likely to be affected by temporary disturbance arising from the decommissioning of the CWP Project.

379. It is anticipated that the level of temporary habitat disturbance caused by the removal of the wind farm infrastructure during decommissioning activities will be no greater than that generated by the installation during construction. Given this, the potential effects of this impact on the subtidal and intertidal habitats with be less than, or equal to, those of temporary habitat disturbance during construction which have been assessed as not significant.

380. Therefore, an effect of **Not Significant** adverse impact on benthic and intertidal ecology receptors is predicted for all habitats.

381. Based on the predicted level of effect it is concluded that no additional mitigation is required beyond the primary mitigation described in **Section 8.9**.

Impact 2: Temporary increase in SSC

382. Activities associated with the removal of CWP Project infrastructure during decommissioning activities have the potential to lead to local increases in SSC.

383. It is likely that increases in SSC during decommissioning with be no greater than those associated with the dredge and disposal and trenching activities during construction. Given this, the potential effects of this impact on the subtidal and intertidal habitats will be less than, or equal to, those of temporary increase in SSC during construction which have been assessed as not significant.

384. Therefore, an effect of **Not Significant** adverse impact on benthic and intertidal ecology receptors is predicted for all habitats.

385. Based on the predicted level of effect it is concluded that no additional mitigation is required beyond the primary mitigation described in **Section 8.9**.

Impact 3: Remobilisation of contaminated sediments

386. Activities associated with removal of the CWP Project Generating station and OfTI have the potential to remobilise sediments which may contain levels of chemical contaminants.

387. In the baseline site specific survey, contaminated sediment results showed low levels of chemical contaminants at stations sampled within the offshore development area. The majority of contaminants levels at sampled stations were below the Irish Lower AL and Cefas AL1 (**Appendix 8.3 Benthic Baseline Report**). However, it is unknown what levels of contaminated sediments will exist in the areas of habitat disturbance at the time of decommissioning, however no sources of significant contamination are predicted to be present within the offshore development area during its lifetime, and as such it is expected that levels of contamination will not increase during this time.

388. As such, it is considered that the remobilisation of contaminated sediment during decommissioning will be no greater than that during construction.

389. Given this, the potential effects of this impact on the subtidal and intertidal habitats with be less than, or equal to, those of remobilisation of contaminated sediments during construction, which have been assessed as not significant.

390. Therefore, an effect of **not significant** adverse impact on benthic and intertidal ecology receptors is predicted for all habitats.

391. Based on the predicted level of effect it is concluded that no additional mitigation is required beyond the primary mitigation described in **Section 8.9**.

Impact 4: Long-term habitat loss

392. Activities associated with the removal of CWP Project infrastructure during decommissioning activities have the potential to remove the hard substrate habitats formed during the CWP Project lifetime.

393. It is likely that long-term habitat loss during decommissioning will be no greater than that of long-term habitat loss caused during the operation and maintenance phase. Where newly created habitat is lost the areas in which it is lost from will return over time to the habitats of the surrounding areas. Given this, the potential effects of this impact on the subtidal and intertidal habitats will be less than, or equal to, those of long-term habitat loss during operation and maintenance which have been assessed as not significant.

394. Therefore, an effect of **not significant** adverse impact on benthic and intertidal ecology receptors is predicted for all habitats.

395. Based on the predicted level of effect it is concluded that no additional mitigation is required beyond the primary mitigation described in **Section 8.9**.

Impact 5: Introduction of INNS

396. Generally, decommissioning is anticipated to be a reverse of the construction and installation process for the CWP Project and the assumptions around the number of vessels on site, and vessel round trips is therefore the same as described for the construction phase of the offshore components.

397. Primary project mitigation is outlined in **Section 8.9** and states that all vessels working on the CWP Project will be subject to a CEMP which will contain an offshore biosecurity and invasive species management detailing how the risk of introduction and spread of invasive non-native species will be minimised. Implementation of this plan will reduce the potential for introduction of any INNS to as low as reasonably practicable.

398. As such, and based on the criteria set out in **Table 8-4**, the potential magnitude of impact from the introduction of INNS to the offshore development area is considered to be negligible.

399. Therefore, an effect of **not significant** adverse impact on benthic and intertidal ecology receptors is predicted for all habitats.

400. Based on the predicted level of effect it is concluded that no additional mitigation is required beyond the primary mitigation described in **Section 8.9**.

Impact 6: Accidental pollution events

401. Generally, decommissioning is anticipated to be a reverse of the construction and installation process for the CWP Project and the assumptions around the number of vessels on site, and vessel round trips is therefore the same as described for the construction phase of the offshore components.

402. Primary project mitigation outlined in **Section 8.9** includes a **Construction Environmental Management Plan** (CEMP) to provide a management framework, to ensure appropriate controls are in place to manage environmental risks associated with the construction of the CWP Project. It outlines environmental procedures that require consideration throughout the construction process, in accordance with legislative requirements and industry best practice. In summary, the CEMP includes details of: measures proposed to ensure effective handling of chemicals, oils and fuels including compliance with the MARPOL convention; a Marine Pollution Prevention and Contingency Plan to address the procedures to be followed in the event of a marine pollution incident originating from the operations of the CWP Project; and offshore waste management and disposal arrangements.

403. The CEMP will be implemented by the Applicant and its appointed contractor(s) and will be secured through conditions of the development consent. It will be a live document which will be updated and submitted to the relevant authority, prior to the start of construction. Through the application of primary mitigation measures, the risk of occurrence of significant accidental pollution events will be reduced to as low as is reasonably practical. As a result, subtidal and intertidal receptors are extremely unlikely to be adversely affected by any such incident.

404. Given this, and based on the criteria set out in **Table 8-4**, the magnitude of impact is considered to be negligible, as mitigation will remove any route to impact.

405. Therefore, an effect of **not significant** adverse impact on subtidal and intertidal ecology receptors is predicted for all habitats.

406. Based on the predicted level of effect it is concluded that no additional mitigation is required beyond the primary mitigation described in **Section 8.9**.

8.11 Cumulative impacts

407. A fundamental component of the EIA is to consider and assess the potential for cumulative effects of the CWP Project with other projects, plans and activities (hereafter referred to as 'other development').

408. **Appendix 8.1** presents the findings of the CEA for subtidal and intertidal ecology, which considers the residual effects presented in **Section 8.10** alongside the potential effects of other proposed and reasonably foreseeable other development.

409. As the magnitude of impacts of Introduction of INNS and Accidental pollution events are assessed as negligible from CWP Project activities alone, it is considered that there is no potential for cumulative impacts with the other projects identified in **Appendix 8.1**.

410. A summary of the CEA for subtidal and intertidal ecology is presented below.

411. The potential impacts considered for cumulative assessment are in line with those conclusions described for assessment of the project alone and include the following:

For construction:

- Impact 1 Temporary habitat disturbance, **Not Significant**
- Impact 2 Temporary increase in SSC, **Not Significant**
- Impact 3 Remobilisation of contaminated sediments, **Not Significant**

For Operation and Maintenance:

- Impact 1 Long-term habitat loss, **Not Significant**
- Impact 2 Habitat creation (increase in hard substrate), **Not Significant**
- Impact 3 Temporary habitat disturbance, **Not Significant**
- Impact 4 Presence of EMF and temperature changes, **Not Significant**

For Decommissioning:

- Impact 1 Temporary habitat disturbance, **Not Significant**
- Impact 2 Temporary increase in SSC, **Not Significant**
- Impact 3 Remobilisation of contaminated sediments, **Not Significant**
- Impact 4 Long-term habitat loss, **Not Significant**

8.12 Transboundary impacts

412. The impact that poses the largest potential to have a transboundary impact is increased SSC or introduction of INNS as they have the largest spatial distribution. Sediment plume modelling suggests no increase in SSC extends beyond the transboundary line and benthic habitat receptors are relatively mobile. As such, there is no potential for transboundary impacts from increased SSC. The potential impact for the introduction of INNS is mitigated through best practices and vessel biosecurity plans and therefore there is no potential for transboundary impacts.

8.13 Inter-relationships

413. The inter-related effects assessment considers the potential for all relevant effects across multiple topics to interact, spatially and temporally, to create inter-related effects on a receptor group. This includes incorporating the findings of the individual assessment chapters to describe potential additional effects that may be of greater significance when compared to individual effects acting on a receptor group.

414. The term 'receptor group' is used to highlight the fact that the proposed approach to the inter-relationships assessment has not assessed every individual receptor considered in this chapter, but instead focuses on groups of receptors that may be sensitive to inter-related effects.

415. **Chapter 5 EIA Methodology** provides a matrix to show at a broad level where across the EIAR interactions between effects on different receptor groups have been identified.

416. The potential inter-related effects that could arise in relation to subtidal and intertidal ecology are presented in **Table 8-26**. If there are additional effects, these are considered additively and qualitatively using expert judgement.

Table 8-26 Inter-related effects (lifetime) assessment for subtidal and intertidal ecology

Impact / receptor	Related chapter	Phase assessment
Temporary habitat disturbance	Chapter 6 Marine Geology, Sediments and Coastal Processes Chapter 9 Fish, Shellfish and Turtles Ecology Chapter 10 Ornithology	Construction, maintenance and decommissioning activities within the offshore development could disturb benthic habitats. This potential impact is addressed within this chapter as **Not Significant**.
Temporary increases in SSC	Chapter 6 Marine Geology, Sediments and Coastal Processes Chapter 7 Marine Water Quality Chapter 9 Fish, Shellfish and Turtles Ecology Chapter 10 Ornithology	Construction, maintenance, and decommissioning activities within the offshore development could disturb benthic habitats causing a temporary increase in SSC. This potential impact is addressed within this chapter as **Not Significant**.
Remobilisation of contaminated sediments	Chapter 6 Marine Geology, Sediments and Coastal Processes Chapter 7 Marine Water Quality Chapter 9 Fish, Shellfish and Turtles Ecology	Construction, maintenance and decommissioning activities within the offshore development could disturb benthic habitats causing the remobilisation of contaminated sediments. This potential impact is addressed within this chapter as **Not Significant**.

Impact / receptor	Related chapter	Phase assessment
Long-term habitat loss	Chapter 6 Marine Geology, Sediments and Coastal Processes Chapter 9 Fish, Shellfish and Turtles Ecology Chapter 10 Ornithology	The greatest potential magnitude of effect comes from long-term habitat loss during the construction and decommissioning phases. However, only a small proportion of the available habitat in the offshore development area and / or wider study area have the potential to be impacted with the majority of the habitat type unimpacted. This potential impact is addressed within this chapter as **Not Significant**.
Habitat creation (increase in hard substrate)	Chapter 6 Marine Geology, Sediments and Coastal Processes Chapter 9 Fish, Shellfish and Turtles Ecology Chapter 10 Ornithology	Habitat creation from the colonisation of the offshore development substructures can have a positive effect on benthic and intertidal ecology receptors during the operation and maintenance phase. This new habitat can act as feeding, nursery and shelter grounds for fish and shellfish species which in turn could increase availability of prey species for ornithological receptors in the area. This potential impact is addressed within this chapter as positive, **Not Significant**.
Presence of EMF and / or temperature changes	Chapter 9 Fish, Shellfish and Turtles Ecology Chapter 11 Marine Mammals	Operation and maintenance, activities within the offshore development could introduce the presence of EMF and / or temperature changes. This potential impact is addressed within this chapter as **Not Significant**.

8.14 Potential monitoring requirements

417. Monitoring requirements for the CWP Project will be described in the **In Principle Project Environmental Monitoring Plan** submitted alongside the EIAR and further developed and agreed with stakeholders prior to construction.

418. The assessment of impacts on subtidal and intertidal ecology as a result of the construction, O&M and decommissioning phases of the CWP Project are predicted to be not significant in EIA terms. Based on the predicted impacts it is concluded that no specific monitoring is required.

8.15 Impact assessment summary

419. This chapter of the EIAR has assessed the potential environmental impacts on subtidal and intertidal ecology from the construction, operation and maintenance and decommissioning phases of the CWP Project. Where significant impacts have been identified, additional mitigation has been considered and incorporated into the assessment.

420. This section, including **Table 8-27**, summarises the impact assessment undertaken and confirms the significance of any residual effects, following the application of additional mitigation.

421. Subtidal and intertidal habitats have been assessed as there is the potential they can experience significant effects from the various aspects of the CWP Project. For construction and decommissioning, this includes temporary habitat disturbance, increase in SSC, remobilisation of contaminated sediments, the introduction of INNS and accidental pollution events. For operation and maintenance this includes long-term habitat loss, habitat creation, the presence of EMF and temperature changes, the introduction of INNS and accidental pollution events. For decommissioning this includes the impacts considered under construction as well as long-term habitat loss, of newly created hard substrate habitat from CWP Project infrastructure.

422. Key consultations have taken place with stakeholders such as the MI and NPWS. Key sources, such as INFOMAR and EUSeamap sediment and habitat types have been used alongside site specific survey results to determine the receptors.

423. The receptors have been categorised into broad habitat groups containing sub habitats / biotopes where known.

424. These receptors have then been assessed in terms of sensitivity and magnitude, based on the definitions provided in **Section 8.4**. The sensitivity, in combination with the magnitude determined for each impact, were used to determine the significance of the predicted effects for the various activities that will occur over the CWP Project lifetime.

425. The following **Table 8-27** provides a summary construction and decommissioning related significance. For the impacts of temporary habitat disturbance, increased SSC and remobilisation of contaminated sediments, the highest significance was slight. For the potential introduction of INNS and accidental pollution events, the highest significance was slight. None of the predicted significances are significant.

426. The following also provides a summary of operation and maintenance related significance. For long-term habitat loss, the highest significance was slight. For the presence of EMF and temperature changes, the highest significance was **Not Significant**. For the potential introduction of INNS and accidental pollution events, the highest significance was slight. None of the predicted significances are significant.

Table 8-27 Summary of potential impacts and residual effects

Potential impact	Receptor	Receptor sensitivity	Magnitude of impact	Significance of effect	Additional mitigation	Residual effect
Construction						
Impact 1: Temporary habitat disturbance	Subtidal coarse sediment habitats	Low	Low	Not significant	N/A	**Not significant** (not significant)
	Subtidal sand habitats	Low	Medium	Slight (not significant)	N/A	**Slight** (not significant)
	Intertidal habitats	Medium	Low	Slight (not significant)	N/A	**Slight** (not significant)
	River Liffey habitats	Negligible	Negligible	Imperceptible (not significant)	N/A	**Imperceptible** (not significant)
Impact 2: Temporary increase in suspended sediment concentration (SSC)	Subtidal coarse sediment habitats	Low	Low	Not significant	N/A	**Not significant** (not significant)
	Subtidal sand habitats	Medium	Low	Slight (not significant)	N/A	**Slight** (not significant)
	Subtidal mud habitats	Negligible	Negligible	Imperceptible (not significant)	N/A	**Imperceptible** (not significant)
	Subtidal rock habitats	Medium	Negligible	Slight / Not significant	N/A	**Slight / Not significant** (not significant)

Potential impact	Receptor	Receptor sensitivity	Magnitude of impact	Significance of effect	Additional mitigation	Residual effect
	Subtidal mixed habitats	Negligible	Negligible	Imperceptible (not significant)	N/A	**Imperceptible** (not significant)
	Intertidal habitats	Medium	Low	Slight (not significant)	N/A	**Slight** (not significant)
	River Liffey habitats	Negligible	Negligible	Imperceptible (not significant)	N/A	**Imperceptible (not significant)** (not significant)
Impact 3: Remobilisation of contaminated sediments	Subtidal coarse sediment habitats	Low	Low	Not significant	N/A	**Not significant** (not significant)
	Subtidal sand habitats	Low	Low	Not significant	N/A	**Not significant** (not significant)
	Subtidal mud habitats	Negligible	Negligible	Not significant	N/A	**Not significant** (not significant)
	Subtidal rock habitats	Medium	Negligible	Slight (not significant)	N/A	**Slight** (not significant)
	Subtidal mixed habitats	Negligible	Negligible	Not significant	N/A	**Not significant** (not significant)
	Intertidal habitats	Medium	Low	Slight (not significant)	N/A	**Slight** (not significant)
	River Liffey habitats	Negligible	Negligible	Not significant	N/A	**Not significant** (not significant)

Potential impact	Receptor	Receptor sensitivity	Magnitude of impact	Significance of effect	Additional mitigation	Residual effect
Impact 4: Introduction of INNS	Subtidal coarse sediment habitats	Low	Negligible	Not significant	N/A	**Not significant** (not significant)
	Subtidal sand habitats	Low	Negligible	Not significant	N/A	**Not significant** (not significant)
	Subtidal mud habitats	Low	Negligible	Not significant	N/A	**Not significant** (not significant)
	Subtidal rock habitats	Medium	Negligible	Slight / Not significant	N/A	**Slight / Not significant** (not significant)
	Subtidal mixed habitats	Low	Negligible	Not significant	N/A	**Not significant** (not significant)
	Intertidal habitats	High	Negligible	Slight (not significant)	N/A	**Slight** (not significant)
	River Liffey habitats	Low	Negligible	Not significant	N/A	**Not significant** (not significant)
Impact 5: Accidental pollution events	Subtidal coarse sediment habitats	Low	Negligible	Not significant	N/A	**Not significant** (not significant)
	Subtidal sand habitats	Low	Negligible	Not significant	N/A	**Not significant** (not significant)

Potential impact	Receptor	Receptor sensitivity	Magnitude of impact	Significance of effect	Additional mitigation	Residual effect
	Subtidal mud habitats	Low	Negligible	Not significant	N/A	**Not significant** (not significant)
	Subtidal rock habitats	Medium	Negligible	Slight / Not significant	N/A	**Slight / Not significant** (not significant)
	Subtidal mixed habitats	Low	Negligible	Not significant	N/A	**Not significant** (not significant)
	Intertidal habitats	High	Negligible	Slight (not significant)	N/A	**Slight** (not significant)
	River Liffey habitats	Low	Negligible	Not significant	N/A	**Not significant** (not significant)
Operation and maintenance						
Impact 1: Long-term habitat loss	Subtidal coarse sediment habitats	High	Negligible	Slight (not significant)	N/A	**Slight** (not significant)
	Subtidal sand habitats	High	Negligible	Slight (not significant)	N/A	**Slight** (not significant)
	River Liffey habitats	High	Negligible	Slight (not significant)	N/A	**Slight** (not significant)
Impact 2: Habitat creation (increase in hard substrate)	Subtidal coarse sediment habitats	High	Negligible	Slight (not significant)	N/A	**Slight** (not significant)

Potential impact	Receptor	Receptor sensitivity	Magnitude of impact	Significance of effect	Additional mitigation	Residual effect
	Subtidal sand habitats	High	Negligible	Slight (not significant)	N/A	**Slight** (not significant)
	River Liffey habitats	High	Negligible	Slight (not significant)	N/A	**Slight** (not significant)
Impact 3: Temporary habitat disturbance	Subtidal coarse sediment habitats	Low	Low	Not significant	N/A	**Not significant** (not significant)
	Subtidal sand habitats	Low	Medium	Slight (not significant)	N/A	**Slight** (not significant)
	Intertidal habitats	Medium	Low	Slight (not significant)	N/A	**Slight** (not significant)
	River Liffey habitats	Negligible	Negligible	Imperceptible (not significant)	N/A	**Imperceptible** (not significant)
Impact 4: Presence of EMF and / or Temperature changes resulting from presence of electrical infrastructure	Subtidal coarse sediment habitats	Low	Low	Not significant	N/A	**Not significant** (not significant)
	Subtidal sand habitats	Low	Low	Not significant	N/A	**Not significant** (not significant)
	Intertidal habitats	Low	Low	Not significant	N/A	**Not significant** (not significant)
Impact 5: Introduction of INNS	Subtidal coarse sediment habitats	Low	Negligible	Not significant	N/A	**Not significant** (not significant)

Potential impact	Receptor	Receptor sensitivity	Magnitude of impact	Significance of effect	Additional mitigation	Residual effect
	Subtidal sand habitats	Low	Negligible	Not significant	N/A	**Not significant** (not significant)
	Subtidal mud habitats	Low	Negligible	Not significant	N/A	**Not significant** (not significant)
	Subtidal rock habitats	Medium	Negligible	Slight / Not significant	N/A	**Slight / Not significant** (not significant)
	Subtidal mixed habitats	Low	Negligible	Not significant	N/A	**Not significant** (not significant)
	Intertidal habitats	High	Negligible	Slight (not significant)	N/A	**Slight** (not significant)
	River Liffey habitats	Low	Negligible	Not significant	N/A	**Not significant** (not significant)
Impact 6: Accidental pollution events	Subtidal coarse sediment habitats	Low	Negligible	Not significant	N/A	**Not significant** (not significant)
	Subtidal sand habitats	Low	Negligible	Not significant	N/A	**Not significant** (not significant)
	Subtidal mud habitats	Low	Negligible	Not significant	N/A	**Not significant** (not significant)
	Subtidal rock habitats	Medium	Negligible	Slight / Not significant	N/A	**Slight / Not significant** (not significant)

Potential impact	Receptor	Receptor sensitivity	Magnitude of impact	Significance of effect	Additional mitigation	Residual effect
	Subtidal mixed habitats	Low	Negligible	Not significant	N/A	Not significant (not significant)
	Intertidal habitats	High	Negligible	Slight (not significant)	N/A	Slight (not significant)
	River Liffey habitats	Low	Negligible	Not significant	N/A	Not significant (not significant)
Decommissioning						
Impact 1: Temporary habitat disturbance	Subtidal coarse sediment habitats	Low	Low	Not significant	N/A	**Not significant** (not significant)
	Subtidal sand habitats	Low	Medium	Slight (not significant)	N/A	**Slight** (not significant)
	Intertidal habitats	Medium	Low	Slight (not significant)	N/A	**Slight** (not significant)
	River Liffey habitats	Negligible	Negligible	Imperceptible (not significant)	N/A	**Imperceptible** (not significant)
Impact 2: Temporary increase in suspended sediment	Subtidal coarse sediment habitats	Low	Low	Not significant	N/A	**Not significant** (not significant)
	Subtidal sand habitats	Medium	Low	Slight (not significant)	N/A	**Slight** (not significant)

Potential impact	Receptor	Receptor sensitivity	Magnitude of impact	Significance of effect	Additional mitigation	Residual effect
concentration (SSC)	Subtidal mud habitats	Negligible	Negligible	Imperceptible (not significant)	N/A	**Imperceptible** (not significant)
	Subtidal rock habitats	Medium	Negligible	Slight/Not significant	N/A	**Slight/Not significant** (not significant)
	Subtidal mixed habitats	Negligible	Negligible	Imperceptible (not significant)	N/A	**Imperceptible** (not significant)
	Intertidal habitats	Medium	Low	Slight (not significant)	N/A	**Slight** (not significant)
	River Liffey habitats	Negligible	Negligible	Imperceptible (not significant)	N/A	**Imperceptible** (not significant)
Impact 3: Remobilisation of contaminated sediments	Subtidal coarse sediment habitats	Low	Low	Not significant	N/A	**Not significant** (not significant)
	Subtidal sand habitats	Low	Low	Not significant	N/A	**Not significant** (not significant)
	Subtidal mud habitats	Negligible	Negligible	Not significant	N/A	**Not significant** (not significant)
	Subtidal rock habitats	Medium	Negligible	Slight (not significant)	N/A	**Slight** (not significant)
	Subtidal mixed habitats	Negligible	Negligible	Not significant	N/A	**Not significant** (not significant)

Potential impact	Receptor	Receptor sensitivity	Magnitude of impact	Significance of effect	Additional mitigation	Residual effect
	Intertidal habitats	Medium	Low	Slight (not significant)	N/A	**Slight** (not significant)
	River Liffey habitats	Negligible	Negligible	Not significant	N/A	**Not significant** (not significant)
Impact 4: Long-term habitat loss	Subtidal coarse sediment habitats	High	Negligible	Slight (not significant)	N/A	**Slight** (not significant)
	Subtidal sand habitats	High	Negligible	Slight (not significant)	N/A	**Slight** (not significant)
	River Liffey habitats	High	Negligible	Slight (not significant)	N/A	**Slight** (not significant)
Impact 5: Introduction of INNS	Subtidal coarse sediment habitats	Low	Negligible	Not significant	N/A	**Not significant** (not significant)
	Subtidal sand habitats	Low	Negligible	Not significant	N/A	**Not significant** (not significant)
	Subtidal mud habitats	Low	Negligible	Not significant	N/A	**Not significant** (not significant)
	Subtidal rock habitats	Medium	Negligible	Slight / Not significant	N/A	**Slight / Not significant** (not significant)
	Subtidal mixed habitats	Low	Negligible	Not significant	N/A	**Not significant** (not significant)

Potential impact	Receptor	Receptor sensitivity	Magnitude of impact	Significance of effect	Additional mitigation	Residual effect
	Intertidal habitats	High	Negligible	Slight (not significant)	N/A	**Slight** (not significant)
	River Liffey habitats	Low	Negligible	Not significant	N/A	**Not significant** (not significant)
Impact 6: Accidental pollution events	Subtidal coarse sediment habitats	Low	Negligible	Not significant	N/A	**Not significant** (not significant)
	Subtidal sand habitats	Low	Negligible	Not significant	N/A	**Not significant** (not significant)
	Subtidal mud habitats	Low	Negligible	Not significant	N/A	**Not significant** (not significant)
	Subtidal rock habitats	Medium	Negligible	Slight / Not significant	N/A	**Slight / Not significant** (not significant)
	Subtidal mixed habitats	Low	Negligible	Not significant	N/A	**Not significant** (not significant)
	Intertidal habitats	High	Negligible	Slight (not significant)	N/A	**Slight** (not significant)
	River Liffey habitats	Low	Negligible	Not significant	N/A	**Not significant** (not significant)

8.16 References

427. Albert, L. Deschamps, F. Jolivet, A., Olivier, F., Chauvaud, L. & Chauvaud S. (2020). A current synthesis on the effects of electric and magnetic fields emitted by submarine power cables on invertebrates. Available at: https://www.sciencedirect.com/science/article/abs/pii/S014111361930

428. Ashley, M., (2016). Polychaetes in littoral fine sand. In Tyler-Walters H. and Hiscock K. *Marine Life Information Network: Biology and Sensitivity Key Information Reviews*, [online, accessed: 30-10-2023]. Plymouth: Marine Biological Association of the United Kingdom. Available at: https://www.marlin.ac.uk/habitat/detail/1125

429. Bijkerk, R., (1988). Ontsnappen of begraven blijven: de effecten op bodemdieren van een verhoogde sedimentatieals gevolg van baggerwerkzaamheden: literatuuronderzoek: RDD, Aquatic ecosystems.

430. Bryan, G.J.M.e., (1984). Pollution due to heavy metals and their compounds. In *Marine Ecology: A Comprehensive Integrated Treatise on Life in the Oceans and Coastal Waters*, vol 5 Ocean Management (Part3), 1289–1431.

431. Capasso, E., Jenkins, S., Frost, M. & Hinz, H., (2010). Investigation of benthic community change over a century-wide scale in the western English Channel. *Journal of the Marine Biological Association of the United Kingdom*, 90 (06), 1161–1172.

432. d'Avack, E.A.S., Tillin, H., Jackson, E.L. & Tyler-Walters, H. , (2014). Assessing the sensitivity of seagrass bed biotopes to pressures associated with marine activities. *JNCC Report No. 505*. Joint Nature Conservation Committee, Peterborough.

433. Dauvin, J.C., (2000). The muddy fine sand *Abra alba – Melinna palmata* community of the Bay of Morlaix twenty years after the Amoco Cadiz oil spill. Marine Pollution Bulletin, 40, 528–536.

434. De-Bastos, E.S.R. & Hill, J., (2016). [*Polydora*] sp. tubes on moderately exposed sublittoral soft rock. In Tyler-Walters H. and Hiscock K. (eds) *Marine Life Information Network: Biology and Sensitivity Key Information Reviews*, [on-line]. Plymouth: Marine Biological Association of the United Kingdom. [cited 30-10-2023]. Available from: https://www.marlin.ac.uk/habitat/detail/247

435. De-Bastos, E.S.R. & Watson, A., (2023). *Amphiura filiformis* and *Ennucula tenuis* in circalittoral and offshore sandy mud. In Tyler-Walters H. *Marine Life Information Network: Biology and Sensitivity Key Information Reviews,* [online]. Plymouth: Marine Biological Association of the United Kingdom. [cited 07-12-2023]. Available at: https://marlin.ac.uk/habitat/detail/1107

436. Gill, A.B., Huang, Y., Gloyne-Philips, I., Metcalfe, J., Quayle, V., Spencer, J. and Wearmouth, V. (2009). COWRIE 2.0 Electromagnetic Fields (EMF) Phase 2: EMF-sensitive fish response to EM emissions from sub-sea electricity cables of the type used by the offshore renewable energy industry. Commissioned by COWRIE Ltd (project reference COWRIE-EMF-1-06). https://tethys.pnnl.gov/sites/default/files/publications/Sensitive_Fish_Response_to_EM_Emissions_from_Offshore_Renewable.pdf

437. Gill, A.B. and M. Desender. (2020). Risk to Animals from Electro-magnetic Fields Emitted by Electric Cables and Marine Renewable Energy Devices.

438. Gittenberger, A. & Van Loon, W.M.G.M., (2011). Common marine macrozoobenthos species in the Netherlands, their characteristics and sensitivities to environmental pressures. GiMaRIS Report no 2011.08. DOI: https://doi.org/10.13140/RG.2.1.3135.7521

439. Hiscock, K., (1983). Water movement. In Sublittoral ecology. The ecology of shallow sublittoral benthos (ed. R. Earll & D.G. Erwin), pp. 58-96. Oxford: Clarendon Press.

440. IPCC, 2013: Climate Change (2013): The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)] Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 1535 pp

441. JNCC[1] https://sac.jncc.gov.uk/habitat/H1170/ [online, accessed 20-11-2022].

442. Karlsson, R., Tivefälth, M., Duranović, I., Martinsson, S., Kjølhamar, A. & Murvoll, K. M. (2022). Artificial hard-substrate colonisation in the offshore Hywind Scotland Pilot Park, Wind Energ. Sci., 7, 801–814. Available at: https://doi.org/10.5194/wes-7-801-2022, 2022.

443. Katrien, J.J., Van Landeghem, A.J., Wheeler, N.C., & Mitchell, Gerry Sutton. (2009). Variations in sediment wave dimensions across the tidally dominated Irish Sea, NW Europe, Marine Geology, 263(1–4), 108–119.

444. Kingston, PF (2001). Benthic Organisms Review. *In Encyclopedia of Ocean Sciences, 2nd Edition*. Compiled by Steele, JS and edited by Steele, JS; Thorpe, SA & Turekian, KK.

445. Love, M. S., Nishimoto, M. M., Snook, L., Schroeder, D. M., and Scarborough Bull, A. (2017b). A Comparison of Fishes and Invertebrates Living in the Vicinity of Energized and Unenergized Submarine Power Cables and Natural Sea Floor off Southern California, USA. Journal of Renewable Energy, 13. doi:10.1155/2017/872716.

446. Mackie, A.S.Y., Oliver, P.G. & Rees, E.I.S., (1995). Benthic biodiversity in the southern Irish Sea. *Studies in Marine Biodiversity and Systematics from the National Museum of Wales. BIOMOR Reports*, no. 1.

447. Marine Renewable Energy Devices. In A.E. Copping & L.G. Hemery (Eds.), OES-Environmental 2020 State of the Science Report: Environmental Effects of Marine Renewable Energy Development Around the World. Report for Ocean Energy Systems (OES). (pp. 86–10). DOI: 10.2172/1633088.

448. Menon, N.R., (1972). Heat tolerance, growth and regeneration in three North Sea bryozoans exposed to different constant temperatures. *Marine Biology* 15, 1–11 (1972). https://doi.org/10.1007/BF00347433.

449. MMO (2014). Review of post-consent offshore wind farm monitoring data associated with licence conditions. A report produced for the Marine Management Organisation, pp 194. MMO Project No: 1031. ISBN: 978-1-909452-24-4.NPWS[1], 2013. South Dublin Bay SAC (site code:0210) Conservation Objectives Supporting Document – Marine Habitat. Castlemaine Biological Community Groups (npws.ie) [online, accessed 20-11-2022].

450. NPWS (2013). Rockabill to Dalkey Island SAC (site code: 3000) Conservation objectives supporting document – Marine Habitats and Species. Castlemaine Biological Community Groups (npws.ie) [online, accessed 20-11-2022].

451. NPWS[3], (2013). Wicklow Reef SAC (site code: 2274) Conservation Objectives Supporting Document – Marine Habitat. https://www.npws.ie/sites/default/files/publications/pdf/002274_Wicklow%20Reef%20SAC%20Marine%20Supporting%20Doc_V1.pdf [online, accessed 20-11-2022].

452. Quality Status Report of the Marine and Coastal Areas of the Irish Sea (2010). OSPAR Commission, London. ISBN 978-1-90739-38-8.

453. Riley, K. & Ballerstedt, S., (2005). Spirobranchus triqueter. Marine Life Information Network: Biology and Sensitivity Key Information Sub-programme [on-line]. Plymouth: Marine Biological Association of the United Kingdom:. [cited 07/01/2023]. Available from: https://www.marlin.ac.uk/species/detail/1794.

454. Roberts, Louise & Harding, Harry & Voellmy, Irene & Bruintjes, Rick & Simpson, Stephen & Radford, Andrew & Breithaupt, Thomas & Elliott, Michael. (2016). Exposure of benthic invertebrates to sediment

vibration: From laboratory experiments to outdoor simulated pile-driving. *Proceedings of Meetings on Acoustics*. 27. 010029. 10.1121/2.0000324.

455. Roberts L. & Elliott M. (2017). Good or bad vibrations? Impacts of anthropogenic vibration on the marine epibenthos, *Science of The Total Environment*, 595, 255–268.

456. Stamp, T.E. (2016). Faunal and algal crusts with *Spirobranchus triqueter* and sparse *Alcyonium digitatum* on exposed to moderately wave-exposed circalittoral rock. In Tyler-Walters H. Marine Life Information Network: Biology and Sensitivity Key Information Reviews. Plymouth: Marine Biological Association of the United Kingdom. [online, accessed: 07-12-2023]. Available at: https://www.marlin.ac.uk/habitat/detail/1064.

457. Stamp, T.E., Tyler-Walters, H., & Burdett, E.G. (2023). Laminaria hyperborea and foliose red seaweeds on moderately exposed infralittoral rock. In Tyler-Walters H. *Marine Life Information Network: Biology and Sensitivity Key Information Reviews*, [on-line]. Plymouth: Marine Biological Association of the United Kingdom. [online, accessed: 07-12-2023]. Available at: https://www.marlin.ac.uk/habitat/detail/292.

458. Suchanek, T.H., (1993). Oil impacts on marine invertebrate populations and communities. American Zoologist, 33, 510–523. DOI https://doi.org/10.1093/icb/33.6.510.

459. Thomas, R., (1975). Functional morphology, ecology, and evolutionary conservatism in the Glycymerididae (Bivalvia). Palaeontology, 18 (2), 217-254.

460. Tillin, H.M. (2016a). [*Mediomastus fragilis*], [*Lumbrineris*] spp. and venerid bivalves in circalittoral coarse sand or gravel. In Tyler-Walters H. and Hiscock K. (eds) *Marine Life Information Network: Biology and Sensitivity Key Information Reviews*, [on-line]. Plymouth: Marine Biological Association of the United Kingdom. DOI https://dx.doi.org/10.17031/marlinhab.382.

461. Tillin, H.M. (2016b). [*Capitella capitata*] in enriched sublittoral muddy sediments. In Tyler-Walters H. and Hiscock K. (eds) *Marine Life Information Network: Biology and Sensitivity Key Information Reviews* [on-line]. Plymouth: Marine Biological Association of the United Kingdom.

462. DOI https://dx.doi.org/10.17031/marlinhab.106.1

463. Tillin, H.M., Lloyd, K.A. & Watson, A., (2023). *Tubificoides benedii* and other oligochaetes in littoral mud. In Tyler-Walters H. *Marine Life Information Network: Biology and Sensitivity Key Information Reviews*, [online, accessed: 30-10-2023]. Plymouth: Marine Biological Association of the United Kingdom. Available at: https://www.marlin.ac.uk/habitat/detail/1093.

464. Tillin, H.M. & Rayment, W., (2001). [*Venerupis corrugata*], [*Amphipholis squamata*] and [*Apseudes holthuisi*] in infralittoral mixed sediment. In Tyler-Walters H. and Hiscock K. (eds) *Marine Life Information Network: Biology and Sensitivity Key Information Reviews*, [on-line]. Plymouth: Marine Biological Association of the United Kingdom. DOI https://dx.doi.org/10.17031/marlinhab.354.1

465. Tillin, H.M. & Rayment, W.J. (2023). *Fabulina fabula* and *Magelona mirabilis* with venerid bivalves and amphipods in infralittoral compacted fine muddy sand. In Tyler-Walters H. and Hiscock K. (eds) *Marine Life Information Network: Biology and Sensitivity Key Information Reviews*, [online, accessed:30-10-2023]. Plymouth: Marine Biological Association of the United Kingdom. Available at: https://www.marlin.ac.uk/habitat/detail/142.

466. Tillin, H.M. & Tyler-Walters, H. (2015). *Mytilus edulis* and barnacles on very exposed eulittoral rock. In Tyler-Walters H. and Hiscock K. (eds) *Marine Life Information Network: Biology and Sensitivity Key Information Reviews*, [on-line]. Plymouth: Marine Biological Association of the United Kingdom. [online, accessed:23-10-2023]. Available at: https://www.marlin.ac.uk/habitat/detail/203.

467. Tillin, H.M. & Watson, A., (2023). *Capitella capitata* and *Tubificoides* spp. in reduced salinity infralittoral muddy sediment. In Tyler-Walters H. *Marine Life Information Network: Biology and Sensitivity Key*

Information Reviews, [online, accessed:30-10-2023] Plymouth: Marine Biological Association of the United Kingdom. Available at: https://www.marlin.ac.uk/habitat/detail/32.

468. Tillin, H. & Tyler-Walters, H., (2014). Assessing the sensitivity of subtidal sedimentary habitats to pressures associated with marine activities. *Phase 2 Report – Literature review and sensitivity assessments for ecological groups for circalittoral and offshore Level 5 biotopes*. Joint Nature Conservation Committee, Peterborough, JNCC Report No. 512B, 260 pp.

469. Tyler-Walters, H. & Marshall, C., (2006). Polychaete / bivalve dominated muddy sand shores. In Tyler-Walters H. and Hiscock K. (eds) *Marine Life Information Network: Biology and Sensitivity Key Information Reviews*, [on-line]. Plymouth: Marine Biological Association of the United Kingdom. [cited 15-12-2023]. Available from: https://www.marlin.ac.uk/habitat/detail/21.

470. Tyler-Walters, H., Tillin, H.M., d'Avack, E.A.S., Perry, F., Stamp, T., (2023). Marine Evidence based Sensitivity Assessment (MarESA) – *Guidance Manual. Marine Life Information Network* (MarLIN). Marine Biological Association of the UK, Plymouth, pp. 170. Available at: https://www.marlin.ac.uk/publications [online, accessed:30-10-2023].

471. Tyler-Walters, H., & Watson, A., (2023). *Mediomastus fragilis* and cirratulids in infralittoral mixed sediment. In Tyler-Walters H. *Marine Life Information Network: Biology and Sensitivity Key Information Reviews,* [on-line]. Plymouth: Marine Biological Association of the United Kingdom. [online, accessed: 07-12-2023]. Available at: https://www.marlin.ac.uk/habitat/detail/1260.

472. Valentine, P.C., Collie, J.S., Reid, R.N., Asch, R.G., Guida, V.G. and Blackwood, D.S. (2007). The occurrence of the colonial ascidian *Didemnum* sp. on Georges Bank gravel habitat: Ecological observations and potential effects on groundfish and scallop fisheries. *Journal of Experimental Marine Biology and Ecology* 342: 179–181.

473. Warner, G.F., (1985). Dynamic stability in two contrasting epibenthic communities. *In Proceedings of the 19th European Marine Biology Symposium*, Plymouth, Devon, UK, 16-21 September, 1984 (ed. P.E. Gibbs), pp. 401-410.

474. Wilson, Jennifer & Elliott, Michael. (2009). The Habitat-creation Potential of Offshore Wind Farms. Wind Energy. 12. 203 - 212. 10.1002/we.324.

475. Andrew J. Wheeler , Jim Walshe & Gerry D. Sutton (2001). Seabed mapping and seafloor processes in the Kish, Burford, Bray and Fraser Banks area, South-Western Irish Sea, Irish Geography, 34:2, 194–211, DOI: 10.1080/00750770109555787.