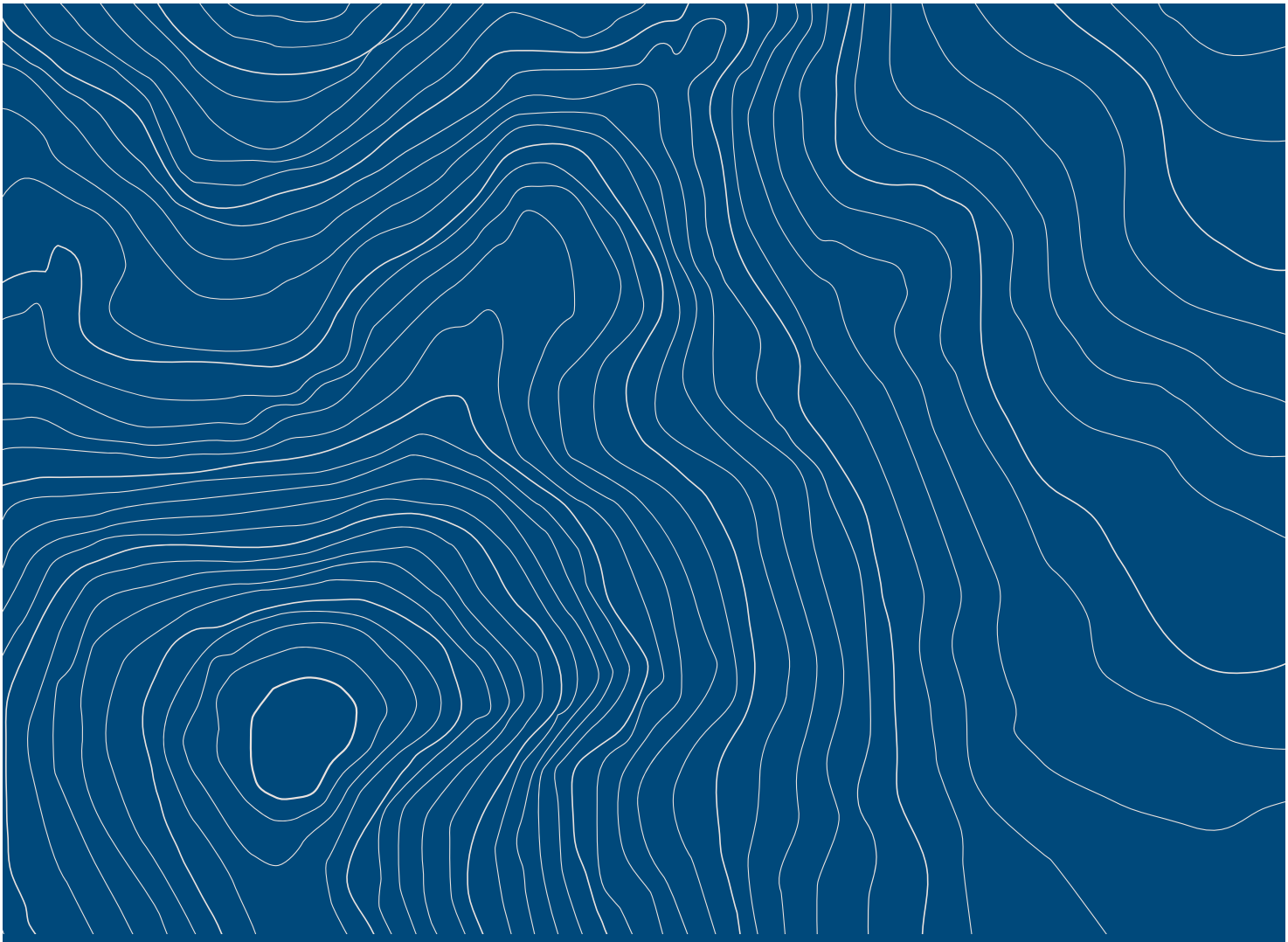

DublinArray
Generation for generations

EIAR Volume 2: Introductory Chapters
Chapter 3: Environmental Impact Assessment Methodology

Kish Offshore Wind Ltd.

RWE SLR GoBe
APEM Group

www.dublinarray-marineplanning.ie

Dublin Array Offshore Wind Farm

Environmental Impact Assessment Report

Volume 2, Chapter 3: EIA Methodology

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Glossary

Term	Definition
An Bord Pleanála (ABP)	Competent authority as defined by the Planning Acts to determine the application for development consent for Dublin Array and carry out the EIA and AA of the proposed development.
Applicant	Kish Offshore Wind Limited. Kish Offshore Wind Limited is making the application on behalf of and/or with the consent of the joint holders of the MACs for the maritime area to which the proposed development relates: Kish Offshore Wind Limited, Bray Offshore Wind Limited and DLRCC.
Cumulative Effects Assessment (CEA)	The assessment of potential cumulative effects that may arise when effects arising from Dublin Array act cumulatively with impacts from other projects considered in the assessment.
Dublin Array	Dublin Array Offshore Wind Farm. Where the context so provides within the EIAR, references to Dublin Array refer to all geographical areas of the proposed development, i.e. both offshore, onshore and including the proposed O&M Base.
Environmental Impact Assessment (EIA)	Assessment of the likely significant effects of a proposed project on the environment. The EIA will be carried out by An Bord Pleanála in this instance.
EIA Report (EIAR)	As defined in the Planning and Development Act 2000, as amended: "environmental impact assessment report" means a report of the effects, if any, which proposed development, if carried out, would have on the environment and shall include the information specified in Annex IV of the Environmental Impact Assessment Directive.
Landfall	The location where the Offshore Export Cable Corridor comes ashore at Shanganagh Waste Water Treatment Plant (WWTP).
Maritime Area Consent (MAC)	State consent which grants the holder a right to occupy a specific part of the maritime area for the purposes of proposed maritime usage as set out in the MAC and subject to such conditions (if any) as may be attached.
Maximum Design Scenario	The design scenario that is assessed for each impact and which will result in the greatest impact (e.g. largest footprint, longest exposure, or largest dimensions). Unless otherwise identified in the assessment it can be assumed that any other design scenario for that impact will result in no greater environmental significance than that assessed and presented in the EIAR.
Offshore Infrastructure	Wind turbine generators, offshore substation platform, inter array cables, and offshore export cables.
Offshore Substation Platform (OSP)	Offshore substation, which is necessary to connect the WTGs with the Offshore Export Cable.
Onshore Electrical System (OES)	Collective term for all onshore infrastructure from the landfall/TJB to the grid connection point which is likely to be necessary to connect the project to the national grid.

Term	Definition
	OES works is a term used in the EIAR to describe the construction of the OES.
Phase 1 Projects	These are the offshore wind farm projects awarded a MAC in 2022 and include Dublin Array, North Irish Sea Array (NISA), Oriel Offshore Wind Farm, Codling Wind Park (CWP), Arklow Phase 2 and Sceirde Rocks. With the exception of Sceirde Rocks these Projects may also be referred to as the East Coast Phase 1 Projects (see above).
Planning Acts	Planning and Development Act 2000, as amended, and where the context so admits, including also the Planning Regulations
Planning Regulations	Planning and Development Regulations 2001, as amended.
Prescribed Bodies	Authorities likely to be concerned by the project by reason of their specific environmental responsibilities or local and regional competences. The list of prescribed bodies is set out in the Planning and Development (Maritime Development) Regulations 2023.
Receiving environment	The baseline environment.
Transition Joint Bay (TJB)	The proposed infrastructure at the Landfall location where the offshore and onshore cables connect.

Acronyms

Term	Definition
ABP	An Bord Pleanála
ADO	Alternative Design Option
CEA	Cumulative Effects Assessment
CWP	Codling Wind Park
DCCAE	Department of Communications, Climate Action and Environment
DHPLG	Department of Housing, Planning and Local Government.
EC	European Commission
ECR	External Cable Route
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
EU	European Union
MAC	Maritime Area Consent
MAP	Maritime Area Planning
MDO	Maximum Design Option
NIS	Natura Impact Assessment
NISA	North Irish Sea Array
NTS	Non-Technical Summary
OES	Onshore Electrical System
OSP	Offshore Substation Platform
SAC	Special Area of Conservation
SLVIA	Seascape, Landscape and Visual Impact Assessment
SPA	Special Protection Area
TJB	Transition Joint Bay
UN	United Nations
UNECE	United Nations Economic Commission for Europe
WWTP	Waste Water Treatment Plant

Term	Definition
ZoI	Zone of Influence

3 EIA Methodology

3.1 Introduction

3.1.1 This chapter sets out the approach that has been taken to prepare the Environmental Impact Assessment Report (EIAR) for the Dublin Array Offshore Wind Farm (Dublin Array), on behalf of the Applicant. Specifically, this chapter describes the methodology that has been used to identify, describe and assess in an appropriate manner, in the light of each individual case, the direct and indirect significant effects of the Dublin Array project on relevant environmental factors. Each chapter of the EIAR sets out the precise topic specific methodology used to prepare that individual chapter, including the desk-based and site-specific surveys used to identify the baseline, relevant topic-specific guidance, supporting information and resources, and other information relevant to the methodology of the assessment of that topic within the EIAR.

3.2 EIA legislation and guidance

Legislation

3.2.1 This EIAR has been prepared in compliance with:

- The EIA Directive 2011/92/EU as revised by Directive 2014/52/EU ('the EIA Directive');
- The Planning and Development Act 2000, as amended ('Planning Acts');
- The Planning and Development Regulations 20011, as amended, ('Planning Regulations'); and
- The Maritime Area Planning Act 2021, as amended ('MAP Act').

3.2.1 A detailed description of the relevant development consent legislative framework is set out in Volume 2, Chapter 2: Consents, Legislation, Policy and Guidance, together with a description of the overarching legislative and policy framework for the proposed Dublin Array. Topic-specific legislation and policy relevant to individual chapters of the EIAR is set out at the start of each chapter.

Guidance

3.2.2 Guidance relevant to the methodology for EIA and the preparation of an EIAR includes:

- Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (EPA Guidelines, 2022);

- European Commission Environmental Impact Assessment of Projects: Guidance on the preparation of the Environmental Impact Assessment Report (European Commission Guidance, 2017);
- European Commission: Directorate-General for Environment, Interpretation of definitions of project categories of annex I and II of the EIA Directive, Publications Office of the European Union, 2024 (CJEU Rulings, 2024);
- Guidance on Environmental Impact Statement (EIS) and Natura Impact Statement (NIS) Preparation for Offshore Renewable Energy Projects (Environmental Working Group of the Offshore Renewable Energy Steering Group and the Department of Communications, Climate Action and Environment, 2017) (hereafter referred to as the DCCAE Guidance);
- Guidance on Marine Baseline Ecological Assessments and Monitoring Activities for Offshore Renewable Energy Projects Part 1 and 2 (DCCAE, 2018);
- Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment, August 2018 (DHPLG, 2018);
- European Commission Guidance on streamlining environmental assessments conducted under Article 2(3) of the EIA Directive (EC, 2016); and
- European Commission Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment (EC, 2013).

3.2.3 In addition to these overarching documents, each environmental aspect[1] is assessed in accordance with specific EU and Irish guidance and best practice for the environmental aspect. Where relevant, guidance from other jurisdictions with established offshore renewable energy sectors is referred to, particularly jurisdictions from which relevant environmental monitoring data is available. Specific guidelines of relevance to each technical discipline are detailed in the EIAR assessment chapters in Volumes 2-6.

1 Annex IIA of the amended EIA Directive specifies that the Developer must provide a description of the aspects of the environment likely to be significantly affected by the project.

3.3 EIA process

3.3.1 Environmental Impact Assessment is defined by Article 1 of the EIA Directive as a process consisting of:

- The preparation of an EIAR by the developer;
- The carrying out of consultations, including transboundary consultations where required;
- The examination by the competent authority of the information presented in the EIAR and any supplementary information provided, where necessary, by the developer, and any relevant information received through the consultations;
- The reasoned conclusion by the competent authority on the significant effects of the project on the environment, taking into account the results of the examination of the information referred to in the previous point, and where appropriate its own supplementary examination; and
- The integration of the competent authority's reasoned conclusion into the development consent decision.

3.3.2 The EPA Guidelines (2022) summarises the EIA process as:

'The process of examining the anticipated environmental effects of proposed project – from consideration of environmental aspects at design stage, through consultation and preparation of an Environmental Impact Assessment Report (EIAR), evaluation of the EIAR by a competent authority, the subsequent decision as to whether the project should be permitted to proceed, encompassing public response to that decision.'

3.3.3 The stages of the EIA process and the preparation of the EIAR are depicted in Figure 1.

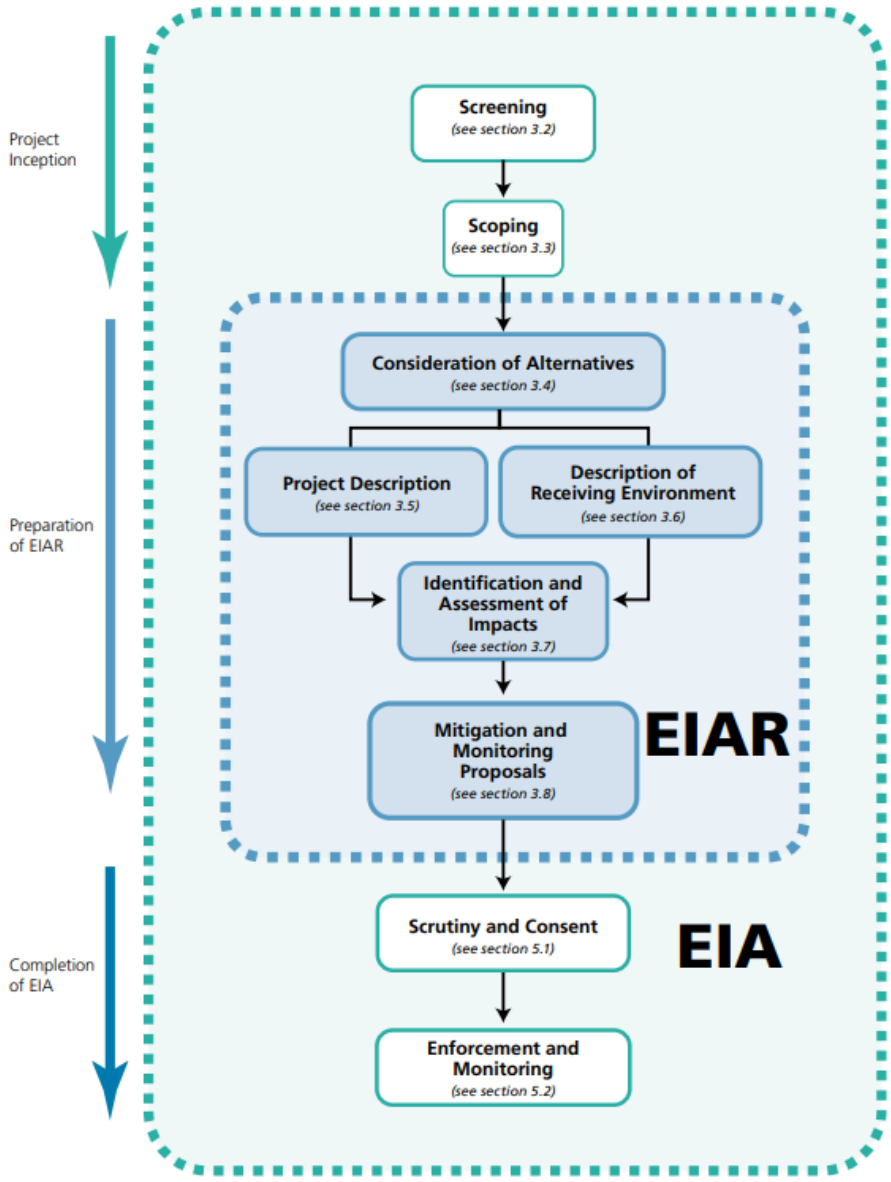


Figure 1 The EIA process (EPA, 2022)[2]

2 Source: Adapted from Guidelines on the Information to be contained in Environmental Impact Assessment reports (Environmental Protection Agency, 2022)

EIA screening

3.3.4 As noted in Volume 2, Chapter 2: Consents, Legislation, Policy and Guidance, Section 172 and section 317 of the Planning Act sets out the requirement for an EIA to be carried out by An Bord Pleanála before any decision to grant planning permission under section 293 of the Planning Act. The proposed Dublin Array is above the statutory threshold for which an EIA is mandatory, as set out in Schedule 5, Part 2, Class 3(i) of the Planning Regulations. Consequently, there is no requirement for a formal screening for EIA to be undertaken.

EIA scoping

3.3.5 Article 5, paragraph 2 of the EIA Directive, sets out a process whereby a prospective developer can ask the competent authority for its opinion on the scope and level of detail required to be included in an EIAR, and where such scoping opinion is obtained from the competent authority, the EIAR shall be prepared in accordance with it. Scoping is not a mandatory requirement under the EIA Directive or under Irish law.

3.3.6 Scoping is defined in the EPA Guidelines (2022) as *'a process of deciding what information should be contained in an EIAR and what methods should be used to gather and assess that information*[3]*.'*

3.3.7 Scoping can be formal (statutory) or informal (non-statutory). The Dublin Array EIA Scoping Report[4] was made publicly available and issued to statutory consultees on 9th October 2020. This was done on an informal (non-statutory) basis. The scoping process identified sources or potential causes of potential environmental effects, the pathways by which the effects could happen, and the sensitive receptors which would likely be affected. It outlined the intended level of detail for the information to be provided in the EIAR, to ensure that the approach would be proportionate, concise and focussed on significant effects (in EIA terms)[5]. Responses to the scoping report received during the consultation are detailed within the assessment chapters of the EIAR in Volumes 3 and 5.

EIAR

3.3.8 Article 3, paragraph 1, and Annex IV of the EIA Directive require that the EIAR shall include a description of the likely significant effects on environmental factors, as outlined in Table 1. This is further set out in Article 94 of the Planning Regulations, and Schedule 6.

3 EPA Guidance (2022), section 3.3.1
4 https://dublinarray.com/wp-content/uploads/2020/10/Dublin-Array-EIAR-Scoping-Report-Part-1-of-2.pdf
5 Significant effects (in EIA terms) are defined within each technical topic chapter.

Table 1 The environmental factors to be included in the EIAR

EIA Directive – Environmental Factors	Where is this address in the EIAR
1(a): population and human health	Volume 3 (Offshore Infrastructure): ▪ Chapter 17: Socio-economics, Tourism, Recreation and Land Use Volume 5 (Onshore Infrastructure): ▪ Chapter 9: Human Health
1(b): biodiversity (for example fauna and flora), with particular attention to species and habitats protected under Directive 92/43/EEC and Directive 2009/147/EC	Volume 3 (Offshore Infrastructure): ▪ Chapter 3: Benthic Subtidal and Intertidal Ecology ▪ Chapter 4: Fish and Shellfish Ecology ▪ Chapter 5: Marine Mammals ▪ Chapter 6: Offshore and Intertidal Ornithology ▪ Chapter 7: Bats in the Offshore Environment ▪ Chapter 8: Nature Conservation Volume 5 (Onshore Infrastructure): ▪ Chapter 2: Biodiversity
1(c): land (for example land take), soil (for example organic matter, erosion, compaction, sealing), water (for example hydromorphological changes, quantity and quality), air and climate (for example greenhouse gas emissions, impacts relevant to adaptation)	Volume 3 (Offshore Infrastructure): ▪ Chapter 1: Marine Geology, Oceanography and Physical Processes ▪ Chapter 2: Marine Water and Sediment Quality ▪ Chapter 3: Benthic Subtidal and Intertidal Ecology ▪ Chapter 18: Climate Change Volume 5 (Onshore Infrastructure) ▪ Chapter 3: Land, Soils and Geology ▪ Chapter 4: Water (Hydrology, Hydrogeology, and Flood Risk) ▪ Chapter 5: Noise and Vibration ▪ Chapter 10: Air Quality
1(d): material assets, cultural heritage, including architectural and archaeological aspects, and the landscape	Volume 3 (Offshore Infrastructure): ▪ Chapter 10: Commercial Fisheries ▪ Chapter 11: Shipping and Navigation ▪ Chapter 12: Marine Infrastructure and Other Users ▪ Chapter 13: Aviation and Radar ▪ Chapter 14: Marine Archaeology ▪ Chapter 15: Cultural Heritage Settings Assessment (Terrestrial Archaeology and Monuments) ▪ Chapter 16: Seascape, Landscape and Visual Impact Assessment ▪ Chapter 20: P&M Base Offshore Assessment Volume 5 (Onshore Infrastructure) ▪ Chapter 7: Traffic and Transport ▪ Chapter 8: Landscape and Visual ▪ Chapter 9: Archaeology and Cultural Heritage ▪ Chapter 11: Material Assets
1(e): the interaction between the factors referred to in points (a) to (d)	Volume 8 (Interactions and Schedule of Commitments): ▪ Chapter 1: Interactions of the Environmental Factors
2: The effects referred to in paragraph 1 on the factors set out therein shall	Volume 3 (Offshore Infrastructure): ▪ Chapter 18: Climate change ▪ Chapter 19: Major Accidents and Disasters

EIA Directive – Environmental Factors	Where is this address in the EIAR
include the expected effects deriving from the vulnerability of the project to risks of major accidents and/or disasters that are relevant to the project concerned	

3.3.9 Article 5(1) and Annex IV of the EIA Directive set out the information that must be included in the EIAR, summarised in Table 2. This is further set out in Article 94 of the Planning Regulations, which provides that an EIAR shall include any information specified in Part 1 of Schedule 6, and in addition, the information specified in Part 2 of Schedule 6 that is relevant to the specific characteristics of the Dublin Array and developments of that type, and to the environmental features likely to be affected, and to the methods of assessment used in the EIA, by way of explanation or amplification of the information referred to in Part 1 of Schedule 6.

3.3.10 Table 2 both summarises the information to be contained in an EIAR and identifies where the corresponding information can be found in the EIA Report.

Table 2 Information to be included in an EIAR

EIA Directive Requirement (Article 5(1))	Where in the EIAR this can be found
a) description of the project comprising of information on the site, design, size and other relevant features of the project	Volume 2 (Introductory Chapters) ▪ Chapter 6: Project Description
(b) a description of the likely significant effects of the project on the environment	Volume 3 (Offshore Infrastructure Assessment Chapters) Volume 5 (Onshore Infrastructure Assessment Chapters)
(c) a description of the features of the project and/or measures envisaged in order to avoid, prevent, or reduce and, if possible, offset likely significant adverse effects on the environment	Volume 2 (Introductory Chapters) ▪ Chapter 6: Project Description Volume 3 (Offshore Infrastructure Assessment Chapters) Volume 5 (Onshore Infrastructure Assessment Chapters)
(d) a description of the reasonable alternatives studied by the developer, which are relevant to the project and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the project on the environmental	Volume 2 (Introductory Chapters) ▪ Chapter 5: Consideration of Alternatives
(e) a non-technical summary of the information referred to in points (a) to (d)	A Non-Technical Summary (NTS) is presented as Volume 1 of this EIAR.

EIA Directive Requirement (Article 5(1))	Where in the EIAR this can be found
(f) any additional information specific in Annex IV relevant to the specific characteristics of a particular project or type of project and to the environmental features likely to be affected	(See below)
Where a Scoping Opinion has been provided by the competent authority, the EIAR shall be based on that opinion, and include the information that may reasonably be required for reaching a reasoned conclusion on the significant effects of the project on the environment, taking into account current knowledge and methods of assessment.	A formal Scoping Opinion has not been obtained from An Bord Pleanála. An informal (non-statutory) Scoping Report and consultation with various statutory and non-statutory organisations and the public has informed the preparation of this EIAR.
The developer shall, with a view to avoiding duplication of assessments, take into account the available results of other relevant assessments under Union or national legislation, in preparing the environmental impact assessment report.	A Habitats Directive Assessment has been prepared and submitted as part of the planning application alongside this EIAR: Part 4 Habitats Directive Assessment. An Offshore Water Framework Directive Report is included in Volume 4, Appendix 3.2-1. An Onshore Water Framework Directive Report is included in Volume 6, Appendix 6.5.4-4.
EIA Directive Requirement (Annex IV)	**EIAR Section**
1. A description of the project, including in particular: (a) a description of the location of the project; (b) a description of the physical characteristics of the whole project, including, where relevant, requisite demolition works, and the land-use requirements during the construction and operational phases; (c) a description of the main characteristics of the operational phase of the project (in particular any production process), for instance, energy demand and energy used, nature and quantity of the materials and natural resources (including water, land, soil and biodiversity) used; (d) an estimate, by type and quantity, of expected residues and emissions (such as water, air, soil and subsoil pollution, noise, vibration, light, heat, radiation) and quantities and types of waste produced	a) The location of the project is detailed in the following project description chapters: Volume 2 (Introductory Chapters): ▪ Chapter 6: Project Description b) The physical characteristics of the whole project during construction, operation and demolition are also detailed in the Volume 2, Chapter 6: Project Description. c) The main characteristics of the operations phase is included in Volume 2, Chapter 6: Project Description. d) Volume 3 (Offshore Infrastructure) ▪ Chapter 1: Marine Geology, Oceanography and Physical Processes; ▪ Chapter 2: Marine Water and Sediment Quality; ▪ Chapter 3: Benthic Subtidal and Intertidal Ecology; ▪ Chapter 4: Fish and Shellfish Ecology; ▪ Chapter 5: Marine Mammals; ▪ Chapter 6: Offshore and Intertidal Ornithology; ▪ Chapter 7: Bats in the Offshore Environment; ▪ Chapter 8: Nature Conservation;

EIA Directive Requirement (Article 5(1))	Where in the EIAR this can be found
during the construction and operation phases.	▪ Chapter 9: Commercial Fisheries; ▪ Chapter 10: Shipping and Navigation; ▪ Chapter 11: Infrastructure and Other Users; ▪ Chapter 12: Aviation and Radar; ▪ Chapter 13: Marine Archaeology; ▪ Chapter 14: Cultural Heritage Settings Assessment (Terrestrial Archaeology and Monuments); ▪ Chapter 15: Seascape, Landscape and Visual Impact Assessment; ▪ Chapter 16: Noise and Vibration (Terrestrial receptor); ▪ Chapter 17: Socio-economic, Tourism, Recreation and Land Use; ▪ Chapter 18: Climate Change; ▪ Chapter 19: Major Accidents and Disasters; ▪ Chapter 20: Offshore Assessment – Operations and Maintenance Base. ▪ Volume 5 (Onshore Infrastructure) ▪ Chapter 1: Introduction; ▪ Chapter 2: Biodiversity; ▪ Chapter 3: Land, Soils and Geology; ▪ Chapter 4: Water (Hydrology, hydrogeology and Flood Risk); ▪ Chapter 5: Noise and Vibration; ▪ Chapter 6: Traffic and Transport; ▪ Chapter 7: Landscape and Visual; ▪ Chapter 8: Archaeology and Cultural Heritage; ▪ Chapter 9: Human Health; ▪ Chapter 10: Air Quality; ▪ Chapter 11: Material Assets.
2. A description of the reasonable alternatives (for example in terms of project design, technology, location, size and scale) studied by the developer, which are relevant to the proposed project and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects.	Volume 2 (Introductory Chapters) ▪ Chapter 5: Consideration of Alternatives.
3. A description of the relevant aspects of the current state of the environment (baseline scenario) and an outline of the likely evolution thereof without implementation of the project as far as natural changes from the baseline scenario can be assessed with reasonable effort on the basis of the availability of environmental information and scientific knowledge.	Each technical topic chapter in Volumes 3 to 6 provides a description of the receiving environment. A subsection titled 'Future receiving environment' describes the likely evolution without implementation of the Project.

EIA Directive Requirement (Article 5(1))	Where in the EIAR this can be found
4. A description of the factors specified in Article 3(1) likely to be significantly affected by the project: population, human health, biodiversity (for example fauna and flora), land (for example land take), soil (for example organic matter, erosion, compaction, sealing), water (for example hydromorphological changes, quantity and quality), air, climate (for example greenhouse gas emissions, impacts relevant to adaptation), material assets, cultural heritage, including architectural and archaeological aspects, and landscape.	See Table 1 earlier in this chapter.
5. A description of the likely significant effects of the project on the environment resulting from, inter alia: (a) the construction and existence of the project, including, where relevant, demolition works; (b) the use of natural resources, in particular land, soil, water and biodiversity, considering as far as possible the sustainable availability of these resources; (c) the emission of pollutants, noise, vibration, light, heat and radiation, the creation of nuisances, and the disposal and recovery of waste; (d) the risks to human health, cultural heritage or the environment (for example due to accidents or disasters); (e) the cumulation of effects with other existing and/or approved projects, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources; (f) the impact of the project on climate (for example the nature and magnitude of greenhouse gas emissions) and the vulnerability of the project to climate change; (g) the technologies and the substances used. The description of the likely significant effects on the factors specified in Article 3(1) should cover the direct effects and any	▪ Volume 3 (Offshore Infrastructure): ▪ Chapter 1: Marine Geology, Oceanography and Physical Processes; ▪ Chapter 2: Marine Water and Sediment Quality; ▪ Chapter 3: Benthic Subtidal and Intertidal Ecology; ▪ Chapter 4: Fish and Shellfish Ecology; ▪ Chapter 5: Marine Mammals; ▪ Chapter 6: Offshore and Intertidal Ornithology; ▪ Chapter 7: Bats in the Offshore Environment; ▪ Chapter 8: Nature Conservation; ▪ Chapter 9: Commercial Fisheries; ▪ Chapter 10: Shipping and Navigation; ▪ Chapter 11: Marine Infrastructure and Other Users; ▪ Chapter 12: Aviation and Radar; ▪ Chapter 13: Marine Archaeology; ▪ Chapter 14: Cultural Heritage Settings Assessment (Terrestrial Archaeology and Monuments); ▪ Chapter 15: Seascape, Landscape and Visual Impact Assessment; ▪ Chapter 16: Noise and Vibration (Terrestrial Receptors); ▪ Chapter 17: Socio-economic, Tourism, Recreation and Land Use; ▪ Chapter 18: Climate Change; ▪ Chapter 19: Major Accidents and Disasters; ▪ Chapter 20: Offshore Assessment – Operations and Maintenance Base. ▪ Volume 5 (Onshore Infrastructure) ▪ Chapter 1: Introduction; ▪ Chapter 2: Biodiversity; ▪ Chapter 3: Land, Soils and Geology; ▪ Chapter 4: Water (Hydrology, hydrogeology and Flood Risk); ▪ Chapter 5: Noise and Vibration; ▪ Chapter 6: Traffic and Transport;

EIA Directive Requirement (Article 5(1))	Where in the EIAR this can be found
indirect, secondary, cumulative, transboundary, short-term, medium-term and long-term, permanent and temporary, positive and negative effects of the project. This description should take into account the environmental protection objectives established at Union or Member State level which are relevant to the project.	▪ Chapter 7: Landscape and Visual; ▪ Chapter 8: Archaeology and Cultural Heritage; ▪ Chapter 9: Human Health; ▪ Chapter 10: Air Quality; ▪ Chapter 11: Material Assets.
6. A description of the forecasting methods or evidence, used to identify and assess significant effects on the environment, including details of difficulties (for example technical deficiencies or lack of knowledge) encountered compiling the required information and the main uncertainties involved.	The assessment chapters provide details on the methodologies used to collect baseline data and undertake the assessment. Difficulties encountered and/or limitations of the assessment are described within each technical topic chapter of the EIAR, under the subheading 'Technical Difficulties Encountered'.
7. A description of the measures envisaged to avoid, prevent, reduce or, if possible, offset any identified significant adverse effects on the environment and, where appropriate, of any proposed monitoring arrangements (for example the preparation of a post-project analysis). That description should explain the extent to which significant adverse effects on the environment are avoided, prevented, reduced or offset, and should cover both the construction and operational phases.	A description of the measures envisaged to avoid, prevent, reduce or, if possible, offset any identified significant adverse effects on the environment is described in the assessment chapters in the following volumes: Volume 3 (Offshore Infrastructure) ▪ Chapter 1: Marine Geology, Oceanography and Physical Processes; ▪ Chapter 2: Marine Water and Sediment Quality; ▪ Chapter 3: Benthic Subtidal and Intertidal Ecology; ▪ Chapter 4: Fish and Shellfish Ecology; ▪ Chapter 5: Marine Mammals; ▪ Chapter 6: Offshore and Intertidal Ornithology; ▪ Chapter 7: Bats in the Offshore Environment; ▪ Chapter 8: Nature Conservation; ▪ Chapter 9: Commercial Fisheries; ▪ Chapter 10: Shipping and Navigation; ▪ Chapter 11: Marine Infrastructure and Other Users; ▪ Chapter 12: Aviation and Radar; ▪ Chapter 13: Marine Archaeology; ▪ Chapter 14: Cultural Heritage Settings Assessment (Terrestrial Archaeology and Monuments); ▪ Chapter 15: Seascape, Landscape and Visual Impact Assessment; ▪ Chapter 16: Noise and Vibration (Terrestrial Receptors); ▪ Chapter 17: Socio-economic, Tourism, Recreation and Land Use; ▪ Chapter 18: Climate Change ▪ Chapter 19: Major Accidents and Disasters

EIA Directive Requirement (Article 5(1))	Where in the EIAR this can be found
	▪ Chapter 20: Offshore Assessment – Operations and Maintenance Base Volume 5 (Onshore Infrastructure) ▪ Chapter 1: Introduction ▪ Chapter 2: Biodiversity ▪ Chapter 3: Land, Soils and Geology ▪ Chapter 4: Water (Hydrology, hydrogeology and Flood Risk) ▪ Chapter 5: Noise and Vibration ▪ Chapter 6: Traffic and Transport ▪ Chapter 7: Landscape and Visual ▪ Chapter 8: Archaeology and Cultural Heritage ▪ Chapter 9: Human Health ▪ Chapter 10: Air Quality ▪ Chapter 11: Material Assets
8. A description of the expected significant adverse effects of the project on the environment deriving from the vulnerability of the project to risks of major accidents and/or disasters which are relevant to the project concerned. Relevant information available and obtained through risk assessments pursuant to Union legislation such as Directive 2012/18/EU of the European Parliament and of the Council or Council Directive 2009/71/Euratom or relevant assessments carried out pursuant to national legislation may be used for this purpose provided that the requirements of this Directive are met. Where appropriate, this description should include measures envisaged to prevent or mitigate the significant adverse effects of such events on the environment and details of the preparedness for and proposed response to such emergencies.	Volume 3 (Offshore Infrastructure): ▪ Chapter 19: Major Accidents and Disasters
9. A non-technical summary of the information provided under points 1 to 8.	A NTS is presented as Volume 1 of this EIAR.
10. A reference list detailing the sources used for the descriptions and assessments included in the report.	A reference list is included in all technical chapters in Volume 3 (Offshore Infrastructure) and Volume 5 (Onshore Infrastructure).

3.4 Assessment methodology

Introduction

3.4.1 The EIAR presents the assessment of the predicted environmental impacts arising from Dublin Array, with each environmental topic (e.g. Volume 3, Chapter 1: Marine Geology, Oceanography and Physical Processes) presented in a separate topic specific chapter.

3.4.2 In each environmental topic chapter, and as discussed more fully below, the following matters have been considered:

- Regulatory background: provides a summary of the relevant topic-specific legislation and policy that has been taken into account in assessing each individual topic (by way of addition to Volume 2, Chapter 2: Consents, Legislation, Policy and Guidance);
- Consultation: Provides a summary of the relevant topic-specific consultation responses received to date from statutory and non-statutory consultees;
- Methodology: Provides detail confirming the extent of the study area selected for that topic, describing the baseline data sources and survey methodologies, and the topic-specific detail on the approach to assessment;
- Assessment criteria: Outlines the criteria for assigning the sensitivity of receptor, magnitude of impact, and the matrix for defining the subsequent significance of effects, following as closely as possible the EPA Guidelines (2022);
- Receiving environment: Provides a description of the existing environmental baseline condition, drawing on the relevant data sources, including the available results of other relevant assessments under European and Irish legislation, as well as a description of the anticipated evolution of the baseline over the lifetime of the project;
- Uncertainties and technical difficulties: Provides a description of main assumptions and limitations and the methodology taken to reduce the uncertainties and associated risks, applying the precautionary principle;
- Scope of the assessment: Defines the scope of the assessment, including a list of impacts scoped into and out of the assessment;
- Key parameters for assessment: Provides a description and justification of the project design parameters assessed for each topic, the Maximum Design Option (MDO), Alternative Design Options (ADO's) (see Approach to impact assessment: Maximum and alternative design options, and key project design parameters);

- Project Design Features: Provides detail on any features of the Dublin Array project which have been selected as part of the iterative design process and which are demonstrated to avoid and prevent significant adverse effects on the environment, of relevance to the topic-specific chapter;
- Environmental assessment: Presents an assessment of the significance of any identified effects (during construction, operation and maintenance, and decommissioning), taking account of the magnitude of impacts, sensitivity of receptors, the effectiveness of project design features in avoiding and preventing significant adverse effects, identification of any measures proposed as part of the application for permission to further reduce environmental effects, and an assessment of the confidence in the conclusions of that assessment. This includes an assessment of direct and indirect effects, and an assessment of cumulative effects with other plans and projects;
- Interactions of the environmental factors: Provides a holistic understanding of the project's potential impacts by considering and assessing the impact of the inter-relationships between environmental factors on the same receptor; and
- Summary of effects: A summary of impacts, mitigation measures, residual effects, and where appropriate any proposed monitoring arrangements; and
- The reference list in each chapter lists the sources used for the assessment.

Evidence based approach

3.4.3 The evidence-based approach to EIA involves not only utilising data collected specifically for the purposes of the design of the Dublin Array and the preparation of this EIAR, but also data and information from other relevant studies to inform the understanding of the baseline and/or impact assessments for the development that is the subject of the EIA.

3.4.4 Environmental information has been collected from publicly available data sources such as those available from state agencies, published literature, data archives, online repositories, supplemented with information agreed with relevant consultees where possible.

3.4.5 The data collection methodologies followed are based on established good practice and specialist professional judgement. Baseline surveys have been undertaken to fill gaps in the available data, for example data already gathered from desk-based and field surveys already completed. Any difficulties due to technical deficiencies or lack of knowledge have been identified. All methodologies for data analysis and survey have been recorded to ensure that they are replicable. Each topic chapter identifies the source of all data used for the characterisation of the receiving environment and impact assessment.

Receiving environment

3.4.6 In accordance with the EIA Directive, the Planning Regulations and Section 3.6 of the EPA Guidelines (2022), a description of the existing receiving environment is provided in each topic chapter of the EIAR in sufficient detail to accurately and reliably characterise the baseline for the purposes of EIA. The description provides a reference against which the effects can be assessed (see Section 3.6). A study area is defined within each individual chapter, which is informed by (but broader than) the defined 'Zone of Influence' (ZoI) of the Project, as relevant/appropriate for that topic/receptor. The study area and ZoI differ between topics depending upon the pressure or ecosystem component under consideration.

3.4.7 Section 3.6 of the EPA Guidelines (2022) states the importance of also describing the likely future receiving environment given the proposed operational life of the project. Where aspects of the baseline are anticipated to change, either through natural changes (such as seasons or climate change) or proposed plans or projects being constructed or delivered, these changes have been considered in the impact assessment – particularly for operation effects and the cumulative assessments.

Pre-application consultation with An Bord Pleanála

3.4.8 Pre-application consultation with An Bord Pleanála was undertaken in accordance with section 287 of the Planning and Development Act, 2000 as amended. The statutory basis for this and the relevance of pre-application consultation to the EIA process is described more fully in Volume 2, Chapter 2: Consents, Legislation, Policy and Guidance.

Key project design parameters

3.4.1 Key design parameters represent different (a) construction methodologies and (b) geographic footprints that may be adopted by the project for the onshore infrastructure. They are fully described within the Project Description chapter.

3.4.2 For the purpose of environmental assessment, the design parameters that could give rise to the maximum potential adverse impact are listed and described in each onshore technical topic chapter. As the key design parameter represents the greatest potential for change to the respective receptor or receptor group, confidence can be held that development of any alternative construction methodology scenarios will give rise to no worse effects than assessed in this EIAR.

3.4.3 Flexibility it being sought where details or groups of details related to the offshore infrastructure may not be confirmed at the time of the Planning Application. To ensure a robust and transparent assessment, and one that is compliant with the ABP Opinion on Flexibility under Section 287B, the details or groups of details associated with those components where flexibility is being sought are defined in the form of a Maximum Design Option (MDO) and alternative design option(s).

Design flexibility

3.4.9 In accordance with section 287A of the Planning and Development Act, the Applicant requested a meeting with An Bord Pleanála on the details of the proposed development that would be unconfirmed in the application for permission under section 291 of the Planning and Development Act, 2000 as amended.

3.4.10 The Opinion of An Bord Pleanála under section 287B of the Planning and Development Act, 2000 as amended is included in Part 1A Planning Particulars, Schedule 10 of the planning application.

Table 3 Summary of Design Flexibility Opinion

Primary requirement	Associated requirement
Wind Turbine Generator (model)	Number of turbines Maximum rotor diameter Minimum rotor diameter Maximum blade tip height Lower blade tip height
Offshore Substation Platform	Height (m above LAT) Width Length
Array Layout (wind turbine generators and offshore substation platform)	Layout Options Locational Limits of Deviation
Foundation Type and Dimensions (wind turbine generator and offshore substation platform)	Foundation types and dimensions Foundation Scour Protection techniques
Offshore Cables (inter-array and export cables)	Length and layout Locational Limits of Deviation

Approach to impact assessment: Maximum and alternative design options, and key project design parameters

3.4.11 As set out in the An Bord Pleanála Opinion under section 287B(2) of the Planning Act, the Board determined that due to the specific circumstances of the development, it is satisfied that the proposed application can be made before certain details of the application are confirmed. For each detail or groups of details referred to in the Opinion in addition to any other requirement imposed by or under the Planning and Development Act, 2000, as amended, be accompanied by the information referred to in the undertaking submitted with the flexibility meeting requested under section 287(2)(f) of the Planning and Development Act, 2000, as amended. which these details will fall, allowing the planning decision to be made.

3.4.12 Under section 293(4) of the Planning Act, An Bord Pleanála may attach such conditions to the permission as it considers appropriate. Furthermore, under section 293(4A), An Bord Pleanála must attach one or more conditions relating to the Opinion provided under section 287B. These conditions require the final details of the development remain within the options and parameters specified in the application, ensuring consistency with the Opinion provided. Furthermore, the developer must notify An Bord Pleanála of these details prior to the commencement of the development or the specific part of the development to which the detail apply.

3.4.13 In addition, Article 15J(8) of the Planning Regulations states that the developer must provide this notification in writing no later than two weeks before starting the relevant part of the development to which the conditions under section 294(4A) of the Planning Act apply. The application for permission under section 291 of the Planning Act is consistent with An Bord Pleanála's Opinion (see Volume 2, Chapter 6: Project Description).

3.4.14 To ensure a robust, coherent, and transparent assessment of the proposed Dublin Array project for which development consent is being sought under section 291 of the Planning Act, the Applicant has identified and defined a Maximum Design Option (MDO) and Alternative Design Option(s) (ADO) for each environmental topic/receptor. The MDO and ADO have been assessed in the EIAR to determine the full range and magnitude of effects, providing certainty that any option within the specified parameters will not give rise to environmental effects more significant than those associated with the MDO. The extent of significant effects is therefore defined and certain, notwithstanding that not all details of the proposed development are confirmed in the application.

3.4.15 The range of parameters relating to the infrastructure and technology design allow for a range of options in terms of construction methods and practices, which are fully assessed in the EIAR. These options are described in the project description and are detailed in the MDO and ADO tables within each offshore chapter of the EIAR. This ensures that all aspects of the proposed Dublin Array project are appropriately identified, described and comprehensively environmentally assessed.

3.4.16 As noted in Volume 2, Chapter 2: Consents, Legislation, Policy and Guidance, An Bord Pleanála has broad powers to attach planning conditions to any grant of permission. It may require developers to agree on matters of detail with the coastal planning authority (for matters in the nearshore) or with both An Bord Pleanála and the coastal planning authority (for matters in the outer maritime area) prior to commencing relevant parts of the development.

3.4.17 For construction methods and practices that depend on post-permission decisions (e.g. protection for offshore cables or cable crossing designs) parameters relevant to each environmental receptor are identified, quantified, and assessed as MDO and ADO. For details where no flexibility is being sought (e.g. cable installation at the landfall) the MDO and ADO are the same (as there is no alternative). Each technical assessment chapter of the EIAR includes a table explaining and justifying the selection of the MDO and ADO (within the offshore assessments) or the key project design parameters (within the onshore assessments).

3.4.18 The assessment of the MDO (offshore), and key project design measures (onshore), ensures that the option/design parameters with the greatest potential impact on the relevant environmental receptor (e.g. largest footprint, longest exposure, greatest pressure, or largest dimensions) is considered. Where necessary, the ADO in offshore chapters is supported by appendices defining these parameters (e.g. widths/lengths/areas) and/or providing assessments of different options (e.g. alternative turbine sizes/numbers, as discussed in the SLVIA or Ornithology chapters).

Project design features and other avoidance and preventative measures

3.4.19 Under Article 5(1)(c) of the EIA Directive, the EIAR shall include *'a description of the features of the project and/or measures envisaged in order to avoid, prevent or reduce and, if possible, offset likely significant adverse effects on the environment'. Annex IV of the EIA Directive specifies that the EIAR should, where relevant, include*

'7. A description of the measures envisaged to avoid, prevent, reduce or, if possible, offset any identified significant adverse effects on the environment and, where appropriate, of any proposed monitoring arrangements (for example the preparation of a

post-project analysis). That description should explain the extent, to which significant adverse effects on the environment are avoided, prevented, reduced or offset, and should cover both the construction and operational phases.'

3.4.20 Article 8a of the EIA Directive requires that a decision to grant permission shall incorporate certain specified information, including any environmental conditions attached to the decision, a description of any features of the project and/or measures envisaged to avoid, prevent or reduce and, if possible, offset significant adverse effects on the environment as well as, where appropriate, monitoring measures. Furthermore, under Article 8a of the EIA Directive, the State must ensure that the features of the project and/or measures envisaged to avoid, prevent or reduce and, if possible, offset significant adverse effects on the environment are implemented by the Applicant, and shall determine the procedures regarding the monitoring of significant adverse effects on the environment.

3.4.21 Box 34 of the European Commission Guidance, 2017, describes: measures to prevent; measures to reduce; and measures to offset (Figure 2).

Box 34: Types of Mitigation Measures	
Type of measure	**How it works**
Measures to prevent	Impact avoidance by: ■ Changing means or techniques, not undertaking certain Projects or components that could result in adverse impacts. ■ Changing the site, avoiding areas that are environmentally sensitive. ■ Putting in place preventative measures to stop adverse effects from occurring.
Measures to reduce	Impact minimisation by: ■ Scaling down or relocating the Project. ■ Redesign elements of the Project. ■ Using a different technology. ■ Taking supplementary measures to reduce the impacts either at the source or at the receptor (such as noise barriers, waste gas treatment, type of road surface).
Measures to offset	Offset or compensate for residual adverse impacts that cannot be avoided or further reduced in one area with improvements elsewhere with: ■ Site remediation / rehabilitation / restoration. ■ Resettlement. ■ Monetary compensation.

Figure 2 Types of Mitigation Measures, taken from Environmental Impact Assessment of Projects: Guidance on the preparation of the Environmental Impact Assessment Report (European Commission Guidance, 2017)

3.4.22 The EPA Guidelines (2022) describes: Mitigation by Avoidance; Mitigation by Prevention; Mitigation by Reduction; and Offsetting (which may be viewed as compensatory measures as opposed to mitigation). This EIAR follows the EPA Guidelines (2022) where possible.

3.4.23 In accordance with the EPA Guidelines (2022), this EIAR describes the measures in the following structure:

- A: Project Design Features. These are measures that were identified throughout design iteration and incorporated into the design to avoid and prevent likely significant effects;
- B: Other Avoidance and Preventative Measures. These are measures that were identified throughout the early development phase of the project, also to avoid and prevent likely significant effects, which go beyond design features. These measures were incorporated in as constituent elements of the project, they are referenced in the project description chapter of this EIAR, and they form part of the project for which development consent is being sought. These measures are distinct from design features and are found within our suite of management plans; and

- C: Additional Mitigation. These are measures that were identified after the assessment of likely significant effects within each chapter of the EIAR, which are specifically introduced to mitigate against the any identified significant adverse effects on the environment. Where appropriate, monitoring arrangements will be proposed for this additional mitigation.

3.4.4 Each of the three categories are described in more detail below.

3.4.24 Insofar as 'Project Design Features' are concerned, the EPA Guidelines (2022) state:

'Throughout the EIA process, anticipation of effects is the most effective means of avoiding significant adverse effects. Anticipation works best when applied in the earliest stages of a project. This involves forming preliminary opinions, usually in the absence of complete data on the approximate magnitude, character, duration and significance of the likely effects. Relevant experience and expertise are particularly helpful for early anticipation of effects. The use of relevant guidance material, such as the material provided in these Guidelines and in the accompanying Advice Notes, can also be helpful for this early anticipation of effects. Then, once effects are anticipated, potential ways to avoid them are explored. Preliminary opinions are shared as early as possible with the developer and the design team to help them to modify proposals so that significant adverse effects are avoided or minimised. Effect avoidance is principally achieved by consideration of alternatives. Where significant adverse effects are identified then alternative options are identified and evaluated. The objective is to adopt the combination of options that presents the best balance between avoidance of significant adverse environmental effects and achievement of the objectives that drive the project. Alternatives may be identified at many levels and stages during the evolution of a project, from project concepts and site locations, through site layouts, technologies or operational plans and on to mitigation and any monitoring measures. Alternatives that are available for consideration at the earlier stages in the evolution of a project often represent the greatest potential for avoidance of significant adverse effects.'

3.4.25 Insofar as 'Other Avoidance and Preventative Measures' are concerned, the EPA Guidelines (2022) state:

'*Avoidance, usually referring to strategic issues – such as site selection, site configuration or selection of process technology – is generally the fastest, cheapest and most effective form of effect mitigation. Environmental effects and the consideration of alternatives need to be taken into account at the earliest stage in the site/route selection and project design processes. For example, the realignment of a transport corridor to avoid residential property, avoid habitat destruction or to reduce agriculture severance, etc. In many situations, mitigation by avoidance may be viewed as part of the 'consideration of alternatives'.'*

3.4.26 With respect to 'Additional Mitigation':

'This usually refers to technical measures. Where a potential exists for unacceptable significant effects to occur (such as noise or emissions) then measures are put in place to limit the source

of effects to a permissible and acceptable level. Examples include the specification of process technology standards or building design to minimise height or contrasts of materials. Prevention measures are also put in place to prevent the effects of accidental events from giving rise to significant adverse effects. The installation of a fire-water retention basin is an example of mitigation against such risk by prevention.'

3.4.27 As noted in the EPA Guidelines (2022), project design is an iterative process which begins long before the preparation of the EIAR, and which incorporates environmental considerations at an early stage. Baseline information and surveys inform decisions which lead to the potential for significant adverse effects to be avoided. The preparation of the EIAR is itself an iterative process which continues to inform project design (as shown in Figure 1).

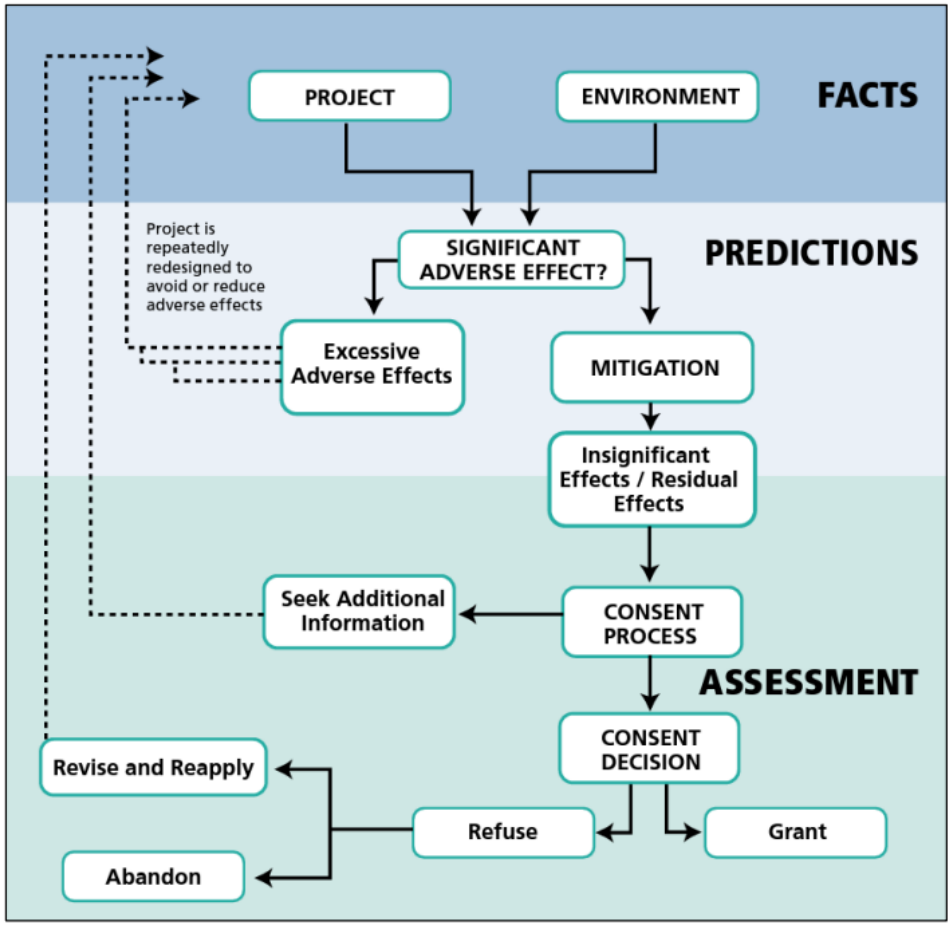
3.4.28 Where the preliminary assessments identify avoidable or unacceptable likely significant effects, changes to the design features are made and/or other measures are incorporated to avoid or prevent such effects. This iterative process is repeated until:

- The effect has been reduced to a level that is not significant in EIA terms; or
- No further changes may reasonably be made to the development parameters in order to reduce the magnitude of the impact, thereby permitting the presentation of an effect that is still significant in EIA terms.

3.4.29 Each chapter of the EIAR identifies relevant Project Design Features and Other Avoidance and Preventative measures which have been selected as part of the iterative design process and early development phase of the project, including through the consideration of alternatives. These are all demonstrated to avoid or prevent significant adverse effects on the environmental factor or receptor being assessed in that chapter. The implementation of these measures is assured by reason of being part of the overall proposed Dublin Array project for which development consent is sought under section 291 of the Planning Act. An example of such avoidance and preventative measures includes measures to comply with regulations made under the Sea Pollution Acts (implementing MARPOL), which are generally applicable binding rules demonstrated to avoid polluting matter being discharged or entering into marine waters.

3.4.30 It should be noted that the iterative design and assessment process is likely to continue throughout the planning process, as features and measures continue to be considered and refined, up to the point at which An Bord Pleanála makes a reasoned decision on the application and determines what planning conditions (if any) to attach.

3.4.31 Where adverse effects on the relevant environmental receptor cannot be avoided or prevented, notwithstanding the iterative process (as described in the EPA Guidelines (2022)), additional mitigation to reduce the effects, or the exposure of the relevant environmental receptor to the effects, are considered. This is the third category of measure considered within this EIAR (see Additional Mitigation).



Source: Guidelines on information to be included in the Environmental Impact Assessment Report (EPA, 2022)

Figure 3 Key stages in the preparation of an EIAR and the EIA process (EPA Guidelines, 2022)

3.5 Identification of impacts and significance of effect

3.5.1 Dublin Array has the potential to create a range of impacts and effects on the physical, biological, and human environment, affecting both onshore, coastal, and marine receptors. The term 'impact' refers to a change caused by an action, whereas the term 'effect' describes the consequence of the impact. For example, the installation of offshore wind turbine generators may result in increased underwater noise levels, which is an impact. This then has the potential to disrupt the communication, navigation and feeding behaviours of marine mammals (the effect). Impacts can be classified as direct, indirect, secondary, cumulative and interactive. They can be beneficial, neutral or adverse, as defined in Table 4.

3.5.2 The broader legal and policy context in which impacts occur is discussed in detail in Volume 2, Chapter 2: Consents, Legislation, Policy and Guidance, particularly with respect to the interconnection between climate change, pollution, and biodiversity loss, and the solutions to address that trio of challenges.

3.5.3 For the proposed components of the project that are planned to be carried out onshore and at the landfall site, including the landfall works and onshore electrical system, the assessment of significant environmental effects has been conducted in accordance with Section 3.7 of the EPA Guidelines (2022).

3.5.4 For the assessment of the details of the proposed project which are the subject of the Design Flexibility Opinion, the assessment of significant environmental effects has been conducted in the following manner, based on an adaptation of the EPA Guidelines (2022).

Step 1 definition of options and project parameters

3.5.5 A definition of the specific characteristics of the proposed development, the location, technical capacity and design details, is provided, enabling an assessment of the likely environmental impact. This aligns with the requirements of Schedule 6 of the Planning Regulations and the EPA (2022) Guidelines, ensuring that the EIAR includes all necessary information to allow for a robust evaluation of the proposed development.

3.5.6 As detailed in the approach to impact assessment, for details or groups of details that remain unconfirmed at the time of application, a description of the options and their associated parameters has been provided (Table 3). These options are defined within a range of scale and locational limits, ensuring that the development complies with the parameters set out in the Flexibility Opinion and remains consistent with the legal and regulatory framework. Confirmed details and a range of normal construction practices are also described in detail, providing a comprehensive baseline for assessment.

3.5.7 The assessment adopts a proportionate and precautionary approach, as recommended in Chapter 4 of the EPA 2022 Guidelines, by considering a MDO and, where relevant, ADO, for each environmental receptor. This ensures that the environmental effects of the project are fully assessed, even under worst-case conditions, providing certainty that no impacts beyond those identified will arise.

3.5.8 The project design parameters used in the assessment are defined within the onshore assessment chapters, where no flexibility is being sought on the project design. The key design parameters have been selected as those having the potential to result in the greatest effect on an identified receptor or receptor group. As the key design parameters are the parameters with the greatest potential for change to the relevant receptor or receptor group, confidence can be held that development of any construction methodology options will give rise to no worse effects than assessed in this impact assessment.

Step 2 identification of impacts sources, pathways and receptors

3.5.9 The options and design parameters proposed for Dublin Array were systematically assessed by each technical specialist in the EIA team to identify potential sources of environmental impacts which may give rise to significant effects. This approach aligns with the requirements of Article 3(1) of the EIA Directive, which mandates the identification, description, and assessment of the direct and indirect significant effects of a project on factors such as population and human health, biodiversity, land, soil, water, air, climate, material assets, cultural heritage, and the landscape, as well as the interrelationships between these factors.

3.5.10 The baseline environment was evaluated through a combination of desk-based studies, site surveys, and consultation with relevant stakeholders. This baseline assessment established the existing environmental conditions against which the impacts of the proposed development were assessed. The evaluation identified potential impact pathways, such as noise, emissions, habitat disturbance, and visual changes, and determined the receptors that could be affected by these pathways, including humans, wildlife, and physical or cultural assets.

3.5.11 This process allowed for the identification and scoping of potential for significant environmental effects, meeting the EIA Directive's requirement for a proportionate and targeted assessment of likely significant effects. By integrating the analysis of design parameters with the evaluation of the baseline environment, the assessment addressed all relevant sources of impact, pathways, and receptors contributing to a comprehensive and robust Environmental Impact Assessment.

Step 3 determination and validation of maximum design option

3.5.12 The design options and range/groups of details permitted by the opinion provided by An Bord Pleanála under section 287B of the Planning Act and S.I. No. 655 of 2023 were considered, and the relevant MDO was identified i.e. that which will result in the greatest effect for the impact under consideration (as detailed in paragraph 3.4.14). The MDO differs between impacts according to the nature and sensitivity of the particular environmental receptor and/or the impact. The MDO for certain impacts, such as those arising from the seabed footprint of the proposed infrastructure, have been demonstrated by deriving calculations e.g. comparing the seabed footprint arising from each design option. All other design options have been demonstrated to have a smaller seabed footprint and therefore environmental effects related to direct impacts on the seabed no greater than those of the maximum design.

3.5.13 For more complex environmental topics, modelling was undertaken to determine the maximum design with the worst-case effects. For example, the turbine option which will give rise to the greatest risk of bird collisions is difficult to demonstrate by reference to turbine parameters alone. Therefore, modelling was undertaken of each of the three proposed layout options, A, B & C, to determine the predicted collisions for each option. The option giving rise to the greatest number of predicted collisions was identified as the MDO.

3.5.14 In the case of seascape and visual effects, the determination of the maximum design giving rise to the greatest effects was based on expert judgment. Wirelines and/or photomontages which visually represent the maximum and minimum turbine sizes and the array layouts for each, were produced for key viewpoints, to illustrate the difference between the design options to support the selection of the maximum design for seascape and visual impact assessment.

Step 4 environmental impact assessment

3.5.15 For each environmental receptor the potential impacts which were scoped in for assessment were assessed using the relevant MDO to determine the maximum environmental effect. An assessment of the other design options or parameters is also presented to demonstrate that the effects of the ADO and/or parameters will not exceed those of the MDO. Table 4 provides key definitions used in the EIA process, drawing from a range of sources such as the EPA Guidelines (2022), internationally recognised EIA terminology, and the collective professional expertise of the project team. These definitions align with established practices in environmental assessment and are justified within the relevant technical chapters of the EIAR, where their application is demonstrated in context.

Table 4 Impact assessment definitions

Term	Definition and example
Direct impact	▪ **Definition:** 'Direct impacts are those impacts that arise as a result of a direct interaction between a project and its environment' (EPA, 2022). ▪ **Example:** The construction of a wind turbine directly disturbs the seabed habitat where the foundation is placed.
Indirect impact	▪ **Definition:** 'Indirect impacts are effects on the environment that arise from consequential processes not directly attributable to the project itself, but resulting from activities induced or triggered by the project' (EPA, 2022). ▪ **Example:** Increased shipping traffic to support the wind farm's construction may lead to a rise in local air pollution levels.
Secondary impact	▪ **Definition:** 'Secondary impacts are often a subset of indirect impacts and refer to those effects that are triggered by primary impacts, creating a chain of consequences' (EPA, 2022). ▪ **Example:** The disturbance of the seabed (a direct impact) may lead to a temporary reduction in water quality, which in turn may affect fish populations (secondary impact).
Cumulative impacts	▪ **Definition:** 'Cumulative impacts are those resulting from the incremental effects of a project when added to other past, present, and reasonably foreseeable future actions' (EPA, 2022). ▪ **Example:** The combined effects of multiple offshore wind farms in a region, along with other maritime activities, may lead to significant overall changes in marine biodiversity.
Interactive impacts	▪ **Definition:** 'Interactive impacts occur when the effects of different project activities, or multiple projects, interact in ways that may result in an impact greater than the sum of their individual effects' (EPA, 2022).

Term	Definition and example
	▪ **Example:** The noise from wind turbine construction and the increased vessel traffic might interact to create a higher level of disturbance to marine life than either impact would cause on its own.
Beneficial impacts	▪ **Definition:** 'Beneficial impacts are those positive effects that improve environmental quality or contribute to the enhancement of the environment' (EPA, 2022). ▪ **Example:** The generation of renewable energy from the wind farm reduces reliance on fossil fuels, thereby lowering greenhouse gas emissions.
Neutral impacts	▪ **Definition:** 'Neutral impacts are those that do not result in a perceptible effect, typically within the normal bounds of variation or forecasting error' (EPA, 2022). ▪ **Example:** The visual presence of the wind farm at a distance from shore might be neutral to some observers, having neither a significantly positive nor negative impact on the landscape.
Adverse impacts	▪ **Definition:** 'Adverse impacts are those that result in negative effects, often leading to a reduction in environmental quality' (EPA, 2022). ▪ **Example:** The potential collision risk for birds flying through the wind farm area represents an adverse impact on local bird populations.

3.5.16 The significance of an effect, either adverse or beneficial, is determined using a combination of the sensitivity of the receptor and the magnitude of the impact. Where possible, a matrix approach has been used to ensure a consistent approach within the EIAR. Small variations on this approach are necessary for some topics where topic specific guidance indicates an alternative approach is necessary, for example Shipping and Navigation (Volume 3, Chapter 10).

Sensitivity of the receptor

3.5.17 The condition of the receiving environment, as defined in the baseline characterisation, has been used to inform the sensitivity of each receptor or group of receptors. The sensitivity of a receptor is a function of its capacity to accommodate change and reflects its ability to recover if it is affected[6]. The sensitivity of the receptor is therefore quantified via the following criteria:

- Context – The degree to which the impacted receptor will alter from the established (baseline) conditions, i.e. how sensitive is the aspect to the environmental change. To define the context the following sub-factors have been considered:
  - Adaptability – The degree to which a receptor can avoid or adapt to the environmental change;
  - Tolerance – The ability of a receptor to accommodate temporary or permanent change without a significant adverse impact; and

6 Sensitivity is defined in the EPA Guidelines (2022) as 'the potential of a receptor to be significantly affected'.

- Recoverability – The temporal scale over and extent to which a receptor will recover following an impact.

- Value – A measure of the receptor's importance, rarity and worth.

3.5.18 Each EIAR chapter presents a 'sensitivity/importance of the environment' table. This table presents how sensitivity is defined for the topic's receptors, considering the criteria above as appropriate. Some chapters use different terminology based on receptor led technical criteria, and where this is the case the alternative criteria/terminology is explained.

3.5.19 Where possible, four levels of sensitivity for receptors are utilised – Negligible, Low, Medium and High. A topic-specific definition of the levels of receptor sensitivity is presented in each EIAR chapter, for example an international habitat designation could be equivalent to High whereas a local designation could be defined as Low.

3.5.20 The sensitivity of each receptor to each impact is determined to account for the context of the impact on the receptor. Any deviations to this approach, for example to reflect topic specific guidance, are explained in the topic EIAR chapter.

Magnitude of the impact

3.5.21 The magnitude of an impact provides a useful initial measure of the likelihood of an environmental effect arising. Magnitude is defined for the purposes of assessment via five factors, adapted from the EPA (2022) Guidelines:

- Extent – The area, the number of sites and/or the proportion of a population affected over which an impact occurs;

- Duration – The time for which the impact occurs;

- Frequency – How often the impact occurs;

- Probability – How likely the impact is to occur; and

- Consequences – The degree of change relative to the baseline level and the change in character.

3.5.22 'Duration' is a concept that can have different meaning for different topics. The EIAR has applied the definitions of duration of effects across topics as provided in Table 3.4 of the EPA Guidelines (2022). For instance, Momentary Effects (defined as from seconds to minutes) through to Permanent Effects (lasting over sixty years).

3.5.23 Each EIAR chapter presents a topic specific 'magnitude of the impact' table which explains how the magnitude of the identified impacts is defined based on the five factors listed above.

3.5.24 Where possible, four levels of magnitude are utilised – Negligible, Low, Medium and High. For each impact a definition is presented in the EIAR chapter which is topic specific based on the factors described above. The MDO and alternative design option(s) are assessed in terms of the magnitude of the impact, to provide certainty that any option within the range of parameters will not give rise to an impact which is of greater significance than the MDO.

3.5.25 Any deviations to this approach, for example to reflect topic specific guidance are explained in the topic EIAR chapter.

Determining likely significant effects

3.5.26 Following the identification of potential effects, the significance of the effect, which may be adverse, neutral or positive, is determined using a combination of the magnitude of the impact and the sensitivity of the receptor. The methodology is informed by the EPA Guidelines (2022), which provide a robust framework for defining and categorising effects to ensure consistency, transparency, and alignment with best practices in EIA.

3.5.27 Where possible, a matrix approach has been used to ensure a consistent application of these principles across the EIAR. The approach aligns the magnitude of impacts with receptor sensitivity to determine overall significance. Any deviations from this methodology, for example to align with topic specific guidance, are explained within the respective EIAR chapters.

3.5.28 In the absence of topic-specific deviations, the following definitions, derived from the EPA Guidelines (2022), have been adopted to categorise effects:

- Imperceptible: An effect capable of measurement but without significant consequences.
- Not significant: An effect which causes noticeable changes in the character of the environment but without significant consequences.
- Slight: An effect which causes noticeable changes in the character of the environment without affecting its sensitivities.
- Moderate: An effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends.
- Significant: An effect which, by its character, magnitude, duration or intensity, alters a sensitive aspect of the environment.
- Very significant: An effect which, by its character, magnitude, duration or intensity, significantly alters most of a sensitive aspect of the environment.
- Profound: An effect which obliterates sensitive characteristics.

3.5.29 Effects defined as Significant, Very Significant and Profound are considered significant in EIA terms. Table 5 presents the matrix used to determine the significance of effects, which has been informed by the EPA Guidelines, ensuring the determination of significance is systematic and consistent. The matrix is an adaption of the figure provided in the EPA Guidelines (2022), which uses a contoured graph to represent the relationship between sensitivity and magnitude. To facilitate consistent application across all disciplines and ensure ease of use, the figure has been translated into a tabular format. This approach provides clear thresholds and definitions, allowing for consistent and robust evaluations across different topics.

3.5.30 Moderate levels of effect have the potential, subject to the assessor's professional judgement, to be significant. Whether a moderate effect is considered significant or not significant in EIA terms depends on an evaluation of sensitivity and magnitude factors, and these evaluations are explained within the assessment where they occur.

3.5.31 Predictions of impacts are based on the use of best available data, professional judgement, specialist knowledge and modelling where appropriate. This is especially true for the determination between whether an effect is Profound or Very Significant – see Table 5. The precautionary principle has been applied to ensure that potential effects are not ascribed unduly low probability of occurrence or low levels of significance.

3.5.32 Where significant effects are identified during the iterative design process, these are avoided and prevented, where possible, including through the consideration of alternatives.

Table 5 Matrix for determining the significance of effect (adapted from the EPA (2022) Guidelines

Description of Impact – Magnitude		Existing Environment – Sensitivity			
		High	Medium	Low	Negligible
Adverse impact	High	Profound or Very Significant (significant)	Significant	Moderate*	Imperceptible
	Medium	Significant	Moderate*	Slight	Imperceptible
	Low	Moderate*	Slight	Slight	Imperceptible
Neutral impact	Negligible	Not significant	Not significant	Not significant	Imperceptible
	Negligible	Not significant	Not significant	Not significant	Imperceptible
Positive impact	Low	Moderate*	Slight	Slight	Imperceptible
	Medium	Significant	Moderate*	Slight	Imperceptible
	High	Profound or Very Significant (significant)	Significant	Moderate*	Imperceptible

*Moderate levels of effect have the potential, subject to the assessor's professional judgement to be significant or not significant. Where the outcome of using the matrix results in a Moderate effect, suitable professional scrutiny has been applied to determine the final significance outcome with appropriate justification provided.

Additional Mitigation

3.5.33 Where, having assessed the proposed development incorporating Project Design Features and Other Avoidance and Preventative Measures (i.e. those measures to avoid and prevent significant adverse effects (as described above)), the assessment determines that there will be remaining significant adverse effects, 'Additional Mitigation' measures are identified.

3.5.34 This Additional Mitigation can involve measures that avoid, prevent, reduce and, if possible, offset likely significant adverse effects on the environment, and, where appropriate, monitoring arrangements.

3.5.35 With respect to Mitigation by Reduction, the EPA Guidelines (2022) state:

'This is a very common strategy for dealing with effects which cannot be avoided. It tends to concentrate on the emissions and effects and seeks to limit the exposure of the receptor. It is generally regarded as the 'end of pipe' approach because it tends not to affect the source of the problems. As such this is regarded as a less sustainable, though still effective, approach.

Reducing the Effect

This strategy seeks to intercept emissions, effects and wastes before they enter the environment. It monitors and controls them so that acceptable standards are not exceeded. Examples include waste water treatment, filtration of air emissions and noise attenuation measures.

Reducing Exposure to the Effects

This strategy is used for effects which occur over an extensive and undefined area. Such effects may include noise, visual effects or exposure to accidents or hazards. The mitigation is achieved by installing barriers between the location(s) of likely receptors and the source of the effects.'

3.5.36 In this EIAR, Additional Mitigation is proposed where:

- An adverse effect is significant in EIA terms, notwithstanding the Project Design Features and Other Avoidance and Preventative Measures already incorporated within the project proposal, but mitigation is available which can reduce the level of or exposure to such effect; and
- The implementation of such mitigation can be assured through planning conditions, including monitoring where appropriate.

3.5.37 Consistent with the EPA Guidelines (2022), the EIAR includes *'a compendium of mitigation and monitoring commitments'* (see Volume 8, Chapter 2: Schedule of Commitments).

- Insofar as the EIAR proposes the implementation of management plans as Additional Mitigation to avoid, prevent or reduce environmental effects, the relevant contractor(s) carrying out the Dublin Array project shall be required to prepare a final version of each such management plan to be submitted to a relevant authority for approval or notice prior to the commencement of a relevant part of the proposed development. Each contractor shall be contractually bound to implement the final management plan in accordance with the terms of the contract, and the relevant Additional Mitigation shall be enforceable as a condition of the permission.

3.5.38 In addition to the planning conditions that may be attached to a permission under section 293 of the Planning Acts, section 172(1I)(a) requires An Bord Pleanála to take specific steps when granting permission for the proposed Dublin Array. These include:

- (i) attaching any conditions it considers necessary to avoid, prevent, reduce, or, where possible, offset the significant adverse effects of the development on the environment;
- (ii) Clearly outlining in its decision any features of the proposed development or measures intended to avoid, prevent, reduce, or offset significant adverse environmental effects; and

- (iii) Specifying any monitoring measures to assess significant adverse environmental effects, ensuring these are proportionate to the size, location, and nature of the proposed development, as well as the significance of the effects.

3.5.39 Under section 172(1I)(b) of the Planning Act, An Bord Pleanála may, if appropriate to avoid duplication of monitoring, and without prejudice to existing monitoring arrangements pursuant to national or European Union legislation (other than the EIA Directive), identify those arrangements (or such of those arrangements as it thinks appropriate in the particular case) to be used for the purpose of ensuring monitoring in accordance with paragraph (a)(iii) of section 172(1I) of the Planning Acts.

Residual effects

3.5.40 The residual effects are those that could not be reasonably avoided, prevented or reduced, having considered alternatives, and having regard to the necessity for the proposed project. The EPA Guidelines (2022) define residual effects in the Glossary as: *'The final predicted effect/impact remaining after mitigation'*, and in the main body of the text, describes residual effects as:

> *'the remaining environmental 'costs' of a project that could not be reasonably avoided. These are a key consideration in deciding whether the project should be permitted or not.'*

3.5.41 Consistent with the EPA Guidelines (2022), the EIAR clearly identifies and describes residual effects in accordance with the standardised terminology as set out in the EPA Guidelines (2022). A summary of the residual effects is provided in each chapter within the EIAR.

3.6 Approach to assessment of cumulative effects

3.6.1 A Cumulative Effects Assessment (CEA) has been undertaken as part of the Dublin Array EIA to ensure that any additive impacts arising from other developments are fully assessed. The CEA has been undertaken in line with the principles outlined in the EPA Guidelines 2022.

3.6.2 The CEA methodology is set out in full in Volume 2, Chapter 4: Cumulative Effects Assessment Methodology and comprises a systematic approach to identifying and evaluating the potential cumulative effects of the Dublin Array project in combination with other existing, planned, and reasonably foreseeable projects.

3.6.3 The assessments were conducted in three main stages. The first stage involved compiling a comprehensive list of relevant projects, plans, and activities within defined search areas based on topic-specific Zones of Influence (ZoIs). This long list included various sectors such as offshore wind, other offshore energy, shipping, and coastal assets. The second stage involved screening the long list to identify projects with potential spatial, temporal, and conceptual overlaps with Dublin Array. This screening process considered factors such as data confidence, physical and temporal overlaps, and the potential for significant cumulative effects. The third stage categorised the projects into tiers based on their stage in the planning and development process. Tier 1 included projects under construction, Tier 2 included permitted but not yet implemented projects, and Tier 3 included submitted applications and development objectives in approved plans. This structured approach ensures that all potential cumulative effects are thoroughly assessed, providing a robust basis for decision-making and mitigation planning.

3.7 Approach to transboundary assessment

3.7.1 The Espoo Convention[7] sets out the obligations of Parties to assess the environmental impact of certain activities that have the potential to have transboundary effects. This includes activities such as major wind farms, which are listed in Annex I of the Convention. Parties are required to notify and consult other States in cases where there is likely to be significant adverse environmental impact on those States. This duty is encapsulated for EU Member States in the EIA Directive, and for all relevant Espoo Convention States in the Planning Act and the Planning Regulations. The EPA Guidelines (2022) outline that for any project that is likely to cause significant transboundary effects, contact with the relevant authorities in other Member States should be made.

3.7.2 Potential transboundary effects were identified through the scoping and assessment process, which involved reviewing baseline data, predictive modelling, and considering sensitive receptors beyond national boundaries. These effects are discussed in each topic chapter of the EIAR.

3.7.3 No significant transboundary effects have been identified during the assessment process.

3.8 Assumptions, limitations and technical difficulties

3.8.1 The EIA process is designed to enable informed decision-making based on the best available information about the significant environmental implications of a proposed development, including through consultation with the public and with prescribed bodies. Assumptions have been made during preparation of the EIAR. Assumptions specific to certain technical topics are discussed in the relevant chapters of the EIAR.

7 The Convention on EIA in a Transboundary Context. United Nations Economic Commission for Europe (UNECE), signed at Espoo, Finland, 1991 to which Ireland is a signatory.

3.8.3 General assumptions made in the preparation of the EIAR also include:

- Information obtained from third parties, including publicly available information sourced from databases, is correct at the time of their publication; and
- The main land uses next to the work areas for the O&M Base, the Export Cable Route (ECR), landfall, TJB, and the Onshore Electrical System (OES) will remain unchanged when the application for permission is made under section 291 of the Planning Act. However, if there is already consent for development, it is assumed that this development will occur during the Dublin Array project. This development is considered in the Environmental Impact Assessment Report (EIAR) either as part of the existing baseline (if it already exists) or as part of the cumulative effects assessment, with its impact assessed in the relevant chapter.

3.8.4 Any limitations to baseline characterisation is addressed within each technical topic chapter. The assessment has been undertaken with consideration to the following limitations:

- The assessment of cumulative effects has been reliant on the availability of up-to-date, accurate and reasonably complete information on other proposed plans and projects, including those for which applications are pending (on the basis that these may be permitted by the time the EIA process is concluded). The CEA methodology is set out in full in Volume 2, Chapter 4: Cumulative Effects Assessment Methodology.
- The Decommissioning and Restoration Plan, including the three rehabilitation schedules attached thereto, describes how the Applicant proposes to rehabilitate that part of the maritime area, and any other part of the maritime area, adversely affected by the permitted maritime usages the subject of the Maritime Area Consent (MACs) (Reference Nos. 2022-MAC-003 and 004 / 20230012 and 20240020). It is based on the best scientific and technical knowledge available at the time of submission of this planning application. However, the lengthy passage of time between submission of the application and the carrying out of decommissioning works (expected to be in the region of 30-35 years) gives rise to knowledge limitations and technical difficulties.
- For example, during the lifetime of the Project, it is expected that any concrete mattresses or rock armour protection will have been colonised by a variety of marine organisms, which would be disturbed by the removal operations. Therefore, notwithstanding that there may be a policy preference at one point in time that all such infrastructure should be removed, it is anticipated that it may be environmentally preferable at the relevant time to leave certain materials in situ, or to reduce them to rubble and remove only the other materials. It is proposed that suitable surveys will be undertaken and considered with the relevant competent authority and relevant stakeholders prior to any final decision being taken as to the extent of decommissioning, following discussions on the most appropriate approach.

- Accordingly, the Decommissioning and Restoration Plan will be kept under review by the Applicant as the project progresses, and an application to alter the 'planning rehabilitation schedule' (per the language used in the Maritime Area Planning Act 2021, as amended) will be submitted to the relevant competent authority, if necessary. In addition to the relevant statutory requirements under the applicable legislation, the Decommissioning and Restoration Plan will be reviewed having regard to the following:
  - The baseline environment at the time rehabilitation works are proposed to be carried out,
  - What, if any, adverse effects have occurred that require rehabilitation,
  - Technological developments relating to the rehabilitation of marine environments,
  - Changes in what is accepted as best practice relating to the rehabilitation of marine environments,
  - Submissions or recommendations made to the Applicant by interested parties, organisations and other bodies concerned with the rehabilitation of marine environments,
  - The views of the Maritime Area Regulatory Authority, and/or
  - Any new relevant regulatory requirements.

3.10 References

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Registered office:
Unit 5,
Desart House,
Lower New Street,
Kilkenny
www.RWE.com