



Chapter 6: Environmental Impact Assessment Methodology

Array EIA Report
2024

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6. EIA METHODOLOGY

6.1. INTRODUCTION

1. This chapter of the Array Environmental Impact Assessment (EIA) Report presents the EIA methodology used for the assessment of likely significant environmental effects of the Ossian Array infrastructure (hereafter the 'Array') on physical, biological and human environment receptors.
2. This Array EIA Report has been developed to support an application for consent for the Array under Section 36 of the Electricity Act 1989 and relevant Marine Licences (under the provisions of Part 4 of the Marine and Coastal Access Act 2009 for United Kingdom (UK) waters beyond 12 nm) and in accordance with the requirements of the following regulations (collectively referred to hereafter as the EIA Regulations):
 - in respect of a Section 36 consent application: The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017; and
 - in respect of a marine licence application: The Marine Works (Environmental Impact Assessment) Regulations 2007.
3. As explained in volume 1, chapter 1, this EIA Report has been prepared for the Array only; the Proposed offshore export cable corridor(s) and Proposed onshore transmission infrastructure (comprising the Proposed onshore export cable corridor(s) and Proposed onshore converter station(s)) and the Proposed landfall location(s)) associated with the Array will be subject to a separate EIA Scoping Report(s), EIA Report(s) and consent applications(s). While these other elements of Ossian do not form a part of this application or the project-alone assessment in this Array EIA Report, they are included in the Cumulative Effects Assessment (CEA) for the Array.
4. This chapter presents:
 - the assessment methodology used to determine potential impact including the approach that has been used to assess magnitude, sensitivity of receptors and reach a conclusion on the likely significance of effect;
 - the methodology used for Cumulative Effects Assessment (CEA);
 - the methodology for assessing inter-related effects; and
 - the methodology for assessing transboundary effects.
5. Each topic chapter also contains further-topic specific methodologies where appropriate. These are explained further within the relevant Array EIA Report chapters (volume 2, chapters 7 to 20).

6.2. ENVIRONMENTAL IMPACT ASSESSMENT LEGISLATION AND GUIDANCE

6. In compliance with the European Union (EU) Directive on the assessment of the effects of certain public and private projects on the environment (EIA Directive) (2011/92/EU, as amended by Directive 2014/52/EU) and the EIA Regulations, when applying for Section 36 consent or a marine licence, an EIA Report is required to be prepared and submitted to support these applications if the Array is likely to have a significant effect on the environment due to factors such as its size, nature or location.
7. The assessment of effects methodology employed in this Array EIA Report draws upon relevant legislation, policy and guidance, including those listed below:
 - Council Directive 2011/92/EU of 13 December 2011 on the assessment of the effects of certain public and private projects on the environment, as amended by Council Directive 2014/52/EU (the EIA Directive);
 - The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017;
 - The Marine Works (Environmental Impact Assessment) Regulations 2007;

- The Conservation of Habitats and Species Regulations 2017 – only applies in Scotland for specific activities including consent applications under Sections 36 and 37 of the Electricity Act 1989;
 - The Conservation of Offshore Marine Habitats and Species Regulations 2017 – applies to the Scottish offshore region (beyond 12 nm);
 - The Wildlife and Countryside Act 1981;
 - Marine Scotland Consenting and Licensing Guidance: For Offshore Wind, Wave and Tidal Energy Applications (Marine Scotland, 2018);
 - Guidelines for Ecological Impact Assessment (EclA) in the UK and Ireland – Terrestrial, Freshwater, Coastal and Marine (Chartered Institute of Ecology and Environmental Management (CIEEM), 2019);
 - A Handbook on Environmental Impact Assessment: Guidance for Competent Authorities, Consultees and Others Involved in the Environmental Impact Assessment Process in Scotland (NatureScot, 2018);
 - Environmental Impact Assessment for Offshore Renewable Energy Projects (British Standards Institute (BSI), 2015);
 - Guidelines for data acquisition to support marine environmental assessments of offshore renewable energy projects (Centre for Environment, Fisheries and Aquaculture Science (Cefas), 2012);
 - A Review of Assessment Methodologies for Offshore Wind Farms (Collaborative Offshore Wind Research into The Environment (COWRIE) METH-08-08) (Maclean *et al.*, 2009);
 - Institute of Environmental Management and Assessment (IEMA) Environmental Impact Assessment Guide to Delivering Quality Development (IEMA, 2016);
 - UK Planning Inspectorate Advice Note Nine: Rochdale Envelope (PINS, 2018);
 - UK Planning Inspectorate Advice Note Twelve: Transboundary Impacts (PINS, 2020);
 - UK Planning Inspectorate Advice Note Seventeen: Cumulative Effects Assessment (PINS, 2019);
 - The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019 (HM Government, 2019a);
 - Planning Advice Note (PAN) 1/2013 Environmental Impact Assessment (Scottish Government, 2013);
 - Cumulative Impact Assessment Guidelines – Guiding Principles for Cumulative Impact Assessment in Offshore Wind Farms (RenewableUK, 2013); and
 - IEMA Guide to Determining Significant for Human Health In Environmental Impact Assessment (IEMA, 2022).
8. Topic-specific guidance and legislation, where appropriate, is discussed within the relevant Array EIA Report chapters (volume 2, chapters 7 to 20).
 9. References to legislation in this Array EIA Report are to the relevant legislation as amended.

6.3. CONSULTATION

10. Consultation on the Array EIA methodology (including the CEA methodology and approach to assessing transboundary and inter-related effects) was undertaken at the Array EIA scoping stage. The Ossian Array EIA Scoping Report (Ossian OWFL, 2023) presented these methodologies and requested feedback on the proposed approaches. Additional post-scoping consultation relating to methodology was sought on specific technical topics which is discussed in the technical chapters (volume 2, chapters 7 to 20). A summary of the key issues raised during consultation relating to this chapter are outlined below in Table 6.1 together with how these issues have been considered in the production of this chapter.

Table 6.1: Summary of Key Consultation Issues Raised relevant to the EIA Methodology (Marine Directorate – Licensing Operations Team (MD-LOT), 2023)

Consultee	Issue Raised	Response to Issue Raised/Where This has Been Considered in Chapter
MD-LOT	The Scottish Ministers advise that <i>“as more than one set of EIA regulations apply the most stringent requirements must be adhered to in terms of, for example, consultation timelines and public notice requirements.”</i>	The Applicant has applied the most stringent requirements of the EIA regulations relevant to the assessment where more than one set of EIA regulations apply.
	MD-LOT advise that <i>“matters are not scoped out unless specifically addressed and justified by the Developer and confirmed as being scoped out by the Scottish Ministers. The matters scoped out should be documented and an appropriate justification noted in the EIA report.”</i>	Impacts that are scoped out from the Array EIA Report are justified within the relevant topic chapters (volume 2, chapters 7 to 20).
	MD-LOT suggests that <i>“any embedded mitigation relied upon for the purposes of the assessment should be clearly and accurately explained in detail within the EIA Report. The likely efficacy of the mitigation proposed should be explained with reference to residual effects. The EIA Report must identify and describe any proposed monitoring of significant adverse effects and how the results of such monitoring would be utilised to inform any necessary remedial actions.”</i>	<p>The use of designed in measures implemented as part of the Project Design is summarised in the Project Description (volume 1, chapter 3) and presented as relevant in each topic chapter (volume 2, chapters 7 to 20).</p> <p>The likely efficacy of the mitigation proposed are explained with reference to residual effects within the relevant topic chapters (volume 2, chapters 7 to 20).</p> <p>Proposed monitoring measures are identified and described in the Enhancement, Mitigation, and Monitoring Commitments appendix (volume 3, appendix 6.3) and in each topic chapter as relevant (volume 2, chapters 7 to 20).</p>
	MD-LOT states that <i>“the EIA Report should clearly demonstrate how the Developer has had regard to the mitigation hierarchy, including giving consideration to the avoidance of key receptors.”</i>	The mitigation hierarchy is explained in this chapter (section 6.4.4). Consideration of the avoidance of key receptors is considered within the Site Selection and Consideration of Alternatives chapter (volume 1, chapter 4).
	MD-LOT states that <i>“the EIA Report must include a table of mitigation which corresponds with the mitigation identified and discussed within the various chapters of the EIA Report and accounts for the representations and advice attached in Appendix I.”</i>	A table of mitigation measures, corresponding with the mitigation identified and discussed in the relevant topic chapters, is included in the Enhancement, Mitigation, and Monitoring Commitments appendix (volume 3, appendix 6). The mitigation presented will consider representation and advice provided as Appendix I to the Scoping Opinion (MD-LOT, 2023).
	MD-LOT suggests that <i>“where potential impacts on the environment have been fully investigated but found to be of little or no significance, it is sufficient to validate that part of the assessment by detailing in the EIA Report, the work that has been undertaken, the results, what impact, if any, has been identified and why it is not significant.”</i>	Effects that are found to be of little or no significance are justified within the relevant topic chapters (volume 2, chapters 7 to 20).
	MD-LOT states that <i>“any uncertainty on the impacts upon receptors from activities during decommissioning should be clearly explained, along with the implications for the assessment of significant effects.”</i>	Effects upon receptors from activities during the decommissioning phase have been considered as part of the assessment within the relevant topic chapters (volume 2, chapters 7 to 20).
	MD-LOT states that <i>“in examining the EIA Report, and any other environmental information, the Scottish Ministers will seek to reach an up to date reasoned conclusion on the significant effects on the environment from the Array. This reasoned conclusion will be considered as up to date if the Scottish Ministers are satisfied that current knowledge and methods of assessment have been taken account of.”</i>	Where possible, new data and information will be considered and incorporated within the relevant topic chapters of this Array EIA Report to form up to date reasoned conclusions. (volume 2, chapters 7 to 20). Where appropriate, the Application will consult with relevant stakeholders on the incorporation of new information within the Array EIA Report. Where it is not possible to consider new information within the Array EIA Report, the Applicant will justify why this has not been possible.
	The Scottish Ministers understand that <i>“due to the ongoing National Grid Holistic Network Design Follow Up Exercise and the potential for third party involvement, the grid connection for the Proposed Development is currently unknown. It therefore may not be possible to submit the onshore EIA, or the EIA for the offshore export cable infrastructure at the same time as the EIA for the Proposed Development. If this is the case, it is essential that sufficient information concerning proposed offshore export cable works and onshore works is included in the EIA Report to understand the cumulative impacts of the Proposed Development. This will ensure that as much information as possible relating to the project as a ‘whole’ is presented.”</i>	The Applicant will submit further consent applications, including EIA Reports, for the Proposed offshore export cable corridor(s) (to MD-LOT for a Marine Licence for works in Scottish waters and to the Marine Management Organisation (MMO ¹), for works in English waters) and to the Planning Inspectorate for a Developmental Consent Order (DCO) for all onshore transmission infrastructure in England. These applications are planned to be submitted in 2026. Assessment of the likely significant effects of the works related to the Proposed offshore export cable corridor(s) and Proposed onshore transmission infrastructure have been included within the CEA of the Array where appropriate.
	The Scottish Ministers advise that <i>“the Developer must make every attempt to narrow the range of options. Where flexibility in the design envelope is required, this must be defined within the EIA Report and the reasons for requiring such flexibility clearly stated.”</i>	<p>The Applicant has employed a Project Design Envelope (PDE) approach to the assessment, which accounts for the need for flexibility in the design for the future evolution of the detailed Array proposal, within clearly defined parameters. The level of detail provided within the PDE is sufficient to enable a robust assessment of the likely significant effects, and any resultant mitigation measures, considering, where necessary, a range of possibilities.</p> <p>This PDE approach is further detailed within volume 1, chapter 3.</p>
	<i>“To address any uncertainty, the EIA Report must consider the potential impacts associated with each of the different scenarios. The criteria for selecting the worst case and the most likely scenario, together with the potential impacts arising from these, must also be described. The parameters of the Proposed Development must be clearly and consistently defined in the application for the s36 consent and marine licences and the accompanying EIA Report.”</i>	The Applicant has presented the parameters to be considered during the assessment as part of the Maximum Design Scenario (MDS) tables for each topic within their respective chapters (volume 2, chapters 7 to 19). Where appropriate, the most likely scenario will be described and assessed.
NatureScot Scoping Representation (May 2023)	The EIA Report must <i>“clearly articulate mitigation measures which informed by the EIA (or HRA) are necessary to avoid or reduce predicted significant adverse environmental effects of the Array. NatureScot further advise that the full range of mitigation and monitoring measures, and published guidance, are considered and discussed in the EIA Report.”</i>	<p>This parameters of the PDE are further detailed within volume 1, chapter 3.</p> <p>Proposed designed in measures have been articulated within the relevant topic chapters (volume 2, chapters 7 to 19) and are summarised in volume 1, chapter 3.</p>

11. In addition to this, the Applicant has carried out several public consultation events. A summary of these events can be found in Table 6.2.

Table 6.2: Public Consultation Events

Date	Type of Consultation	Location
Wednesday 24 January 2024	Project introduction	Virtual
Tuesday 30 January 2024	Environmental assessments	Virtual
Friday 09 February 2024	Supply chain	Virtual
Friday 16 February 2024	Human environment	Virtual
Wednesday 28 February 2024	Q&A drop-in session	Virtual

6.4. KEY PRINCIPLES OF THE ARRAY ASSESSMENT

6.4.1. OVERVIEW

12. Within this Array EIA Report, the assessment of each topic (e.g. benthic subtidal ecology, offshore ornithology, shipping and navigation, etc.) is presented in a separate topic specific chapter (volume 2, chapters 7 to 19). Within each of the topic chapters, the following matters have been considered:

- identification of the study area for the topic-specific assessments;
- description of topic-specific policy, guidance and legislation;
- summary of topic-specific consultation activity, including comments received from MD-LOT and stakeholder representation as part of the Ossian Array Scoping Opinion (MD-LOT, 2023);
- description of the methodology to inform the baseline conditions, including detail on desktop study sources and site-specific surveys where relevant;
- description of the environmental baseline conditions, including future baseline scenario; and
- presentation of the assessment of likely significant effects, which includes:
 - presentation of a MDS considering each potential impact;
 - detail on impacts scoped out of the assessment with appropriate justification;
 - a description of the designed in measures adopted as part of the Array;
 - identification of likely impacts and assessment of the significance of their identified effects through the construction, operation and maintenance, and decommissioning phases of the development. This assessment includes consideration of designed in measures that have been considered within the Project Design;
 - identification of any further mitigation measures required in respect of likely significant effects (in addition to designed in measures) along with the assessment of any residual effects;
 - assessment of any likely significant cumulative effects between the Array and other developments on a single receptor. These will include projects which have become operational since collection of baseline data, projects under construction, those with consent, projects for which an application for consent has been submitted but not yet determined, projects in scoping and where an Agreement for Lease (AfL) has been granted;
 - identification of any future monitoring that may be required;
 - assessment of any transboundary effects (i.e. effects on European Economic Area (EEA) states); and
 - summary of the inter-related effects and ecosystem assessment.

13. Inter-related effects (i.e. inter-relationships between environmental topic areas) have been assessed in a standalone chapter (volume 2, chapter 20). Where appropriate, this includes consideration of ecosystem assessment of relevant receptor groups.
14. The effects of climate change on future baseline conditions have been considered in the description of baseline conditions, and therefore are inherently considered in the assessment of likely significant effects on the receptors in the respective topic chapters (volume 2, chapters 7 to 20). The climate assessment for the Array is included in the Climatic Effects chapter and appendices (volume 2, chapter 17; volume 3, appendices 17.1, 17.2 and 17.3).
15. The consideration of impacts of the Array on human health is an inherent part of a number of technical assessments presented within the Array EIA Report. Table 6.4 signposts to those technical assessments relevant to human health. It is considered that where there is no significant impact within the technical assessments there can be no significant impacts on human health.
16. A number of key principles which have been applied to each topic chapter are detailed in sections 6.4.2 to 6.4.5.

6.4.2. EVIDENCE BASED APPROACH

17. The Array is located in the North Sea, approximately 80 km south-east from Aberdeen at its nearest point. This area of the North Sea has an existing base of data/knowledge acquired through surveys and assessments undertaken for existing and proposed offshore development applications for Berwick Bank, Seagreen Alpha/Bravo (referred to as Seagreen 1 and Seagreen 1A Projects when considered as part of the CEA for the Array), Inch Cape and Neart na Gaoithe (NnG). The Applicant has further commissioned site-specific surveys carried out as part of the Array baseline studies. Where possible in this Array EIA Report, the Applicant has made use of these data to:
 - characterise the baseline environment to inform the EIA where data are sufficient and appropriate;
 - identify data gaps;
 - draw upon the pre-existing evidence base in addition to site-specific and recent data as appropriate; and
 - support scoping out of impacts where there is clear evidence of lack of a receptor-impact pathway.
18. Where possible, additional data to inform the Array assessment of effects have been identified and described within the relevant topic chapter of this Array EIA Report (volume 2, chapters 7 to 20).

6.4.3. MAXIMUM DESIGN SCENARIO

19. The PDE approach (also known as the Rochdale Envelope approach) has been adopted for the assessment of the Array, in accordance with current best practice and the “Rochdale Envelope Principle¹” (volume 1, chapter 3) (PINS, 2018). This approach follows the assessment of likely significant effects of the realistic ‘maximum adverse scenario’ parameters of the Array.
20. Volume 1, chapter 3 presents the PDE parameters and identifies the range of potential project design values for relevant components of the Array. For each of the topic chapters (volume 2, chapters 7 to 20) within this Array EIA Report and for each of the effects assessed, the PDE considered will be the scenario which would give rise to the greatest potential effect (hereafter referred to as the ‘maximum design scenario’ or ‘MDS’).
21. An example of the PDE approach would be where several types of piling scenarios are being considered. The assessment in this case would be based on the scenario known to have the greatest potential for impact on a given receptor. In this instance, the PDE for the piling scenario with the greatest noise potential would be the foundation with the largest footprint (i.e. the maximum design scenario for e.g. marine mammals and fish and shellfish ecology). It can be assumed that any project parameters equal to or less

¹ Case law (i.e. R v Rochdale MBC ex parte Milne (No1.) [1999] 5 WLUK 67 and R v Rochdale MBC ex parte Milne (No.2) [2000] 7 WLUK 955).

than those assessed will have environmental effects of the same level or less upon the receptors for the topic under consideration.

22. Through identifying and assessing the MDS for any given impact, it can be assumed that the impact (and therefore the effect) will be no greater for any other design scenario. This approach enables the Applicant to retain necessary flexibility in design of the Array, within the maximum scenarios which are fully assessed in the Array EIA Report. Flexibility in design is required to ensure the most appropriate and up-to-date wind turbine technology for the site is procured and installed, which may be a matter of years after EIA Report production.

6.4.4. MEASURES TO AVOID, PREVENT, REDUCE OR, IF POSSIBLE, OFFSET LIKELY SIGNIFICANT ADVERSE EFFECTS

Overview

23. Where likely significant effects are identified, the EIA Regulations require ‘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’ to be included in the EIA Report.

24. The iterative approach to the assessment process for the Array involves a feedback loop, as illustrated in Figure 6.1. An impact, and the resulting significance of effect, is initially assessed, and if this is deemed to be a significant adverse effect in EIA terms, changes are made (where reasonably practicable) to relevant project design parameters, or specific mitigation measures are introduced to avoid, reduce or offset the magnitude of the potential impact. The assessment is then repeated, and the process continues, until the EIA practitioner is satisfied within the bounds of the Project objectives, that:
 - the effect has been reduced to a level that is not significant in EIA terms; or
 - having regard to other constraints, no further changes may be made to project design parameters or no practicable mitigation measures are available to reduce the magnitude of impact (and hence significance of effect). In such cases, an overall effect that is still significant in EIA terms may be presented in the Array EIA Report.

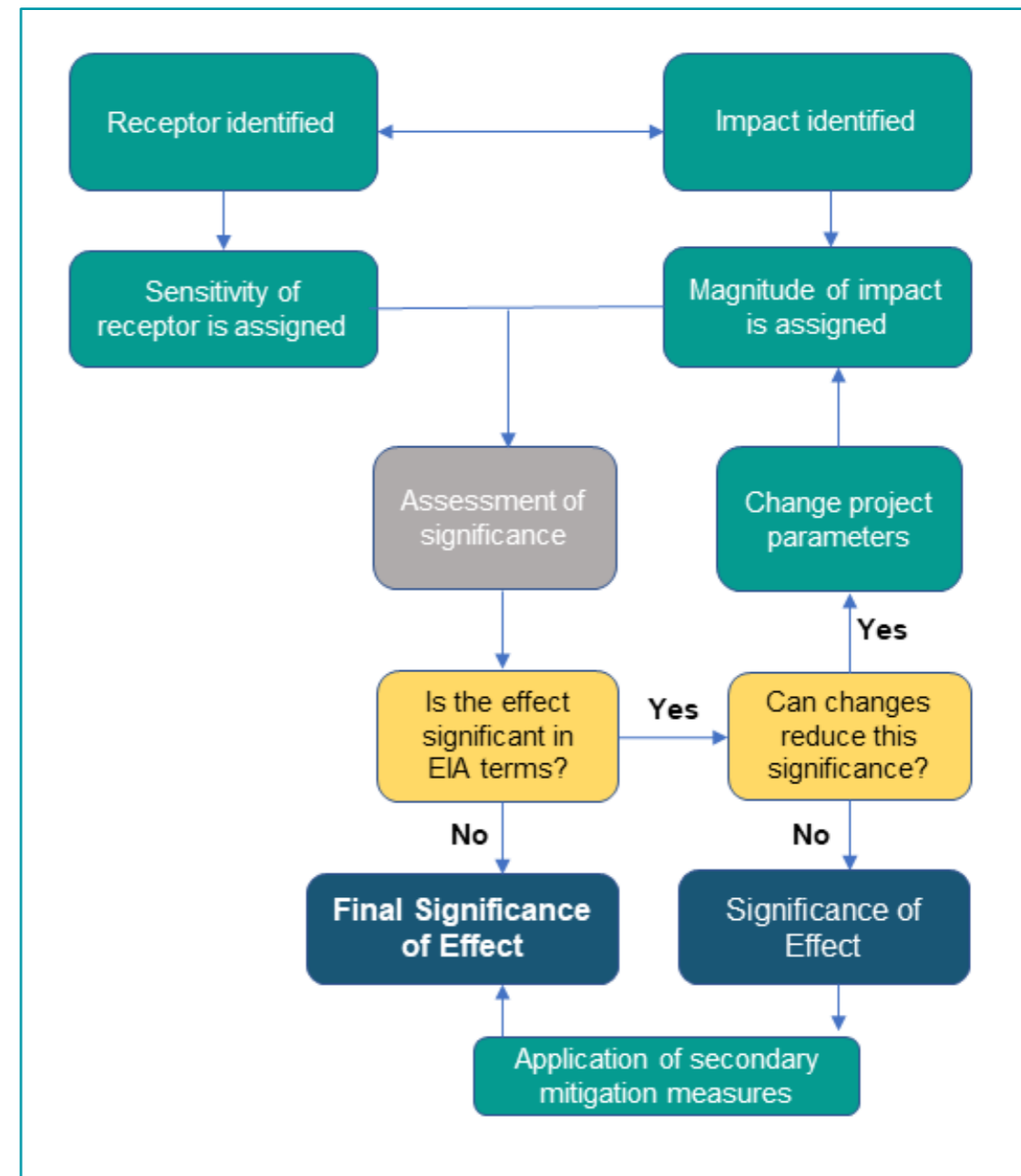


Figure 6.1: Proposed Iterative Approach to Mitigation Within the Array EIA

Designed in measures (primary mitigation)

25. IEMA (2016) describe primary (inherent) mitigation as: “Modifications to the location or design of the development made during the pre-application phase that are an inherent part of the project, and do not require additional action to be taken”.
26. Primary mitigation has been referred to as “designed in measures” within this Array EIA Report.
27. As described in paragraph 24, the iterative approach to the assessment process has been utilised to inform the design of the Array (through the identification of likely significant effects and development of designed

in measures to address these). Commitment to implementing the identified measures is demonstrated through incorporation of such measures within the design as “designed in measures”.

28. This approach ensures that the significance of effect presented in the Array EIA Report is considered representative of the maximum effect of the Array should the application for consent be approved and the Array be developed.

Secondary mitigation

29. IEMA (2016) describe secondary (foreseeable) mitigation as: “Actions that will require further activity in order to achieve the anticipated outcome. These may be imposed as part of the planning consent, or through inclusion in the Environmental Statement”.
30. Secondary mitigation is an additional measure which is implemented after the assessment process has been completed. The aim of a secondary mitigation measure is to prevent, reduce and offset likely significant effects which could not be avoided through designed in measures.

Tertiary mitigation

31. IEMA (2016) describe Tertiary (inexorable) mitigation as: “Actions that would occur with or without input from the EIA feeding into the design process. These include actions that will be undertaken to meet other existing legislative requirement, or actions that are considered to be standard practices used to manage commonly occurring environmental effects”.
32. Both primary (inherent) mitigation and tertiary (inexorable) mitigation are considered designed in measures. Secondary mitigation proposed to reduce significance of impact are detailed within the topic chapters of the Array EIA Report and summarised in volume 2, chapters 7 to 20.

6.4.5. IDENTIFICATION OF IMPACTS AND SIGNIFICANCE OF EFFECT

Impacts and effects

33. The Array has the potential to create a range of impacts and effects with regards to the physical, biological and human environment.
34. For the purposes of the Array EIA Report, the term ‘impact’ is defined as a change as a result of an action. For example, the laying of an inter-array cable (action) is likely to result in seabed disturbance (impact). Impacts can be defined as direct, indirect, temporary, irreversible, secondary, cumulative and inter-related. They can also be either beneficial or adverse, although the relationship between them is not always straightforward and relies on available evidence and professional judgement.

Table 6.3: Definition of Impact Terms Relevant to the Array EIA Report

Term	Definition
Direct impact	Occurs as a straightforward consequence of activities undertaken in direct connection to the project (derived from Highways Agency <i>et al.</i> , 2008).
Indirect impact	Occurs as a consequence of a direct impact and may arise via a complex pathway and be experienced at a point in space or time that is removed from the direct impact (Highways Agency <i>et al.</i> , 2008).
Cumulative effect	Combined effect of the project being assessed in combination with the effects from a number of different projects and/or plans, on the same receptor or resource (based on Highways Agency <i>et al.</i> , 2020).
Inter-related impact	Consideration of how the accumulation of, and inter-relationship between effects might affect the environment, economy or community as a whole (DECC, 2011).

Term	Definition
Beneficial or adverse impact	An impact can be either “beneficial” or ‘adverse’. A beneficial impact is one that improves the quality of the environment and an adverse impact is one that reduces the quality of the environment (CIEEM, 2019).

35. The term ‘effect’ is defined as the consequence of an impact. For example, following the inter-array cable laying example described in paragraph 34, the laying of an inter-array cable (action) results in seabed disturbance (impact), with the potential to disturb benthic habitats and species (effect).
36. The significance of effects is determined by consideration of the magnitude of impact alongside the sensitivity of each receptor/receptor group in accordance with the defined significance criteria.

Scope of the assessment

37. The scope of this Array EIA Report complies with the requirements set out by the EIA Regulations as discussed in volume 1, chapter 2.
38. In March 2023, the Applicant submitted the Ossian Array EIA Scoping Report (Ossian OWFL, 2023) to MD-LOT to support a request for a formal Scoping Opinion in relation to the Array application from Scottish Ministers. The Scoping Opinion (Ossian Array EIA Scoping Opinion (MD-LOT, 2023)); was received in June 2023.
39. Due to the nature, size and location of the Array and advice provided through the EIA process, the Array EIA Report focuses on the following topic areas:
- Physical Processes (volume 2, chapter 7);
 - Benthic Subtidal Ecology (volume 2, chapter 8);
 - Fish and Shellfish Ecology (volume 2, chapter 9);
 - Marine Mammals (volume 2, chapter 10);
 - Offshore Ornithology (volume 2, chapter 11);
 - Commercial Fisheries (volume 2, chapter 12);
 - Shipping and Navigation (volume 2, chapter 13);
 - Aviation, Military and Communications (volume 2, chapter 14);
 - Infrastructure and Other Users (volume 2, chapter 15);
 - Major Accidents and Disasters (volume 2, chapter 16);
 - Climatic Effects (volume 2, chapter 17);
 - Offshore Socio-economics (volume 2, chapter 18);
 - Marine Archaeology (volume 2, chapter 19); and
 - Inter-Related Effects (volume 2, chapter 20);
40. Table 6.4 outlines the requirements of the EIA Regulations and where these requirements have been considered within this Array EIA Report.

Table 6.4: EIA Regulations Requirements and Where in this Array EIA Report these are Addressed

EIA Regulations - Requirement	Where Addressed within this Array EIA Report
1(a): Population and human health	volume 2, chapter 9 – Fish and Shellfish Ecology volume 2, chapter 12 – Commercial Fisheries; volume 2, chapter 13 – Shipping and Navigation; volume 2, chapter 14 – Aviation, Military and Communications;

EIA Regulations - Requirement	Where Addressed within this Array EIA Report
	volume 2, chapter 15 – Infrastructure and Other Users; volume 2, chapter 16 – Major Accidents and Disasters. and volume 2, chapter 18 – Offshore Socio-economics.
1(b): Biodiversity, with particular attention to species and habitats protected under the EIA Regulations	volume 2, chapter 8 – Benthic Subtidal Ecology; volume 2, chapter 9 – Fish and Shellfish Ecology; volume 2, chapter 10 – Marine Mammals; and volume 2, chapter 11 – Offshore Ornithology.
1(c): land, soil, water, air and climate	volume 2, chapter 7 – Physical Processes; and volume 2, chapter 17 – Climatic Effects.
1(d): material assets, cultural heritage and the landscape	volume 2, chapter 12 – Commercial Fisheries; volume 2, chapter 13 – Shipping and Navigation; volume 2, chapter 14 – Aviation, Military and Communications; volume 2, chapter 15 – Infrastructure and Other Users; volume 2, chapter 18 – Offshore Socio-economics; and volume 2, chapter 19 – Marine Archaeology.
1(e): the interaction between the factors referred to in points (a) to (d).	volume 2, chapter 20 – Inter-related Effects.
2: The effects referred to in paragraph 1 on the factors set out there in shall 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	volume 2, chapter 16 – Major Accidents and Disasters.

Determining magnitude of impacts

41. The magnitude of an impact is the spatial extent, duration, frequency, and reversibility of an impact from the construction, operation and maintenance or decommissioning of the Array. A magnitude is assigned to each of the impacts assessed within this Array EIA Report.

Table 6.5: Definition of Terms Relevant to Defining the Magnitude of an Impact (Highways Agency *et al.*, (2008) and CIEEM (2019))

Term	Definition
Spatial extent of the impact	The spatial or geographical area over which the impact/effect may occur under a suitably representative range of conditions (e.g. noise transmission under water).
Duration of the impact	The time over which an impact occurs. Duration should be defined in relation to ecological characteristics (such as the lifecycle of a species) as well as human timeframes. An impact may be described as short, medium or long-term and permanent or temporary.

Term	Definition
Frequency of the impact	The number of times or how often an activity occurs over the relevant phase of the Array and will influence the resulting effect.
Reversibility of the impact	An irreversible effect is one from which recovery is not possible within a reasonable timescale or there is no reasonable chance of action being taken to reverse it. A reversible effect is one from which recovery is possible or which may be counteracted by mitigation. In some cases, the same activity can cause both reversible and irreversible effects.

42. The magnitude of an impact is defined within each topic chapter according to the following scale:
- negligible;
 - low;
 - medium; and
 - high.
43. Definitions for each of these categories is set out in Table 6.6, which describes both potential beneficial and adverse magnitudes of change (adapted from Highways Agency *et al.* (2020)). Each of the technical chapters contain topic-specific definitions for each of these categories which are based upon topic-relevant external policy, guidance, standards and other material, including specialist knowledge.

Table 6.6: Definition of Terms Relating to the Magnitude of an Impact (Highways Agency *et al.*, 2020)

Magnitude of Impact	Definition
High	Loss of resource and/or quality and integrity of resource; severe damage to key characteristics, features or elements (Adverse). Large scale or major improvement or resource quality; extensive restoration or enhancement; major improvement of attribute quality (Beneficial).
Medium	Loss of resource, but not adversely affecting integrity of resource; partial loss of/damage to key characteristics, features or elements (Adverse). Benefit to, or addition of, key characteristics, features or elements; improvement of attribute quality (Beneficial).
Low	Some measurable change in attributes, quality or vulnerability, minor loss or, or alteration to, one (maybe more) key characteristics, features or elements (Adverse). Minor benefit to, or addition of, one (maybe more) key characteristics, features or elements; some beneficial impact on attribute or a reduced risk of adverse impact occurring (Beneficial).
Negligible	Very minor loss or detrimental alteration to one or more characteristics, features or elements (Adverse). Very minor benefit to, or positive addition of one or more characteristics, features or elements (Beneficial).

Determining sensitivity of receptors

44. Receptors can be the physical or biological resource or human user group that have the potential to be affected by impacts as a result of the Array. These receptors are identified through available data and baseline studies compiled in the development of the Array EIA Report.
45. In defining the sensitivity for each receptor/receptor group, the vulnerability, recoverability and value/importance of that receptor/receptor group has been considered. These are defined in Table 6.7 and are used in each topic chapter as appropriate. In instances where these considerations are not included in the assessment, the reason for this is explained within the relevant topic chapter.

Table 6.7: Definition of Terms Relevant to Defining the Sensitivity of a Receptor

Term	Definition
Vulnerability of the receptor	The degree to which a receptor is susceptible to injury, damage, or harm from an activity (IPCC, 2007).
Recoverability of the receptor	The ability of a habitat, community or individual (or individual colony) of species to redress damage sustained as a result of an external factor (MarLIN, 2020).
Value/importance of the receptor	Importance of the receptor in terms of ecological, social/community and/or economic value (CIEEM, 2019).

46. Sensitivity is defined within each topic chapter according to the following scale:
- negligible;
 - low;
 - medium;
 - high; and
 - very high.
47. Definitions for each of these categories is set out in Table 6.8, based on the Highways Agency *et al.* (2020). Each technical chapter contains topic-specific definitions for each of these categories and these are based upon topic-relevant external policy, guidance, standards and other material, or specialist knowledge.

Table 6.8: Definition of Terms Relating to the Sensitivity of the Receptor (based on Highways Agency *et al.*, 2020)

Value (Sensitivity of the Receptor)	Description
Very High	Very high importance and rarity, international receptor with no potential or very limited potential for recovery.
High	High importance and rarity, international and/or national receptor and limited potential for recovery.
Medium	High or medium importance and rarity, regional receptor, and potential for recovery.
Low	Low or medium importance and rarity, local receptor and high potential for recovery.
Negligible	Very low importance and rarity, local receptor and very high potential for recovery.

48. The following topic chapters have applied an EIA methodology which deviates from the one described in this chapter. These include:
- marine mammals;
 - commercial fisheries;
 - shipping and navigation;
 - aviation, military and communications;
 - climatic effects;
 - offshore socio-economics; and
 - marine archaeology.
49. The topic specific EIA methodology is described within these chapters.

Determining significance of effect

50. The overall significance of an effect is determined through the correlation of the potential magnitude of impact and the sensitivity of the receptor. To ensure consistency in defining the significance of an effect, a matrix approach has been adopted, and is presented in Table 6.9. In cases where a range of significance is possible for an effect, there remains the possibility that this may span the significance threshold (i.e. the range is given as minor to moderate). In such cases the final significance is based upon the technical

specialist's professional judgement as to which outcome delineates the most likely effect, with an explanation as to why this is the case.

51. The matrix approach is consistent with the general approach described in the Design Manual for Roads and Bridges (DMRB, Highways England *et al.*, 2020) and Environmental Impact Assessment for Offshore Renewable Energy Projects – Guide (BSI, 2015). A number of modifications have however been made in the interest of proportionality, including:
- an impact of 'negligible' magnitude will always lead to a non-significant effect due a maximum possible significance of 'minor' as per the matrix approach included in Table 6.9; and
 - receptors of 'negligible' importance, value or sensitivity will always lead to a non-significant effect due to a maximum possible significance of 'minor' as per the matrix approach included in Table 6.9.
52. Effects to be assessed as part of the Array EIA Report have been agreed with statutory nature conservation bodies (SNCBs) and stakeholders as part of the Scoping Opinion and Stakeholder Engagement Plan (SEP).

Table 6.9: Matrix Used for the Assessment of the Significance of the Effect

		Magnitude of Impact			
		Negligible	Low	Medium	High
Sensitivity of Receptor	Negligible	Negligible	Negligible to Minor	Negligible to Minor	Minor
	Low	Negligible to Minor	Negligible to Minor	Minor	Minor to Moderate
	Medium	Negligible to Minor	Minor	Moderate	Moderate to Major
	High	Minor	Minor to Moderate	Moderate to Major	Major
	Very High	Minor	Moderate to Major	Major	Major

53. For the purposes of this assessment:
- a level of significance of effect of moderate or more will be considered a 'significant' effect in terms of the EIA Regulations; and
 - a level of significance of effect of minor or less will be considered 'not significant' in terms of the EIA Regulations.
54. The definition of each of these significance levels are presented within Table 6.10.
55. A level of significance of effect of moderate or more is considered important in the decision-making process, whilst effects of minor significance or less entitle little, if any, weight in the decision-making process.
56. Where significant effects (in terms of the EIA Regulations) are identified during the assessment these may be subject to secondary mitigation to reduce or offset the effect (paragraph 57 and paragraph 58). If resulting residual effects are still significant taking into account mitigation these will require further consideration as part of the decision-making process to determine whether the effects are acceptable (paragraph 59).

Table 6.10: Definition of Significance Levels for the Array (based on Highways Agency *et al.*, 2020)

Significance Level	Definition
Negligible	No effects or those that are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error.
Minor	These beneficial or adverse effects are generally, but not exclusively, raised as local factors. They are unlikely to be critical in the decision-making process, but are important in potentially enhancing the subsequent design of the project.
Moderate	These beneficial or adverse effects have the potential to be important and may influence the decision-making process. The cumulative effects of such factors may influence decision-making if they lead to an increase in the overall adverse or beneficial effect on a particular resource or receptor.
Major	These beneficial or adverse effects are considered to be very important considerations and are likely to be material in the decision-making process.

Mitigation measures

57. If, during the preparation of the Array EIA Report, the effect of an impact presents a major significant adverse outcome, changes are typically made to the Array design (primary mitigation) to reduce or offset the magnitude of impact or secondary mitigation is proposed to reduce magnitude of impact. If the effect of an impact presents a moderately significant adverse outcome, mitigation such as engineering controls or construction methods (secondary mitigation) are employed to reduce or offset the magnitude of the impact as outlined in section 6.4.4 paragraph 24.
58. Volume 3, appendix 6.3 provides a summary of the mitigation commitments, including the designed in mitigation (primary and tertiary) and secondary mitigation measures detailed within the topic chapters of the Array EIA Report. The means of implementation of these mitigation measures is also specified for each of the mitigation commitments, along with any caveats to these commitments as requested by Scottish Ministers within the Array EIA Scoping Opinion (MD-LOT, 2023).

Residual effects

59. Residual effects are those effects remaining once all mitigation measures have been taken into consideration in assessment. Following the identification of secondary mitigation measures as described above and as required, in addition to primary and tertiary mitigation, the assessment re-evaluates the significance of effect utilising the methodology outlined above. The assessment of likely significance of residual effects provides the following conclusions for the purposes of the assessment:
 - a residual level of significance equal to or greater than moderate will be considered a 'significant' effect in terms of the EIA Regulations; and
 - a residual level equal to or less than minor will be considered 'not significant' in terms of the EIA Regulations.

6.5. CUMULATIVE EFFECT ASSESSMENT

6.5.1. OVERVIEW

60. Under the EIA Regulations, a CEA is required to assess the likely significant effects on the environment arising from the Array alone and cumulatively with other relevant plans, projects and activities. Cumulative effects are therefore the combined effect of the Array on the same receptor group or resource as a result of the effects from a number of different plans, projects and activities.
61. The term 'cumulative assessment' is used in this Array EIA Report to describe the assessment of changes caused by other reasonably foreseeable actions alongside the Array.

62. This section provides an overview of the legislation and guidance associated with the CEA and the approach to CEA.

6.5.2. CUMULATIVE EFFECT ASSESSMENT LEGISLATION AND GUIDANCE

63. An assessment of cumulative effects is required in accordance with the EIA Directive (2011/92/EU, as amended by Directive 2014/52/EU) and the EIA Regulations.
64. The EIA Directive (Annex IV, Article 5e) states: *"A description of the likely significant effects of the project on the environment resulting from: 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"*.
65. Article 5 of the EIA Directive (Annex IV) also states: *"The description of the likely significant effects on the factors specified in Article 3(1) should cover the direct effects and any 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"*.
66. This is transposed directly into domestic law through the EIA Regulations.
67. There are several other relevant guidance documents which have been considered in the development of the CEA, including:
 - A Handbook on Environmental Impact Assessment: Guidance for Competent Authorities, Consultees and Others Involved in the Environmental Impact Assessment Process in Scotland (NatureScot, 2018);
 - Environmental Impact Assessment for Offshore Renewable Energy Projects (BSI, 2015); and
 - Renewable UK Cumulative Impact Assessment Guidelines. Guiding Principles for Cumulative Impacts Assessment in Offshore Wind Farms (Renewable UK, 2013).
68. The Applicant is currently engaging with MD-LOT on the forthcoming release of the Cumulative Effects Framework and will commit to the use of relevant and appropriate guidance, on ornithology and marine mammal assessments, where published and available.

6.5.3. APPROACH TO THE CUMULATIVE EFFECT ASSESSMENT

69. Ahead of the assessment of cumulative effects, other projects, plans and activities were first compiled into a long list of potential projects, and then screened for inclusion in a short list of projects to be considered in the CEA for each Topic. A summary of this process is outlined within this section, and a full description of the CEA methodology is provided in volume 3, appendix 6.4.
70. The methodology for the screening of potential projects, plans and activities to provide cumulative effects is also presented in Figure 6.2.

Screening stage

71. A fundamental requirement of undertaking the CEA is to identify those foreseeable developments or activities with which the Array may interact with resulting in cumulative effects. There is the potential for interaction to occur during all phases (construction, operation and maintenance, and decommissioning) in the development of the Array. The process of identifying those projects, plans or activities for which there is the potential for an interaction to occur is referred to as 'screening'.
72. A specialised process has been developed to screen the projects, plans and activities that may be considered cumulatively alongside the Array. This involves a staged process that takes into consideration the current level of detail available for projects, plans and activities, as well as the potential for interactions on a conceptual, physical and temporal basis.

Compiling the CEA long list

73. To ensure a thorough and comprehensive approach to identification of potential plans, projects and activities considered in the CEA, an initial 'long list' of projects within a defined Zone of Influence (Zol) was developed. The Zol for the Array was based on the offshore ornithology study area, the largest topic-specific study area.
74. The Marine Scotland (2018) Consenting and Licensing Guidance: For Offshore Wind, Wave and Tidal Energy Applications states that "*Engagement with MD-LOT is required to identify which plans/projects/ongoing activities should be included in the in-combination element of the cumulative effects assessment (CEA)*".
75. Offshore wind projects within the Zone of Influence (Zol) being considered by offshore ornithology have been compiled in the long list, including developments which:
- have become operational since baseline data was collected;
 - are under construction;
 - have consent;
 - are the subject of an application for consent that has been submitted but not yet determined;
 - are in scoping or have a Scoping Opinion; and
 - are plans and projects which are "reasonably foreseeable" (i.e. developments that are being planned, such as in the case of offshore renewable energy developments, projects which have a Crown Estate Scotland (CES) AfL).
76. The CEA has considered all other relevant plans, projects and activities that are publicly available six months prior to the Array application where quantitative assessment is required. A qualitative CEA will consider all other relevant projects, plans and activities that are publicly available three months prior to submission of the Array application.
77. The CEA long list has been developed using datasets from MD-LOT, The Crown Estate (TCE) and others to identify projects and plans in the vicinity of the Array relating to topics such as commercial fisheries, cables and pipelines, energy and oil and gas.
78. The CEA long list for the Array is provided in volume 3, appendix 6.5.

Screening of the CEA long list

79. For a cumulative effect to occur, the potential of the effect to directly or indirectly affect the receptor(s) in question must be established (i.e. there must be an impact-receptor-pathway). The plans, projects and activities listed in the CEA long list were considered on a topic-by-topic basis to ensure the potential for a relevant receptor-impact pathway in screening each of the plans, activities or projects was identified.
80. The initial CEA long list was short-listed following consideration of potential for cumulative effects for each potential impact-receptor pathway following the staged process as set out below:
- conceptual overlap – in instances where an impact has the potential to directly or indirectly affect the receptor(s) in question (i.e. presence of an impact-receptor pathway);
 - physical overlap – ability for impacts arising from the Array to overlap with those from other projects/plans on a receptor basis. This results in an overlap of the physical extents of the impacts arising from the two (or more) projects/plans which must be established for a cumulative effect to arise. Exceptions to this exist for certain mobile receptors that may move between, and are subject to, two or more separate physical extents of impact from two or more projects; and
 - temporal overlap – for a cumulative effect to arise from two or more projects, a temporal overlap of impacts arising from each must be established. Some impacts are, however, active only during certain phases of development, such as piling noise during construction. The absence of a strict overlap however may not necessarily preclude a cumulative effect, as receptors may become further affected by additional, non-temporally overlapping projects. This will be considered for each topic with projects being screened in for cumulative assessment if required.

81. This screening stage was led by the experience and knowledge of technical specialists, and the current guidance and regulations. The plans, projects and activities that remain after review of the long list are taken forwards to the assessment stage.
82. In the absence of publicly available information for the Morven Offshore Wind Farm construction phase, a maximum overlap (100%) of the Array construction phase has been assumed for the purposes of CEA, which represents the most precautionary approach for cumulative assessment. This assumes Morven array's construction phase (which is anticipated to be over seven years (Morven Offshore Wind Farm Limited (MvOWFL), 2023) will take place between 2031 and 2037, with the operational and maintenance phase commencing in 2038.
83. Furthermore, although there are no publicly available details relating to the required offshore export cable corridor(s) for the Morven Offshore Wind Farm, as this project is reasonably foreseeable, it has been included as a Tier 3 project for the purposes of CEA.

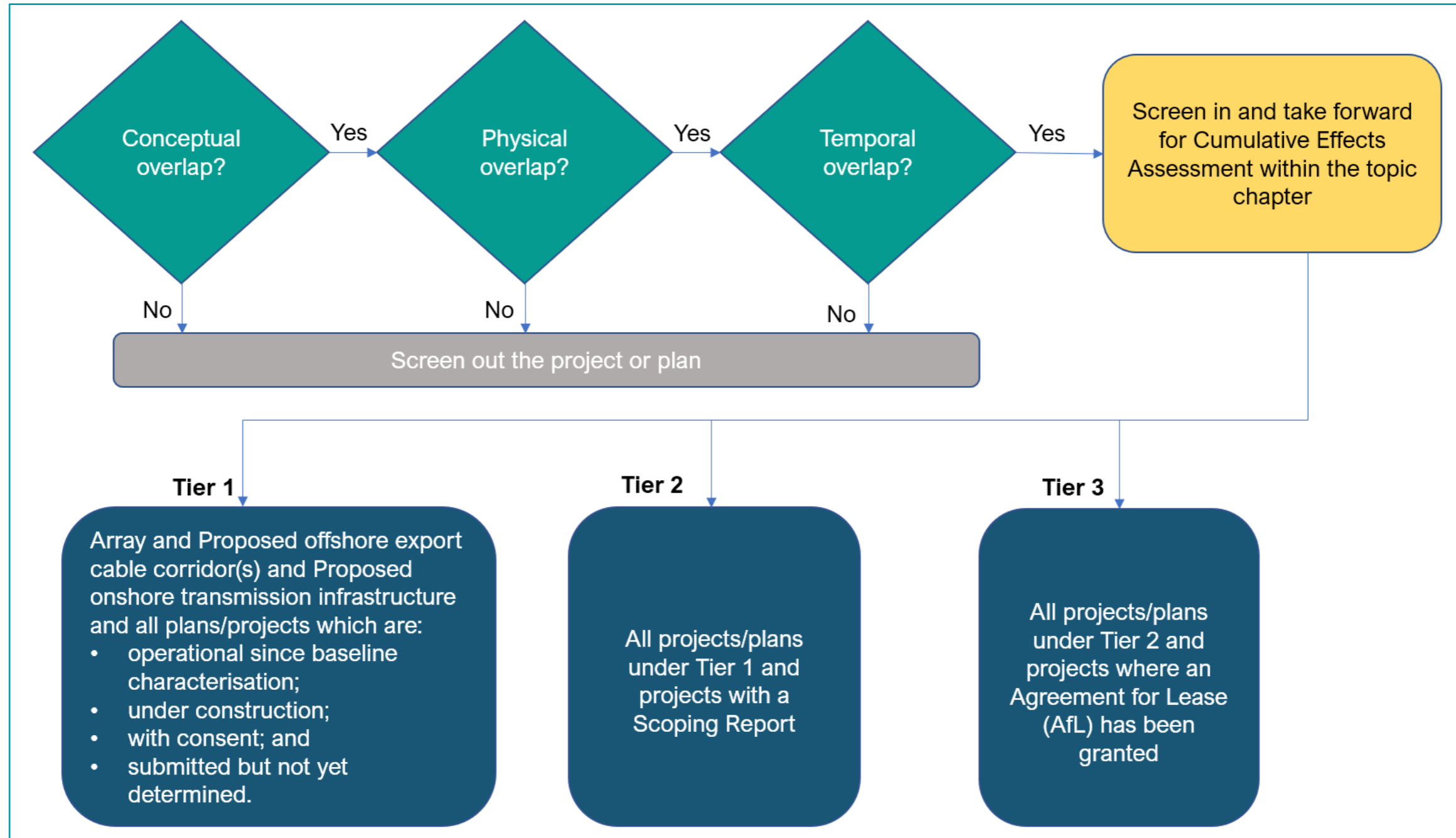


Figure 6.2: CEA Methodology for the Screening of Potential Projects, Plans and Activities

Assessment stage

84. Following the Screening stage, a tiered approach has been adopted for undertaking the CEA of the Array, as described in Figure 6.2. This approach provides a framework for placing relative weight on the potential for each project/plan to be included in the CEA to ultimately be realised, based upon the project/plan's current stage of maturity and certainty in the project's parameters.
85. All projects/plans screened in via the previously described screening process have been allocated into one of the three Tiers and assessed in the CEA. It is worth noting that data collection is assessed against the source of this data (i.e. data confidence) to verify its accuracy and reliability.
86. The CEA presented in this Array EIA Report has been undertaken on the basis of information presented in the EIA Reports (or other similar planning documents) for the other projects, plans and activities. Projects, plans and activities often seek consent for a maximum design scenario, which may be refined during the determination/examination period of the application and during the post-consent phases of the development. Changes made to a project's design since the publication of the EIA Report for that project have not generally been included in the CEA long list or assessed within the topic chapters due to the uncertainty surrounding whether these are ultimately implemented or not. Where topic or project specific advice has been received in relation to the project design, this will be identified in the topic assessment.
87. Where practicable, the CEA methodology follows the Array assessment of effects methodology as described in section 6.4.5. By following this approach, a level of consistency is maintained throughout the topic chapters and relevant comparisons can be made. This approach however differs between topic chapters according to several factors, such as the nature of the topic, the cumulative projects, plans and activities included for that topic, the data available for each project, plan and activity, and the specific practicalities around undertaking CEA for that discipline. Where quantitative assessment has not been practicable, a mix of qualitative and quantitative or wholly qualitative assessment has been undertaken.
88. Where the potential significant effect for the Array alone is assessed as negligible, or where an impact is predicted to be highly localised, these will not generally be considered within the Array CEA, as there is not considered to be a potential for cumulative effects with other plans, projects or activities. Where a specific assessment methodology differs from this approach then this will be outlined within the relevant topic chapter.

Transboundary effects

89. The potential for transboundary effects to arise is a result of an impact from the Array which has the potential to significantly affect the environment of an EEA state(s). Full description of how the transboundary effects assessment has been carried out is found in volume 3, appendix 6.6.
90. To assist with this process, a screening exercise for potential transboundary impacts was undertaken at the scoping stage and presented in the Ossian Array EIA Scoping Report (Ossian OWFL, 2023).
91. Volume 3, appendix 6.6 presents the update to the transboundary screening work undertaken at the scoping stage, taking into consideration more recent project information where relevant.
92. This exercise identified that the following topics may experience transboundary impacts from the Array:
- shipping and navigation (volume 2, chapter 13).
93. This topic chapter provides an assessment of transboundary effects for each receptor group, which also considers the inter-relationships between effects. The inter-related effects identified within each topic chapter have been summarised in a standalone inter-related effects chapter (volume 2, chapter 20).

6.6. INTER-RELATED EFFECTS

94. The EIA Regulations require consideration of the inter-relationships between EIA topics that may lead to environmental effects. For example, the separate impacts of habitat disturbance upon a single receptor group such as benthic subtidal ecology.
95. Potential inter-related effects have been assessed concurrently considering two levels of potential effect:
- project lifetime effects: effects that occur throughout more than one phase of the project (construction, operation and maintenance, and decommissioning) interacting to potentially create a more significant effect upon a receptor than if just assessed in isolation in a single phase; and
 - receptor led effects: effects that interact spatially and/or temporally resulting in inter-related effects upon a single receptor. For example, the effect of displacement of fishing activity into other areas on commercial fisheries may be greater when multiple sources of impact interact or combine to produce a different or greater effect upon this receptor than when single sources of impact are considered in isolation. Receptor led effects might be short term, temporary or transient effects, or incorporate longer term effects.
96. Within the Array EIA Report, assessment of inter-related effects has been undertaken with specific reference to the potential for such effects to arise in relation to receptor groups. The term 'receptor group' is used to highlight the fact that the proposed approach to the inter-relationships assessment will not assess every individual receptor assessed at the EIA stage, but rather, potentially sensitive groups of receptors. Receptor groups considered and assessed in the Array EIA Report include:
- physical processes;
 - benthic subtidal ecology;
 - fish and shellfish ecology;
 - marine mammals;
 - offshore ornithology;
 - commercial fisheries;
 - shipping and navigation;
 - aviation, military and communications;
 - infrastructure and other users;
 - major accidents and disasters;
 - climatic effects;
 - offshore socio-economics; and
 - marine archaeology.
97. Inter-related effects are identified and assessed in volume 2, chapter 20. This chapter provides a descriptive assessment outlining the potential for individual effects to combine, incorporating qualitative and quantitative assessments (where practicable), to potentially create additional effects that may be of greater significance than the individual effects acting in alone.
98. The approach for assessing the potential inter-related effects on each receptor or receptor group follows the steps below:
- review of the topic chapters of the Array EIA Report to identify receptors or receptor groups requiring assessment and the likely effects on each receptor or receptor group; and
 - assessment of how individual effects may combine to create inter-related effects on each receptor or receptor group for project lifetime effects and receptor-led effects and conclusion on likely significant inter-related effects.
99. Where the significance of an effect within the topic-specific assessment has been identified as 'negligible across all stages of the project', the assumption has been made that these effects cannot contribute to any inter-related effects. These effects will therefore not be included in the inter-related effects assessment as any effect is predicted to be negligible for the Array over the lifetime of the project.
100. The inter-related assessment considers potential effects from the Array only, and not those from other projects. Inter-related effects from other projects are considered in the CEA.

101. Additional detail on the approach and methodology followed for the assessment of inter-related effects relating to the Array are provided in volume 2, chapter 20.

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