WHITE CROSS

White Cross Offshore Windfarm Environmental Statement

Chapter 6: Environmental Impact Assessment Methodology

Document Code:	FLO-WHI-REP-0016-06	
Contractor Document Number:	PC2978-RHD-ZZ-XX-RP-Z-0385	
Version Number:	00	
Date:	*Issue Date* *04/08/2023*	
Prepared by:	*KE*	*Electronic Signature*
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Owned by:	*AH*	*Electronic Signature*
Approved by Client:	*OG*	*Electronic Signature*

Version Number	**Reason for Issue / Major Changes**	**Date of Change**
00	For issue	04/08/2023

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Glossary of Acronyms

Acronym	Definition
CEA	Cumulative Effects Assessment
DECC	Department for Energy and Climate Change
EEA	European Economic Area
EIA	Environmental Impact Assessment
ES	Environmental Statement
ETG	Expert Topic Group
EU	European Union
GW	Gigawatt
HRA	Habitats Regulation Assessment
LPA	Local Planning Authority
ICES	International Council for the Exploration of the Sea
IEMA	Institute of Environmental Management and Assessment
JNCC	Joint Nature Conservation Committee
MLWS	Mean Low Water Springs
MMO	Marine Management Organisation
MW	Megawatts
NDDC	North Devon District Council
NTS	Non-Technical Summary
OSPAR	The Convention for the Protection of the Marine Environment of the North-East Atlantic
PDE	Project Design Envelope
PINS	Planning Inspectorate
UK	United Kingdom
UNECE	United Nations Economic Commission for Europe
ZoI	Zone of Influence

Glossary of Terminology

Defined Terms	Description
Applicant	White Cross Offshore Windfarm Limited.
Cumulative effects	The effect of the Onshore Project taken together with similar effects from a number of different projects, on the same single receptor/resource. Cumulative impacts are those that result from changes caused by other past, present or reasonably foreseeable actions together with the Onshore Project.
Development Area	The area comprising the Onshore Development Area and the Offshore Development Area.
Environmental Impact Assessment (EIA)	Assessment of the potential impact of the proposed Onshore Project on the physical, biological and human environment during construction, operation and decommissioning.
Export Cable Corridor	The area in which the export cables will be laid, either from the Offshore Substation or the inter-array cable junction box (if no Offshore Substation), to the National Grid Onshore Substation comprising both the Offshore Export Cable Corridor and Onshore Export Cable Corridor.
Landfall	Where the offshore export cables come ashore.
Mitigation	Mitigation measures have been proposed where the assessment identifies that an aspect of the development is likely to give rise to significant environmental impacts and discussed with the relevant authorities and stakeholders in order to avoid, prevent or reduce impacts to acceptable levels. For the purposes of the EIA, two types of mitigation are defined: • Embedded mitigation: consisting of mitigation measures that are identified and adopted as part of the evolution of the Onshore Project design, and form part of the Onshore Project design that is assessed in the EIA. • Additional mitigation: consisting of mitigation measures that are identified during the EIA process specifically to reduce or eliminate any predicted significant effects. Additional mitigation is therefore subsequently adopted by Offshore Wind Limited as the EIA process progresses.
the Offshore Project	The Offshore Project for the offshore Section 36 and Marine Licence application includes all elements offshore of MHWS. This includes the infrastructure within the windfarm site (e.g. wind turbine generators, substructures, mooring lines, seabed anchors, inter-array cables and Offshore Substation Platform (as applicable)) and all infrastructure associated with the export cable route and landfall (up to MHWS) including the cables and associated cable protection (if required).

Defined Terms	Description
Onshore Development Area	The onshore area above MLWS including the underground onshore export cables connecting to the White Cross Onshore Substation and onward to the NGC grid connection at East Yelland. The onshore development area will form part of a separate Planning application to the Local Planning Authority (LPA) under the Town and Country Planning Act 1990.
Onshore Export Cables	The cables which bring electricity from MLWS at the Landfall to the White Cross Onshore Substation and onward to the NGC grid connection at East Yelland.
Onshore Export Cable Corridor	The proposed onshore area in which the export cables will be laid, from MLWS at the Landfall to the White Cross Onshore Substation and onward to the NGC grid connection at East Yelland.
Onshore infrastructure	The combined name for all infrastructure associated with the Onshore Project from MLWS at the Landfall to the NGC grid connection point at East Yelland. The onshore infrastructure will form part of a separate Planning application to the Local Planning Authority (LPA) under the Town and Country Planning Act 1990.
the Onshore Project	The Onshore Project for the onshore TCPA application includes all elements onshore of MLWS. This includes the infrastructure associated with the offshore export cable (from MLWS), landfall, onshore export cable and associated infrastructure and new onshore substation (if required).
Onshore Transmission Assets	The aspects of the Onshore Project related to the transmission of electricity from MLWS at the Landfall to the NGC grid connection at East Yelland including the Onshore Export Cable, the White Cross Onshore Substation and onward connection to the NGC grid connection at East Yelland.
Project Design Envelope	A description of the range of possible components that make up the Onshore Project design options under consideration. The Project Design Envelope, or 'Rochdale Envelope' is used to define the Onshore Project for EIA purposes when the exact parameters are not yet known but a bounded range of parameters is known for each key project aspect.
White Cross Offshore Windfarm	100MW capacity offshore windfarm including associated onshore and offshore infrastructure.
White Cross Onshore Substation	A new substation built specifically for the White Cross Offshore Windfarm project. It is required to ensure electrical power produced by the offshore windfarm is compliant with NGC electrical requirements at the grid connection at East Yelland.
Windfarm Site	The area within which the wind turbines, Offshore Substation Platform and inter-array cables will be present.

6. EIA Methodology

6.1 Introduction

1. This chapter describes the assessment methodology used throughout the Environmental Statement (ES) chapters for the onshore infrastructure of the White Cross Offshore Windfarm (hereafter referred to as 'the Onshore Project').

2. This chapter specifically, describes the approach used to identify, evaluate and mitigate potential likely significant effects, in EIA terms, using a defined proportionate approach to the assessment process for the Onshore Project.

3. The EIA has been carried out in accordance with the statutory procedures set out in the Town and Country Planning (Environmental Impact Assessment) Regulations 2017 (the '2017 Regulations'). These regulations relate to developments which require planning permission under Part 3 of the Town and Country Planning Act (TCPA) 1990. Further description on EIA regulations can be found in **Chapter 3: Policy and Legislative Context**.

4. In England, the 2017 Regulations apply the amended EU directive "on the assessment of the effects of certain public and private projects on the environment" (commonly referred to as the 'EIA Directive') to the planning system.

5. Furthermore, the approach to the EIA and the production of the ES closely follows relevant policy and guidance, including Planning Inspectorate (PINS) Advice notes, which although applicable to projects consented through the Planning Act 2008, is also relevant to projects consented through other regimes including the TCPA 1990. The relevant policy documents include:

   - The National Planning Policy Framework (NPPF), Department for Levelling Up, Housing & Communities (July 2021)
   - Overarching National Policy Statements (NPSs).
     - for Energy EN-1 (Department of Energy and Climate Change (DECC) 2011a)
     - for Renewable Energy Infrastructure EN-3 (DECC, 2011b)
     - for Electricity Networks Infrastructure EN-5 (DECC, 2011c).

6. Although the Onshore Project is not a Nationally Significant Infrastructure Project, it is recognised that due to its size of up to 100MW, certain NPSs are relevant to the Onshore Project. Therefore, certain NPSs are considered as part of decision making and assessment of the Onshore Project.

7. The relevant guidance documents include:

- Planning Inspectorate Advice Notes:
    - Advice Note Seven: Environmental Impact Assessment, Preliminary Environmental Information, Screening and Scoping (The Planning Inspectorate 2020a)
    - Advice Note Nine: Rochdale Envelope (The Planning Inspectorate 2018)
    - Advice Note Ten: Habitat Regulations Assessment (The Planning Inspectorate 2022)
    - Advice Note Twelve: Transboundary impacts and process (The Planning Inspectorate 2020b).
- Institute of Environmental Management and Assessment, 2004: Guidelines for Environmental Impact Assessment
- Institute of Environmental Management and Assessment, 2015: Guide to Shaping Quality Development
- Institute of Environmental Management and Assessment, 2016: Environmental Impact Assessment Guide to: Delivering Quality Development
- Institute of Environmental Management and Assessment, 2017: Delivering Proportionate EIA
- Receptor-specific guidance documents, described in each technical chapter of this ES.

8. This ES also gives due regard to the requirements of the Marine and Coastal Access Act 2009 and the Habitats Regulations (i.e. The Conservation of Habitats and Species Regulations 2017 (as amended) and The Conservation of Offshore Marine Habitats and Species Regulations 2017 (as amended)). The Report to Inform Appropriate Assessment (RIAA) is appended to this document (see **Appendix 6.A: Report to Inform Appropriate Assessment**) and the Marine Conservation Zone Assessment can be found in **Appendix 10.A: Marine Conservation Zone Assessment**. Further description on these regulations can be found in **Chapter 3: Policy and Legislative Context**.

6.2 Requirement for EIA

9. The EIA framework is set out within European Union (EU) Directive 2011/92/EU (as amended by Directive 2014/52/EU) (the EIA Directive)). The EIA Directive is transposed into English law principally by The Town and Country Planning (EIA) Regulations 2017.

10. The EIA process includes collation of data required to identify and assess the potential effects of a development and the identification of any significant adverse effects and any measures envisaged to avoid, prevent or reduce and, if possible, offset, such significant effects.

11. The primary objective of an EIA, as described in Article 2 of the Directive, is that "Member States shall adopt all measures necessary to ensure that, before development consent is given, projects likely to have significant effects on the environment by virtue, inter alia, of their nature, size or location are made subject to a requirement for development consent and an assessment with regard to their effects on the environment".

12. Further emphasis is given to treating each case individually, with a focus on significant effects considering evidence and consultations through the provisions contained in Article 3 and Article 8:

    "The environmental impact assessment shall identify, describe and assess in an appropriate manner, in the light of each individual case, the direct and indirect significant effects of a project…"

    "The results of consultations and information gathered pursuant to Articles 5 to 7 shall be duly taken into account in the development consent procedure."

13. To support the robustness of the EIA process, a number of consultation events, targeted stakeholder engagement and Expert Topic Group (ETG) meetings have taken place as detailed within **Chapter 7: Consultation**. Feedback from these consultation and engagement events has been taken into consideration and where relevant, used to inform the design development and final design of the Onshore Project.

14. The purpose of this ES is to inform the decision-maker, stakeholders and all interested parties of any significant environmental effects that would result from the Onshore Project during its construction, operation, maintenance, and (where relevant) decommissioning. The information contained within this ES can also be used by affected parties to evaluate the acceptability of the development and its potential effects.

15. The EIA for the Onshore Project has comprised:

    - Identification of the baseline and 'Do Nothing Scenario', through desk-based studies and surveys
    - Assessment of effects (their magnitude and significance including any indirect, secondary, and cumulative effects)

- Development of mitigation measures and enhancement measures (where necessary)
- Identification of residual effects.

16. A Non-Technical Summary (NTS) has also been prepared to accompany this ES. This presents a brief description of the Onshore Project, identifies and describes the potential environmental effects of the Onshore Project, and sets out measures to mitigate adverse effects in less technical language. It is designed to enable stakeholders with less technical knowledge to understand the Onshore Project and its potential significant effects.

17. This ES also includes the following separate environmental assessments as appendices:

- **Appendix 10.A: Marine Conservation Zone Assessment**
- **Appendix 14.B: Water Environment Regulations Compliance Assessment**
- **Appendix 6.A: Report to Inform Appropriate Assessment**.

18. The methodologies for each of these assessments will be covered in the respective assessment methodology section of each report.

6.3 Consultation on Approach and Methodology

19. Consultation is a key feature of the EIA process, and continues throughout the lifecycle of a project, from its initial stages through to consent and post-consent. Article 6 of the EIA Directive concerns public participation in the EIA process. Articles 6(1) and 6(4) respectively state:

- *"Member States shall take the measures necessary to ensure that the authorities likely to be concerned by the project by reason of their specific environmental responsibilities or local and regional competences are given an opportunity to express their opinion on the information supplied by the developer and on the request for development consent, taking into account, where appropriate, the cases referred to in Article 8a (3)."*
- *"The public concerned shall be given early and effective opportunities to participate in the environmental decision-making procedures referred to in Article 2(2) and shall, for that purpose, be entitled to express comments and opinions when all options are open to the competent authority or authorities before the decision on the request for development consent is taken."*

20. The Onshore Project has involved formal consultation with both statutory and non-statutory consultees in the form of the request for an EIA Scoping Opinion, through the ETGs and also informally through email updates. The engagement methods employed have included in-person and virtual meetings, and correspondence via email and letters.

21. Consultation with the public has also been undertaken throughout the development of the Onshore Project, enabling the Applicant, Offshore Wind Limited, to engage with local communities about its plans to develop the Onshore Project. Ongoing public consultation has been conducted through various means including (but not exclusively limited to):

    - Public Information Days held at locations within and adjacent to the Onshore Project development area
    - Direct discussions with landowners
    - Regular and targeted discussion with regulators and other stakeholder bodies.

22. Details of relevant formal consultation and public consultation undertaken during the EIA Scoping process are summarised within each technical chapter. Full details of the Onshore Project consultation process are presented within **Chapter 7: Consultation** of this ES.

6.3.1 Scoping

23. The scoping process provides a mechanism to agree on what information should be included in an ES and the methods to be employed in gathering and assessing such information. Scoping is defined as: *'determining the content and extent of the matters which should be covered in the environmental information to be submitted in the ES'.*

24. The EIA regulations make provision for the Applicant to seek a Scoping Opinion from the relevant Appropriate Authority for EIA projects. On receipt of the Scoping Opinion request, the relevant Appropriate Authority is required to consult with a range of consultees prior to providing a Scoping Opinion identifying those issues to be addressed in the EIA.

25. A request for a Scoping Opinion was submitted to the Marine Management Organisation (MMO) on 18th January 2022, which focussed primarily on the Offshore Project (all infrastructure seaward of Mean High Water Springs), however it did consider some of the onshore infrastructure of the Project. This described broadly the impacts to be assessed as part of the EIA and the methodology for these assessments. A formal Scoping Opinion, on behalf of the Secretary of State for

Business, Energy and Industrial strategy (BEIS) (now Department for Energy Security and Net Zero, was received on 30th May 2022 (MMO Ref: EIA/2022/00002). The Scoping Opinion collated comments from consultees, including North Devon District Council (NDDC), and highlights where agreements were reached on what topics could be scoped in or out of the EIA. Particular impacts within topics have been scoped out, as detailed in the Scoping Opinion and presented within each relevant technical chapter (**Chapters 8** to **24**). Topic specific points from the Scoping Opinion are referenced in the relevant consultation tables within each technical chapter (**Chapters 8** to **24**). 26.

This ES has been partially informed by the Scoping Opinion from the MMO. Feedback from consultation has also been used to inform the final design and impact assessment for the Project as a whole. 27.

The design of the Onshore Project has varied since the receipt of the MMO Scoping Opinion and now includes a new White Cross Onshore Substation within the Project Design Envelope. Extensive engagement with NDC has been undertaken to confirm the expanded scope of the EIA for the Onshore Project, on the basis that this is a significant design change and the original Scoping Opinion came from the MMO, rather than NDC. This is described in **Chapter 7: Consultation**. The site selection process and need for the White Cross Onshore Substation is outlined in **Chapter 4: Site Selection and Assessment of Alternatives**.

6.3.2 EIA Reporting Competent Experts

28. As per Part 5 18(3a) of the Town and Country Planning (EIA) Regulations 2017, "*An environmental statement must be prepared by persons who in the opinion of the relevant authority or the Secretary of State, as appropriate, have sufficient expertise to ensure the completeness and quality of the statement.*"

29. Royal HaskoningDHV has provided environmental, development and consenting support on over 14GW of renewable energy projects across 26 UK offshore windfarms. Their EIA activities and ESs are accredited by the Institute of Environmental Management and Assessment (IEMA) under the EIA Quality Mark Scheme. This demonstrates Royal HaskoningDHV's commitment to ensuring EIA is undertaken at a high-quality level and in accordance with best practices.

30. Royal HaskoningDHV's lead authors are senior and chartered professionals with a significant track record in undertaking technical assessment and EIA in their discipline. The team undertaking the EIA for the Onshore Project on behalf of the Applicant are predominantly Royal HaskoningDHV professional consultants. The team is comprised of a dedicated core team of EIA professionals who take the lead role in the co-ordination and management of the EIA and the preparation of the ES.

The core team is then supported by a wider team of technical specialists taking responsibility of the data collection, data analysis and technical impact assessment.

31. Some of the technical assessments and associated ES chapters have been undertaken by specialist consultancies engaged by Royal HaskoningDHV (see **Table 6.1**).

Table 6.1 Third Party Specialist ES Chapter Authors

Chapter	Author
Chapter 16: Onshore Ecology and Ornithology	BSG Ecology
Chapter 20: Onshore Landscape and Visual Amenity	OP:EN
Chapter 21: Socio-Economics	BiGGAR Economics Limited
Chapter 22: Human Health	Ben Cave Associates Limited

32. In addition, technical consultation provides additional expert input to the assessment process. This has allowed a consensus to be reached on the scope and approach to the impacts included within the EIA, and the comprehensiveness and suitability of data used.

6.4 The Project Design Envelope ('Rochdale Envelope')

33. The proposed approach to assessment for the Onshore Project is based on the principle of a project design envelope (or 'Rochdale Envelope'). The 'Rochdale Envelope' approach has been employed under various consenting regimes including the Planning Act 2008, TCPA 1990, as well as the Electricity Act 1989. It is recognised by consenting authorities that, at the time of submitting an application, developers may not know the precise nature and arrangement of infrastructure and associated infrastructure that make up the proposed development. This is due to a number of factors such as the evolution of technology and the need for further detailed surveys (especially geotechnical surveys) which are required before a final design and layout can be determined. This flexibility is important as it prevents consent being granted for specific infrastructure or a particular layout which is not possible or optimal at the time of construction, which may be several years after the planning/consenting application was made.

34. The general principle of the assessment, under the project design envelope approach, is that for each receptor the impact assessment will be based on assessing project design parameters likely to result in the maximum adverse effect, or least beneficial effect, (i.e., the worst-case scenario) for each potential impact. The Rochdale Envelope for

a project outlines the realistic worst-case scenario for each individual impact, so that it can be safely assumed that all options within the set parameters will have less effect.

35. If a combination of design parameters leads to a scenario that cannot realistically occur, then the worst-case scenario will be reconsidered, and a realistic set of worst-case parameters will be assessed. The end result will be an EIA based on clearly defined environmental parameters that will define the range of development possibilities and hence the likely environmental effects that could result from the Onshore Project. This represents a precautionary but robust assessment of potential effects at this stage of the development process.

36. Using the project design envelope approach means that receptor-specific potential effects draw on the options from within the wider envelope that represent the most realistic worst-case-scenario. It is also worth noting that under this approach the combination of project options constituting the realistic worst-case scenario may differ from one receptor to another and from one effect to another.

37. In accordance with the accepted industry approach, the impact assessment has been undertaken based on a realistic worst-case scenario of predicted impacts, which are set out within each technical chapter. The project design envelope for the Onshore Project is detailed in **Chapter 5: Project Description**.

6.5 Characterisation of the Existing Environment

38. In order to undertake an assessment of potential likely significant effects, an understanding of the current condition of the environment is required (termed environmental baseline).

39. The characterisation (description) of the existing environment for each technical chapter has been undertaken to determine the baseline conditions in the area with potential to be affected by the Onshore Project. This characterisation has followed the steps listed below and are detailed in each technical chapter:

- Study areas are defined for each receptor based on the zone of influence and relevant characteristics of the receptor (e.g., mobility/range)
- Review of the available information and data (either through a desk-based exercise and/or survey data where necessary)
- Review of the likely or potential impacts that might be expected to arise from the Onshore Project
- Determine if sufficient data are available to make the EIA judgements with sufficient confidence

- If further data is required, ensure data gathered are targeted and directed at answering the key questions and filling key data gaps
- Review the information gathered to ensure the environment can be sufficiently characterised in sufficient detail.

40. The Applicant has collated a significant amount of existing data from a number of sources (including from surveys, research, government and industry). These data and information sources are outlined in the Baseline Environment subsections within each technical chapter.

41. Consideration has also been given to the evolution of the baseline in the future, in the absence of the Onshore Project. This has taken account wider issues such as climate change and biodiversity loss (in line with the EIA Regulations).

42. The EIA regulations require an outline of the expected evolution of the baseline, in the absence of the Onshore Project being developed (as far as this can be assessed 'with reasonable effort' based on available information and scientific knowledge). Each respective technical chapter presents the anticipated trend of the existing environment over the anticipated timescales of the Onshore Project's construction and operational lifespan. Such trends reflect natural changes in the baseline environment that may be expected to occur without development.

43. The specific approach to establishing a robust baseline (upon which impacts can be assessed) is set out under each chapter within this ES. This approach is based on feedback in the MMO Scoping Opinion (Case reference: EIA/2022/00002) and consultation with stakeholders. The approach has also evolved and adapted as new data have been collected and the design of the Onshore Project has advanced.

44. Where appropriate, detailed method statements have been provided to the relevant stakeholders to discuss and agree the relevant approach taken in the preparation of this ES.

6.5.1 Study Area

45. Study areas have been defined for each topic at the relevant scale and are stated within the technical chapters. These have been determined by a number of factors such as the distribution of receptors, footprint of potential impact, or administrative / management boundaries and where possible these have been agreed with regulators or advisors.

6.6 Identification of Impacts and Assessment of Significance of Effect

46. The approach to making balanced assessments for the Onshore Project has been guided by the Royal HaskoningDHV EIA team and technical specialists using available data and new data, general and technical guidance, best practice, experience, and expert judgement. In order to provide a consistent framework and system of common tools and terms, a matrix approach has been used to frame and present the expert judgements made. For each topic, the most relevant and latest guidance or best practice has been used and therefore definitions of sensitivity and magnitude of impact are tailored to each receptor. These definitions are detailed fully in each technical chapter.

6.6.1 Impact Identification

6.6.1.1 Types of impact

47. The impact assessment considers the potential for impacts during the construction, operation and maintenance, and decommissioning phases of the Onshore Project. Potential impacts may be classified as follows:

- Direct impacts: these may arise from impacts associated with the construction, operation and maintenance, or decommissioning of the Onshore Project
- Indirect impacts: these may be experienced by a receptor that is removed (e.g., in space or time) from the direct impact
- Inter-relationships between impacts whereby the same receptor or receptor group is affected by multiple impacts acting together
- Cumulative impacts: these may occur as a result of the Onshore Project in conjunction with other existing or planned projects within the study area for each receptor.

6.6.1.2 Source-pathway-receptor model

48. The assessment will use the conceptual 'source-pathway-receptor' model. The model identifies potential impacts resulting from the proposed activities on the environment and sensitive receptors within it. This process provides an easy-to-follow assessment route between impact sources and potentially sensitive receptors ensuring a transparent impact assessment. The aspects of this model are defined as follows:

- Source - the origin of a potential impact (i.e. an activity)
- Pathway - the means by which the effect of the activity could impact a receptor

- Receptor - the element of the receiving environment that is impacted (this could either be a component of the physical, ecological or human environment).

49. In general, the impact assessment for each topic will use this model when considering the potential impacts arising during the construction, operation and maintenance and decommissioning phases of the Onshore Project. In some cases, it is appropriate to use other models for assessment, where this is the case, alternative approaches are described in the relevant topic chapters.

6.6.2 Determining Receptor Sensitivity and Value

50. The characterisation of the existing environment helps to determine the receptor sensitivity in order to assess the potential impacts upon it.

51. The ability of a receptor to adapt to change, tolerate, and/or recover from potential impacts will be key in assessing its sensitivity to the impact under consideration. For ecological receptors, tolerance could relate to short term changes in the physical environment; for human environment receptors, tolerance could relate to impacts upon socio-economics or safety. The time required for recovery will be an important consideration in determining receptor sensitivity.

52. The overall receptor sensitivity is determined by considering a combination of adaptability, tolerance and recoverability. This is achieved through applying known research and information on the status and sensitivity of the feature under consideration coupled with professional judgement and past experience.

53. Expert judgement is particularly important when determining the sensitivity of receptors. For example, an Annex II species (under the Habitats Directive) would have a high inherent value but may be tolerant to an impact or have high recoverability. In this case, sensitivity should reflect the ecological robustness of the species and not necessarily default to its protected status. Example definitions of the different sensitivity levels for a generic receptor are given in **Table 6.2**.

Table 6.2 Example Definition of Different Sensitivity Levels for a Generic Receptor

Sensitivity	Definition
High	Individual receptor has very limited or no capacity to avoid, adapt to, accommodate or recover from the anticipated impact.
Medium	Individual receptor has limited capacity to avoid, adapt to, accommodate or recover from the anticipated impact.

Sensitivity	Definition
Low	Individual receptor has some tolerance to accommodate, adapt or recover from the anticipated impact.
Negligible	Individual receptor is generally tolerant to and can accommodate or recover from the anticipated impact.

54. In addition, the receptor value is considered as a factor in the expert judgement conclusions during the impact assessment. For example, whether the receptor is rare, has protected or threatened status, importance at local, regional, national or international scale, and in the case of biological receptors whether the receptor has a key role in the ecosystem function. An example definition for each value level which could be attributed to a generic receptor is given in **Table 6.3**.

Table 6.3 Example Definitions of the Value Levels for a Generic Receptor

Value	Definition
High	Internationally / nationally important (for example internationally or nationally protected site)
Medium	Regionally important / regionally protected site
Low	Locally important / rare but with high potential for mitigation
Negligible	Not considered to be important (for example common or widespread)

55. In addition, for some assessments, the value of a receptor may also be an element to add to the assessment where relevant, for instance if a receptor is designated or has economic value.

56. The terms 'high value' and 'high sensitivity' are not necessarily linked within a particular impact, and it is important not to inflate impact significance specifically because a feature is valued. For example, a receptor could be of high value (e.g., an Annex I habitat) but have a low or negligible physical / ecological sensitivity to an effect.

6.6.3 Predicting the Magnitude of Impacts

57. In order to predict the significance of an effect, it is fundamental to establish the magnitude and probability of an impact occurring through a consideration of:

- Scale or spatial extent (small scale to large scale or most of the population or a few individuals)
- Duration (short term to long term)

- Likelihood of impact occurring
- Frequency
- Nature of change relative to the baseline.

58. Example definitions of the magnitude levels for a generic receptor are given in **Table 6.4**.

Table 6.4 Example Definitions of the Magnitude Levels for a Generic Receptor

Magnitude	Definition
High	Fundamental, permanent / irreversible changes, over the whole receptor, and / or fundamental alteration to key characteristics or features of the particular receptor's character or distinctiveness
Medium	Considerable, permanent / irreversible changes, over the majority of the receptor, and / or discernible alteration to key characteristics or features of the particular receptor's character or distinctiveness.
Low	Discernible, temporary (throughout project duration) change, over a minority of the receptor, and / or limited but discernible alteration to key characteristics or features of the particular receptor's character or distinctiveness.
Negligible	Discernible, temporary (for part of the Onshore Project duration) change, or barely discernible change for any length of time, over a small area of the receptor, and/or slight alteration to key characteristics or features of the particular receptor's character or distinctiveness.

59. Alternatively, for some topics (such as air quality or noise) magnitude may simply be defined by reference to standard thresholds.

60. The definitions of magnitude given within each chapter are relevant to that particular EIA topic and are clearly defined by the assessor within the context of that assessment and with reference to any topic-specific guidance.

61. Where the assessment identifies that there is no loss or alteration of characteristics, features or elements, or no observable impact in either direction upon a given receptor or group of receptors from an Impact, for example due to implication of embedded mitigation or through an assessment of the potential pathway, then the assessment for that Impact upon those receptor(s) will be **No Change**.

62. Impacts assessed as **No Change** have no potential for a significance of effect and therefore are not assessed further.

6.6.4 Evaluation of Significance

63. Subsequent to establishing the receptor sensitivity and magnitude of impact, the significance of effect is predicted by using quantitative or qualitative criteria, as appropriate to ensure a robust assessment.

64. Wherever possible, the matrix presented in **Table 6.5** has been used to aid the assessment of the significance of effect based on expert judgement, latest guidance and any specific input from consultation, to facilitate a consistent approach throughout the EIA. For each topic assessment, however, best practice methodology (based on the latest available guidance) is followed and, when more appropriate, an alternative approach to the use of a matrix may be used. Where an alternative approach is used, this is fully explained and justified within the relevant chapter.

Table 6.5 Significance of an effect – resulting from each combination of receptor sensitivity and the magnitude of the impact upon it

		Adverse Magnitude				**Beneficial Magnitude**			
		High	**Medium**	**Low**	**Negligible**	**Negligible**	**Low**	**Medium**	**High**
Sensitivity	**High**	Major	Major	Moderate	Minor	Minor	Moderate	Major	Major
	Medium	Major	Moderate	Minor	Negligible	Negligible	Minor	Moderate	Major
	Low	Moderate	Minor	Minor	Negligible	Negligible	Minor	Minor	Moderate
	Negligible	Minor	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Minor

65. **Table 6.5** provides an indication of the significance of effect used in the assessment process for the majority of topics. For the purposes of the EIA, effects which are of major or moderate significance are considered to be significant, and, as such, may require mitigation. It is possible that a moderate effect may not be considered significant; however, in these cases, a justification and rationale is provided in the impact assessment text.

66. Whilst minor effects are not significant in their own right, these may contribute to significant effects cumulatively or through interactions and therefore may require mitigation. Definitions of each level of significance are provided in **Table 6.6**.

67. In concluding the assessment for each effect therefore, the statement made is clear to avoid any ambiguity (for example) *"The effect is considered to be negligible adverse, which is deemed not significant"* rather than *stating "The effect is considered to be of negligible adverse significance"*.

Table 6.6 Definition of Effect Significance

Significance	Definition
Major	Very large or large change in receptor condition, both adverse or beneficial, which are likely to be important considerations at a regional or district level because they contribute to achieving national, regional or local objectives, or could result in exceedance of statutory objectives and / or breaches of legislation.
Moderate	Intermediate change in receptor condition, which are likely to be important considerations at a local level.
Minor	Small change in receptor condition, which may be raised as local issues but are unlikely to be important in the decision-making process.
Negligible	No discernible change in receptor condition.

6.6.5 Confidence

68. Once an assessment of the significance of a potential effect has been made, it is necessary to assign a confidence value to the assessment to assist in the understanding of the judgement. This is undertaken on a simple scale of high-medium-low, where high confidence assessments are made on the basis of robust evidence, medium confidence assessment being based, for example, on academic or scientific studies / papers, with lower confidence assessments being based, for example, on extrapolation and use of proxies.

6.6.6 Mitigation

69. Where an impact assessment identifies that an aspect of the development is likely to give rise to significant environmental effects, mitigation measures have been considered and discussed with the statutory consultees in order to avoid impacts or reduce them to acceptable levels and, if possible, to enhance the environment.

70. For the purposes of the EIA, two types of mitigation have been defined:

    - Embedded mitigation: consisting of mitigation measures that are identified and adopted as part of the evolution of the Onshore Project design, and are included and assessed in the EIA[1]. Embedded mitigation is considered when predicting the magnitude of impact and is therefore taken into account prior to the evaluation of significance

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[1] Considers primary and tertiary mitigation as defined by Institute of Environmental Management and Assessments (IEMA)

- Additional mitigation: consisting of mitigation measures that are identified during the EIA process specifically to reduce or eliminate any predicted significant effects. Additional mitigation has therefore been subsequently adopted as a commitment of the Onshore Project[2].

71. All mitigation associated with the Onshore Project is identified and described in more detail in the relevant chapters of the ES (**Chapters 8** to **24**).

72. In some circumstances it may be necessary to detail monitoring requirements as part of the mitigation measures identified. Monitoring may be appropriate to confirm the assumptions that the assessment is reliant upon (i.e., continue to monitor baseline conditions) and / or to confirm the efficacy of mitigation measures implemented. Monitoring undertaken would be proportionate and directly relevant to the findings of the impact assessment, i.e., it should not be monitoring for the sake of monitoring.

73. **Appendix 6.B: Mitigation Register** lists the mitigation identified as required in the EIA for both the Onshore Project ES (and Offshore Project ES).

6.6.6.1 Biodiversity Net Gain Commitment

74. In addition to the mitigation measures outlined in **Chapter 16: Onshore Ecology and Ornithology**, biodiversity net gain will be sought for the Onshore Project so that it can be demonstrated that the Applicant is improving biodiversity (see **Appendix 16.A: Biodiversity Net Gain Assessment** for more information).

75. This commitment is currently voluntary. However, under the Environment Act 2021, all planning permissions granted in England (with a few exemptions) except for small sites will have to deliver at least 10% biodiversity net gain from November 2023.

6.6.7 Assessing Residual Impacts

76. Following initial assessment, if the impact does not require additional mitigation (or none is possible) the residual impact will remain the same. If, however, additional mitigation is required, an assessment of the post-mitigation residual impact has been undertaken.

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[2] Considers secondary mitigation as defined by IEMA.

6.6.8 Inter-relationships

77. Inter-relationship impacts are covered as part of the assessment and consider impacts from the construction, operation or decommissioning of the Onshore Project on the same receptor (or group). This has been covered within each technical chapter in the inter-relationship section. The potential inter-relationship effects that could arise in relation to include both:

78. **Project lifetime effects:** Effects arising throughout more than one phase of the Onshore Project (construction, operation, and decommissioning) to interact to potentially create a more significant effect on a receptor than if just one phase were assessed in isolation

79. **Receptor led effects:** Assessment of the scope for all relevant effects to interact, spatially and temporally, to create inter-related effects on a receptor (or group). Receptor-led effects might be short term, temporary or transient effects, or incorporate longer term effects.

6.6.9 Interactions

80. The effects identified and assessed for each topic have the potential to interact with each other, which could give rise to synergistic effects as a result of that interaction. The areas of interaction between effects are presented in each topic chapter, along with an indication as to whether the interaction may give rise to synergistic effects. This provides a screening tool for which effects have the potential to interact. There is then an assessment for each receptor (or receptor group) related to these effects in two ways. Firstly, the effects are considered within a development phase (i.e., construction, operation, maintenance or decommissioning) to see if, for example, multiple construction effects could combine. Secondly, a lifetime assessment is undertaken which considers the potential for effects on receptors across development phases.

6.6.10 Cumulative Effects Assessments

81. A cumulative effect results from changes caused by other past, present, or reasonably foreseeable actions when considered together with the Onshore Project. The cumulative effects assessments (CEA) therefore consider other reasonably foreseeable development-related activities occurring within a similar timeframe to the construction and operation of the Onshore Project, for which there is reasonable information upon which to base a meaningful assessment. The specific combined project elements are assessed cumulatively first and then cumulatively with all other projects. The CEA considers the Onshore Project cumulatively the Offshore Project.

82. CEA forms part of the EIA process and is undertaken as part of each technical chapter impact assessment. The scope of the CEA (in terms of relevant issues and projects) has been established with consultees during the EIA process. Additionally, experience from previous relevant UK projects has been considered as well as continuing work from industry-wide initiatives with regard to cumulative effects.

83. The Planning Inspectorate Advice Note Nine and its complimentary guidance in Advice Note 17 provides guidance on the approach to CEA. Where it is helpful to do so, 'tiers' of these other projects' statuses have been defined as well as the availability of information to be used within the CEA. This approach is based on the three-tier system proposed in Planning Inspectorate Advice Note 17. Although Advice Note 17 was produced for Nationally Significant Infrastructure Projects, it is being adopted as best practice across different consenting regimes. The guidance advises that the following plans and projects should be considered in the CEA:

- Tier 1:
  - Projects that are under construction
  - Permitted applications, not yet implemented
  - Submitted applications, not yet determined.

- Tier 2:
  - Projects on the Planning Inspectorate's Programme of Projects, where a scoping report has been submitted.

- Tier 3:
  - Projects on the Planning Inspectorate's Programme of Projects, where a scoping report has not been submitted
  - Development identified in relevant Development Plans, with weight being given as they move closer to adoption and recognising that much information on any relevant proposals will be limited
  - Projects identified in other policy documents as development reasonably likely to come forward.

84. The Planning Inspectorate's Advice Note 17 on the assessment of cumulative effects (ref 5-6) identifies a four-stage approach as follows:

- **Stage 1: Establishing the long list of 'other existing development and/or approved development'.** An initial long list of projects (see **Chapter 7: Consultation**) was developed in consultation with stakeholders, based on the zone of influence (ZOI) approach identified in Guidance Note 17 (PINS, 2019)
- **Stage 2**: **Establishing a short list of 'other existing development and/or approved development'.** Following the creation of a long list at Stage 1, all

projects and plans were screened, based on the potential for interaction with the Onshore Project. As interactions maybe either temporal, spatial or conceptual, on that basis, only projects which are reasonably well described and sufficiently advanced to provide information on which to base a meaningful and robust assessment have been included in the CEA

- **Stage 3: Information gathering on the short listed 'other existing development and/or approved development'.** This involved compilation of publicly available reports, plans and drawings for the short-listed developments to inform the assessment
- **Stage 4: Assessment of cumulative effects.** Assessment have been undertaken on consented parameters is the public domain. Projects which are in construction during the site characterisation for the Onshore Project have been considered as part of the baseline for the EIA.

85. For some topics (where for example the receptors include highly mobile or migratory species) the CEA has a large geographic scale and involve many plans and projects, for others where receptors (or impact ranges) are more spatially fixed the CEA is narrower. The scope of the CEA has therefore been established on a topic-by-topic basis with the relevant consultees during the EIA process.

86. Consultation has been undertaken with NDC regarding onshore plans or projects that may be considered. It has been agreed that major planning applications either decided or in the system since 2020 should be considered. These have been identified as major by the government performance codes:

- N01 - Major dwellings
- N02 - Major Office/R and D/Light Industrial
- N03 - Major General Industry/Storage/Warehousing
- N04 - Major Retail and Service
- N05 - Major Traveller caravan pitches
- N06 - All other major development.

87. Definitions of major development are identified in the NPPF.

88. The list of plans or projects included in the CEA is specific to each topic and is detailed in each technical chapter (**Chapter 8** to **24**) and has been developed as part of an on-going consultation with technical consultees.

6.6.11 Transboundary Impacts

89. The United Nations Economic Commission for Europe (UNECE) Convention on Environmental Impact Assessment in a Transboundary Context (referred to as the Espoo Convention) requires that assessments are extended across borders between Parties of the Convention when a planned activity may cause significant adverse transboundary impacts.

90. Regulation 32 of the EIA Regulations sets procedures to address issues associated with a development that might have a significant impact on the environment in another European Economic Area (EEA) member state.

91. The procedures involve providing information to the member state and for the Planning Inspectorate to enter into consultation with that member state regarding the likely significant transboundary effects of the development and the associated mitigation measures. Further advice on transboundary issues, in particular with regard to consultation is given in the Planning Inspectorate Advice Note Twelve (Planning Inspectorate, 2020b).

92. Transboundary impacts, like cumulative effects are considered on a topic-by-topic basis for offshore topics and are not relevant to the Onshore Project topics.

6.7 Assumptions, Limitations and Uncertainties

93. The ES provides a clear documentary trail of the analysis used to arrive at conclusions, including a description of data and methods used, together with descriptions of the reliability and certainty of the results.

94. Nevertheless, some uncertainty is inherent in the EIA process.

- Limitations in identifying and describing baseline conditions: There may exist limited or no access to inspect relevant datasets or to physically access sites / areas to survey and describe the existing environment
- Dynamic nature of existing or baseline conditions: Baseline conditions presented in this assessment have been assumed to be accurate at the time of surveying, with the acknowledgement that due to the dynamic nature of the environment, these conditions may change over the 25-year operational phase of the Onshore Project
- Uncertainties in the Onshore Project Design: During the preliminary design phase of the Onshore Project, several uncertainties exist relating to the Onshore Project design and construction methodology. Consequently, a range of parameters are used for assessment, using a project design envelope or 'Rochdale Envelope approach', as outlined in **Section 6.4** above

- Uncertainties inherent in the assessment process: Uncertainties may be present to varying degrees in the determination or describing of the nature, intensity, complexity, probability, the expected onset, duration, frequency and reversibility of an impact
- Uncertainties around other plans and projects: There may be uncertainties around the nature and timing of other plans and projects, that may give rise to cumulative effects.

95. Consequently, a precautionary or worst-case scenario approach has been taken where such uncertainties and limitations exist. For example, this includes the assumption of presence of protected species / habitats where surveys were incomplete or inconclusive, or in determining the potential impact of assessment, based on relevant project parameters.

96. Where relevant, any assumptions, limitations and uncertainties within the EIA process are detailed in each topic chapter, residual uncertainties within the assessment are identified, along with any measures proposed to appropriately mitigate any significant effects which may arise.

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White Cross Windfarm EIA Scoping Opinion Report (MMO Ref: EIA/2022/00002).

WHITE CROSS

White Cross Offshore Windfarm Environmental Statement

Appendix 6.A: Habitats Regulations Assessment: Report to Inform Appropriate Assessment

Document Code:	FLO-WHI-REP-0002-06	
Contractor Document Number:	PC2978-RHD-ZZ-XX-RP-Z-0141	
Version Number:	00	
Date:	*16/08/2023*	
Prepared by:	*RHDHV, APEM*	*Electronic Signature*
Checked by:	*CB / PT*	*Electronic Signature*
Owned by:	*AH*	*Electronic Signature*
Approved by Client:	*MJ*	*Electronic Signature*

Version Number	**Reason for Issue / Major Changes**	**Date of Change**
00	For Issue	16/08/2023

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Glossary of Acronyms

Acronym	Definition
ADDs	Acoustic Deterrent Devices
AfL	Agreement for Lease
AOD	Above Ordnance Datum
AEoI	Adverse Effect on Integrity
AoS	Area of Search
ASCOBANS	Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas
BAS	Burial Assessment Study
BATNEEC	Best available technology not entailing excessive costs
BEIS	Department for Business, Energy and Industrial Strategy
BGS	British Geological Society
BSI	British Standards Institution
CAA	Civil Aviation Authority
CBRA	Cable Burial Risk Assessment
Cefas	Centre for the Environment and Fisheries and Aquaculture Science
CEMP	Construction Environmental Management Plan
CL	Critical Level
DECC	Department for Energy and Climate Change
Defra	Department for Environment, Food and Rural Affairs
DESNZ	Department for Energy Security and Net Zero
DMP	Dust Management Plan
EIA	Environmental Impact Assessment
EMF	Electromagnetic Frequency
EPS	European Protect Species
ES	Environmental Statement
EU	European Union
GPS	Global Positioning System
ha	Hectare
HRA	Habitats Regulation Assessment
IAMMWG	Inter-Agency Marine Mammal Working Group
ICES	International Council for the Exploration of the Sea
IUCN Red List	The International Union for Conservation of Nature's Red List of Threatened Species
JNCC	Joint Nature Conservancy Committee
km	Kilometre
km^2	Square kilometre
LPA	Local Planning Authority
m	Metre

Acronym	Definition
MCA	Maritime and Coastguard Agency
MCZ	Marine Conservation Zone
MGN	Marine Guidance Note
MMMP	Marine Mammal Mitigation Protocol
MMO	Marine Management Organisation
MU	Management Units
MW	Megawatts
N-dep	Nutrient nitrogen
NDC	North Devon Council
NE	Natural England
NGC	National Grid Company
nm	Nautical Mile
NOAA	National Oceanic and Atmospheric Administration
NO_x	Nitrogen oxides
NH_3	Ammonia
NRMM	Non-Road Mobile Machinery
OFTO	Offshore Transmission Owner
OS	Ordnance Survey
OWF	Offshore Wind Farm
WCOWL	White Cross Offshore Wind Ltd
PDE	Project Design Envelope
PEMP	Project Environmental Management Plan
PINS	Planning Inspectorate
PTS	Permanent Threshold Shift
RIAA	Report to Inform an Appropriate Assessment
RSPB	Royal Society for the Protection of Birds
S.36	Section 36 Consent
SAC	Special Area of Conservation
SCANS-III	Small Cetaceans in the European Atlantic and North Sea
SCI	Site of Community Importance
SCOS	Special Committee on Seals
SELcum	Cumulative impact from Sound Exposure Level
SELss	Sound Exposure Level for a single strike
SMRU	Sea Mammal Research Unit
SNCB	Statutory Nature Conservation Body
SPA	Special Protection Area
SPLpeak	Peak Sound Pressure Level
SSSI	Site of Special Scientific Interest

Acronym	Definition
TCPA	Town and Country Planning Act
TJB	Transition Joint Bay
TTS	Temporary Threshold Shift
UK	United Kingdom
UXO	Unexploded Ordnance
WTG	Wind Turbine Generator
WWT	Wildfowl and Wetlands Trust

Glossary of Terminology

Defined Term	Description
Agreement for Lease	An Agreement for Lease (AfL) is a non-binding agreement between a landlord and prospective tenant to grant and/or to accept a lease in the future. The AfL only gives the option to investigate a site for potential development. There is no obligation on the developer to execute a lease if they do not wish to.
Applicant	White Cross Offshore Windfarm Limited.
Commitment	A term used interchangeably with mitigation. Commitments are Embedded Mitigation Measures. Commitments are either Primary (Design) or Tertiary (Inherent) and embedded within the assessment at the relevant point in the EIA (e.g. at Scoping). The purpose of commitments is to reduce and/or eliminate Likely Significant Effects (LSE's), in EIA terms.
Cumulative effects	The effect of the Project taken together with similar effects from a number of different projects, on the same single receptor/resource. Cumulative impacts are those that result from changes caused by other past, present or reasonably foreseeable actions together with the Project.
Department for Energy Security and Net Zero (DESNZ)	Government department that is responsible for business, industrial strategy, science and innovation and energy and climate change policy and consent under Section 36 of the Electricity Act.
Project Design Envelope	A description of the range of possible elements that make up the Project design options under consideration. The Project Design Envelope, or 'Rochdale Envelope' is used to define the Project for Environmental Impact Assessment (EIA) purposes when the exact parameters are not yet known but a bounded range of parameters are known for each key project aspect.
Development Area	The area comprising the Onshore Development Area and the Offshore Development Area.
Engineer, Procure, Construct and Install	A common form of contracting for offshore construction. The contractor takes responsibility for a wide scope and delivers via own and subcontract resources.
Environmental Impact Assessment (EIA)	Assessment of the potential impact of the proposed Project on the physical, biological and human environment during construction, operation and decommissioning.
Export Cable Corridor	The area in which the export cables will be laid, either from the Offshore Substation or the point at which the inter-array cables converge (if no offshore substation), to the National Grid Company (NGC) Onshore Substation comprising both the Offshore Export Cable Corridor and Onshore Export Cable Corridor.
Front end engineering and design	Front-end engineering and design (FEED) studies address areas of windfarm system design and develop the concept of the windfarm in advance of procurement, contracting and construction.

Defined Term	Description
Generation Assets	The infrastructure of the Project related to the generation of electricity within the windfarm site, including wind turbine generators, substructures, mooring lines, seabed anchors and inter-array cables.
Grid Connection Point	The point at which the White Cross Offshore Windfarm connects into the distribution network at the National Grid's East Yelland Substation and the distributed electricity network. From East Yelland Substation electricity is transmitted to Alverdiscott where it enters the national transmission network.
High Voltage Alternating Current	High voltage alternating current is the bulk transmission of electricity by alternating current (AC), whereby the flow of electric charge periodically reverses direction.
High Voltage Direct Current	High voltage direct current is the bulk transmission of electricity by direct current (DC), whereby the flow of electric charge is in one direction.
In-combination effects	In-combination effects are those effects that may arise from the development proposed in combination with other plans and projects proposed/consented but not yet built and operational.
Inter-array cables	Cables which link the wind turbines to each other and the Offshore Substation Platform, or the point at which the inter-array cables converge (if no offshore substation).
Interconnecting Cable	The cables that will connect the new White Cross Onshore Substation to the existing East Yelland Substation and the Grid Connection Point.
Joint / Jointing bay	Underground structures constructed at regular intervals along the Onshore Export Cable Corridor to join sections of cable and facilitate installation of the cables into the buried ducts.
Landfall	Where the offshore export cables come ashore.
Link boxes	Underground chambers or above ground cabinets next to the cable trench housing electrical earthing links.
Mean high water springs	The average tidal height throughout the year of two successive high waters during those periods of 24 hours when the range of the tide is at its greatest.
Mean low water springs	The average tidal height throughout a year of two successive low waters during those periods of 24 hours when the range of the tide is at its greatest.
Mean sea level	The average tidal height over a long period of time.
Mitigation	A term used interchangeably with Commitment(s). Mitigation measures (Commitments) are embedded within the assessment at the relevant point in the EIA (e.g. at Scoping).
Offshore Development Area	The Windfarm Site (including wind turbine generators, substructures, mooring lines, seabed anchors, inter-array cables and Offshore Substation Platform (as applicable)) and Offshore Export Cable Corridor to MHWS at the Landfall. This encompasses the part of the project that is the focus of this application and Environmental Statement and the parts of the project consented under Section 36 of the Electricity Act and the Marine and Coastal Access Act 2009.

Defined Term	Description
Offshore Environmental Statement (ES)	The Environmental Statement (ES) as part of the applications for consent under Section 36 of the Electricity Act 1989 and Marine Licences under the Marine and Coastal Access Act (2009) for the offshore components of the Project.
Offshore Export Cables	The cables which bring electricity from the Offshore Substation Platform or the inter-array cables junction box to the Landfall.
Offshore Export Cable Corridor	The proposed offshore area in which the export cables will be laid, from Offshore Substation Platform or the inter-array cables junction box to the Landfall.
Offshore Infrastructure	All of the offshore infrastructure including wind turbine generators, substructures, mooring lines, seabed anchors, Offshore Substation Platform and all cable types (export and inter-array). This encompasses the infrastructure that is the focus of this application and Environmental Statement and the parts of the project consented under Section 36 of the Electricity Act and the Marine and Coastal Access Act 2009.
Offshore Substation Platform	A fixed structure located within the Windfarm Site, containing electrical equipment to aggregate the power from the wind turbines and convert it into a more suitable form for export to shore.
Offshore Transmission Assets	The aspects of the project related to the transmission of electricity from the generation assets including the Offshore Substation Platform (as applicable)) or offshore junction box, Offshore Cable Corridor to MHWS at the Landfall.
Offshore Transmission Owner	An OFTO, appointed in UK by Ofgem (Office of Gas and Electricity Markets), has ownership and responsibility for the transmission assets of an offshore windfarm.
Onshore Development Area	The onshore area above MLWS including the underground onshore export cables connecting to the White Cross Onshore Substation and onward to the Grid Connection Point at East Yelland. The onshore development area will form part of a separate Planning application to the Local Planning Authority (LPA) under the Town and Country Planning Act 1990.
Onshore Environmental Statement (ES)	The Environmental Statement as part of the planning application under the Town and Country Planning Act (TCPA) 1990 for the onshore components of the Project.
Onshore Export Cables	The cables which bring electricity from MLWS at the Landfall to the White Cross Onshore Substation and onward to the Grid Connection Point at East Yelland.
Onshore Export Cable Corridor	The proposed onshore area in which the export cables will be laid, from MLWS at the Landfall to the White Cross Onshore Substation and onward to the Grid Connection Point at East Yelland.
Onshore Infrastructure	The combined name for all infrastructure associated with the Project from MLWS at the Landfall to the Grid Connection Point at East Yelland. The onshore infrastructure will form part of a separate Planning application to the Local Planning Authority (LPA) under the Town and Country Planning Act 1990.

Defined Term	Description
Onshore Transmission Assets	The aspects of the project related to the transmission of electricity from MLWS at the Landfall to the Grid Connection Point at East Yelland including the Onshore Export Cable, the White Cross Onshore Substation and onward connection to the Grid Connection Point at East Yelland.
Onshore Substation	Part of an electrical transmission and distribution system. Substations transform voltage from high to low, or the reverse by means of the electrical transformers.
Onshore Transmission Assets	The aspects of the project related to the transmission of electricity from MLWS at the Landfall to the Grid Connection Point at East Yelland including the Onshore Export Cable, the White Cross Onshore Substation and onward connection to the Grid Connection Point at East Yelland.
the Project	The Project for the offshore Section 36 and Marine Licence application includes all elements offshore of MHWS. This includes the infrastructure within the windfarm site (e.g. wind turbine generators, substructures, mooring lines, seabed anchors, inter-array cables and Offshore Substation Platform (as applicable)) and all infrastructure associated with the export cable route and Landfall (up to MHWS) including the cables and associated cable protection (if required).
Project Design Envelope (PDE)	The PDE is the spatial extent and range of design parameters within which the proposed development will be contained, constructed and operated. This includes the offshore export cable, the Transition Joint Bay, the onshore export cable, the White Cross Onshore Substation (and associated landscape planting and drainage), the Grid Connection Point, the temporary construction compounds, jointing bays, link boxes, access roads and haul roads, and the construction footprint relating to all of these.
Safety zones	A marine zone outlined for the purposes of safety around a possibly hazardous installation or works / construction area.
Service operation vessel	A vessel that provides accommodation, workshops and equipment for the transfer of personnel to turbine during OMS. Vessels in service today are typically up to 85m long with accommodation for about 60 people.
Scour protection	Protective materials to avoid sediment being eroded away from the base of the foundations as a result of the flow of water.
Transition Joint Bay	Underground structures at the Landfall that house the joints between the offshore export cables and the onshore export cables.
Transmission System Operator	The company that owns and operates the high voltage electricity transmission system, 275kV and 400kV, in the UK carrying electricity from the generators to the Distribution Network Operators. In the UK the Transmission System Operator is National Grid Electrical System Operator (ESO).
White Cross Offshore Windfarm	100MW capacity offshore windfarm including associated onshore and offshore infrastructure.
White Cross Onshore Substation	A new substation built specifically for the White Cross project. It is required to ensure electrical power produced by the offshore windfarm is compliant with NGC electrical requirements at the Grid Connection Point at East Yelland.

Defined Term	Description
Wind Turbine Generators (WTG)	The wind turbine generators convert wind energy into electrical power. Key components include the rotor blades, nacelle (housing for electrical generator and other electrical and control equipment) and tower. The final selection of project wind turbine model will be made post-consent application.
Windfarm Site	The area within which the wind turbines, Offshore Substation Platform and inter-array cables will be present.
Works completion date	Date at which construction works are deemed to be complete and the windfarm is handed to the operations team. In reality, this may take place over a period of time.

1. Introduction

1.1 Purpose of this Document

1. The purpose of the 'Habitats Regulations Assessment (HRA) – Report to Inform Appropriate Assessment (RIAA)' is to provide the information necessary for the competent authority to carry out the HRA of the proposed White Cross Offshore Windfarm ('the Project') on the integrity of European and Ramsar sites. The HRA process derives from the requirements of specific European Directives, and the UK Regulations that implement their requirements in national law, which are outlined in Section 2 of this report. This HRA report is submitted alongside:

   - the Environmental Statement (ES) as part of the applications for consent under Section 36 of the Electricity Act 1989 (Offshore ES)
   - the ES for relevant Marine Licences under the Marine and Coastal Access Act (2009) for the offshore components of the Project
   - the ES as part of the planning application under the Town and Country Planning Act (TCPA) 1990 for the onshore components of the Project (the Onshore ES).

2. In addition to fully designated Special Areas of Conservation (SACs) and fully classified Special Protection Areas (SPAs), the HRA process must also be applied as a matter of law or policy to the following sites (also referred to as 'Natura 2000' sites in the EU or 'National Site Network' sites in the UK):

   - Sites of Community Importance (SCI)
   - Potential SPAs (pSPAs)
   - Possible SACs (pSACs)
   - Candidate SACs (cSACs)
   - Listed and proposed Ramsar sites (internationally important wetlands designated under the Ramsar Convention 1971).

3. This report therefore covers potential effects upon the following:

   - Onshore (above MLWS):

     - Terrestrial ecology – features of National Site Network sites (SCIs, cSACs and SACs as appropriate)
     - Onshore ornithology – features of National Site Network sites (SPAs and SCIs as appropriate)

   - Offshore (below MHWS):

  - Benthic ecology – Habitats Directive Annex I (SACs, SCIs and cSACs as appropriate)
  - Fish ecology – Habitats Directive Annex II Species (SACs, SCIs and cSACs as appropriate)
  - Marine mammals – Habitats Directive Annex II Species (SACs, SCIs and cSACs as appropriate)
  - Offshore ornithology – features of National Site Network sites (SPAs, pSPAs and Ramsar sites, including rare and vulnerable birds (as listed on Annex I of the Birds Directive), and regularly occurring migratory species).

4. The structure of this HRA Report is as follows:

- **Section 1** (this section): Introduction to the document and the structure of the assessment
- **Section 2** – Legislation, Policy and Guidance: This section provides the legislative context and details the policy and guidance given by a number of Governmental, statutory and industry bodies in relation to the HRA process.
- **Section 3** – Project Description: An outline of the Project is given with regard to the location of the project infrastructure and the construction, operation and maintenance, and decommissioning.
- **Section 4** – Approach to HRA: Provides an overview of the HRA Process and the approach taken by the Applicant.
- **Section 5** – Screening: This section summarises the screening process and outcomes that have been consulted on during the development of the application. The screening report is provided in **Annex A**
- **Section 6** – Annex I Habitats (and associated Annex II Species)
- **Section 7** – Annex II Species (Marine Mammals)
- **Section 8**– Annex II Species (Ornithology)
- **Section 9** - Annex II Species (Fish).

2. Legislation, Policy and Guidance

2.1 Overview

5. The HRA process covers those features designated under the European Council Directive 2009/147/EC on the conservation of wild birds (the 'Birds Directive') and Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora (the 'Habitats Directive'). These are implemented into UK legislation by the Conservation of Habitats and Species Regulations 2017 and the Conservation of Offshore Marine Habitats and Species Regulations 2017. The UK also has to meet its obligations under relevant international agreements such as the Ramsar Convention.

6. The UK exited the EU on 31st January 2020. The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019 provide amendments to the Habitats Regulations to enable their continued operation following the UK's exit from the EU.

2.2 European Legislation

2.2.1 The Birds Directive

7. The Birds Directive provides a framework for the conservation and management of wild birds in Europe. The relevant provisions of the Directive are the identification and classification of SPAs for rare or vulnerable species listed in Annex I of the Directive and for all regularly occurring migratory species (required by Article 4). The Directive requires national Governments to establish SPAs and to have in place mechanisms to protect and manage them. The SPA protection procedures originally set out in Article 4 of the Birds Directive have been replaced by the Article 6 provisions of the Habitats Directive.

2.2.2 The Habitats Directive

8. The Habitats Directive provides a framework for the conservation and management of natural habitats, wild fauna (except birds) and flora in Europe. Its aim is to maintain or restore natural habitats and wild species at a favourable conservation status. The relevant provisions of the Directive are the identification and classification of Special Areas of Conservation (SAC) (Article 4) and procedures for the protection of SACs and SPAs (Article 6). SACs are identified based on the presence of natural habitat types listed in Annex I and populations of the species listed in Annex II. The Directive requires national Governments to establish SACs and to have in place mechanisms to protect and manage them.

2.2.3 The Ramsar Convention

9. The Convention on Wetlands of International Importance especially as Waterfowl Habitat, as amended in 1982 and 1987 (the 'Ramsar Convention') is an international treaty for the conservation and sustainable use of wetlands of international importance. Ramsar site selection has had an emphasis on wetlands of importance to waterbirds, however non-bird features are increasingly taken into account, both in the selection of new sites and when reviewing existing sites. The UK government and the devolved administrations have issued policy statements relating to Ramsar sites which extend to them the same protection at a policy level as SACs and SPAs. Ramsar sites are therefore included in the HRA process.

2.3 UK National Legislation

10. The Conservation of Habitats and Species Regulations 2017, the Conservation of Offshore Marine Habitats and Species Regulations 2017, and the Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019.

11. These regulations (hereafter the 'Habitats Regulations') together with the Wildlife and Countryside Act 1981 transpose the Habitats and Birds Directives into UK legislation covering terrestrial areas out to and including the UK Offshore Marine Area with the exception of within Scottish territorial waters, where The Conservation (Natural Habitats, &c.) Regulations 1994 continue to apply.

12. The Conservation of Habitats and Species Regulations 2019 make changes to the 2017 Habitats Regulations so that they continue to work (are operable) following the UK's exit from the EU on 31st January 2020. While the basic legal framework for HRA is maintained, the EU Exit Regulations transfer functions previously undertaken by the European Commission (EC) to UK Ministers. Furthermore, where the Habitats Regulations continue to use the term European sites, those sites now form part of a "National Site Network" and not the European "Natura 2000" site network.

13. The Habitats Regulations place an obligation on 'competent authorities' to carry out an appropriate assessment of any proposal likely to significantly affect a designated site, to seek advice from Natural England and not to approve an application that would have an adverse effect on a designated site unless certain conditions are met (where there are no alternative solutions, the plan or project can only proceed if there are imperative reasons of over-riding public interest and if the necessary compensatory measures can be secured). The competent authority in the case of the proposed Project is the Marine Management Organisation (MMO) for the Section

36 and Marine Licences, and North Devon Council (NDC) for the planning permission.

2.4 Policy and Guidance

14. In addition to the legislation outlined above, the HRA will give consideration to all relevant guidance and policies issued by a number of Governmental, statutory and industry bodies. Note that we have identified The Planning Inspectorate guidance for best practice.

2.4.1 Government Guidance

15. Guidance from Government bodies considered in the preparation of this HRA includes:

- Department for Environment, Food & Rural Affairs: Guidance on Habitats regulations assessments: protecting a European site; how a competent authority must decide if a plan or project proposal that affects a European site can go ahead.
- European Commission: Assessment of Plans and Projects Affecting Natura 2000 Sites
- European Commission: EU Guidance on wind energy development in accordance with EU nature legislation
- Department of Communities and Local Government: Guidance on 'Planning for the Protection of European Sites: Appropriate Assessment'
- The Planning Inspectorate Advice Note Nine: Using the Rochdale Envelope
- The Planning Inspectorate Advice Note Ten: Habitats Regulations Assessment relevant to nationally significant infrastructure projects.
- The Planning Inspectorate Advice Note Seventeen: Cumulative Effects Assessment
- Department of Energy and Climate Change: Guidelines on the Assessment of Transboundary Impacts of Energy Developments on Natura 2000 Sites outside the UK.

2.4.2 Statutory Nature Conservation Bodies Guidance

16. Key guidance from Statutory Nature Conservation Bodies (SNCBs) considered in the preparation of this HRA includes:

- English Nature: Habitats Regulations Guidance Note (HRGN) 1: The Appropriate Assessment (Regulation 48) The Conservation (Natural Habitats &c) Regulations, 1994

- English Nature: Habitats Regulations Guidance Note (HRGN) 3: The Determination of Likely Significant Effect under the Conservation (Natural Habitats &c) Regulations, 1994
- English Nature: Habitats Regulations Guidance Note (HRGN) 4: Alone or in-combination
- Natural England and JNCC: Interim advice on HRA screening for seabirds in the non-breeding season
- Natural England and JNCC: Advice on HRA screening for seabirds in the breeding season
- Natural England and JNCC: Interim Advice Note – Presenting information to inform assessment of the potential magnitude and consequences of displacement of seabirds in relation to Offshore Windfarm Developments.

17. Details of any further topic specific guidance used are provided in **Sections 6** to **9**.

2.4.3 Industry Guidance

18. Industry guidance considered in the preparation of this HRA includes:

- Developing Guidance on Ornithological Cumulative Impact Assessment for Offshore Wind Farm Developers (King *et al*., 2009)
- Cumulative Impact Assessment Guidelines – Guiding Principles for Cumulative Impacts Assessment in Offshore Wind Farms (RenewableUK, 2013).

3. Project Description

3.1 Introduction

19. This chapter provides a full description of components and installation required for construction, operation, and decommissioning of the Project. The details provided inform and underpin the assessments that have been undertaken, with realistic worst-case scenarios applied to each habitat or species-specific assessment.

20. The set of consents/permission required in order for the Project to proceed are outlined below:

- Consent under the Section 36 of the Electricity Act 1989 (S.36) and a Marine Licence under the Marine and Coastal Access Act 2009 (MCAA 2009) are required for the following generation assets (within the Windfarm Site):
  - Wind Turbine Generators
  - Semi-submersible floating platforms
  - Subsea catenary mooring lines
  - Anchoring solutions (drag embedment anchors, suction anchor or pin piles)
  - Inter-array cables and associated protection
  - Other associated offshore infrastructure, such as navigational markers.
- A second Marine Licence is required to enable the option for an Offshore Transmission Owner (OFTO) to be appointed under The Electricity (Competitive Tenders for Offshore Transmission Licences) Regulations 2015 for the following transmission assets:
  - OSP Platform (OSP)
  - Offshore export cable (to Mean High Water Springs (MHWS) at Landfall)
  - Other associated offshore infrastructure, such as navigational markers
  - Taw Estuary Crossing (between MHWS on the northern edge to MHWS on the southern edge).
- A separate planning permission under the Town and Country Planning Act 1990 (TCPA 1990) is required for the Onshore (landward of Mean Low Water Springs (MLWS)) transmission assets:
  - Onshore export cables
  - White Cross Onshore Substation
  - Onshore export cables (66kV from Landfall to onshore substation and 132kV from the White Cross Onshore Substation to NGC Grid Connection Point)
  - Temporary main construction compound and temporary construction compounds

  - Transition Joint Bay (TJB), jointing bays, link boxes, access roads and haul roads.

3.2 Project Design Envelope

21. At this stage in the development of the Project, the proposed description is indicative, and a project design envelope (PDE) approach has been utilised in order to undertake the Environmental Impact Assessment (EIA) and support the information for Appropriate Assessment. This is a standard approach and is widely accepted by all stakeholders.

22. The PDE sets out a series of design options for the Project and has a reasoned best and worst-case extent for several key parameters. The final design would lie between the minimum and the maximum extent of the consent sought, for all aspects of the Project; this includes spatial and temporal elements, and the proposed methodology to be employed.

23. The PDE is used to establish the extent to which the Project could impact on the environment. The final detailed design of the Project will fall within this ‘envelope’, allowing for detailed design work to be undertaken post-consent without rendering the assessment inadequate.

24. Therefore, the information presented in this chapter outlines the options and flexibility required and the range of potential design and activity parameters upon which this assessment has been made.

25. The need for flexibility in the consent is a key aspect of any large development but is particularly significant for offshore wind projects where technology continues to evolve quickly. The PDE must therefore provide sufficient flexibility to enable the Applicant and its contractors to use the most up to date, efficient and cost-effective technology and techniques in the construction, operation, maintenance and decommissioning of the Project, without compromising the surrounding environment further than the worst-case scenarios assessed in this report.

26. Where appropriate, each technical assessment contains a section detailing the realistic worst-case scenario for specific Annex I and II receptors and impacts. These realistic worst-case scenario sections are derived from the information provided in this section.

27. Design work is ongoing with the intention that the more detailed design work will be completed post-consent. In addition, post-consent/pre-construction site investigation will further inform detailed design. Key aspects for which flexibility will be required include the following for the offshore components of the Project:

- Wind Turbine Generator (WTG) capacity parameters are required due to the potential evolution of technology prior to offshore construction of the Project.
- Number and dimensions of the floating substructures proposed due to the direct correlation with size and capacity of the selected WTG.
- Numbers and configuration of subsea mooring lines; linked to the dimensions of floating substructures and detailed engineering studies.
- Type of mooring line configuration and material i.e., catenary, taught or semi-taught systems may be used
- Type of mooring seabed anchor i.e., drag embedment anchors or suction, driven pin or drilled piles may be used depending on the dimensions of floating platforms and site-specific ground conditions
- WTG and associated inter-array cable layout.
- An Offshore Export Cable Corridor allows for the micro-routing of the cables within the identified corridor taking into account future detailed pre-installation surveys.
- Amount and exact location of cable protection along the offshore export cable is linked to site-specific ground conditions.
- Landfall construction method will be either trenchless technology or open-cut trenching allowing for unknown ground conditions
- Construction timing and methodologies are to be fully developed once project design is finalised and installation contractors are appointed.
- Operation and maintenance activities will be adjusted to the final as-built project requirements.
- Decommissioning timing and methodologies to be fully developed once project design is finalised.

28. Key aspects for which flexibility will be required include the following for the onshore components of the Project:

- Landfall construction method will be either via trenchless techniques or open-cut trenching, including potential use of cofferdams, allowing for unknown ground conditions.
- Onshore Export Cable Corridor allows for micro-siting of the cable route and, for example, crossings of existing utilities and other assets.
- Onshore substation maximum parameters allow for flexibility subject to detailed design.
- In certain areas, i.e., where trenchless techniques are to be used to install the onshore export cables, or where the Onshore Export Cables connect to the

Offshore Export Cables (TJB), or to accommodate temporary construction compounds, a wider site boundary is provided

- Construction timing and methodologies are to be fully developed once project design is finalised and installation contractors are appointed.
- Operation and maintenance activities will be adjusted to the final as-built project requirements.
- Decommissioning timing and methodologies to be fully developed once project design is finalised.

3.3 Offshore Components of the Project

3.3.1 Overview of the offshore components of the Project

29. An illustration of the main components of the Project is provided in **Plate 3.1.** The Offshore Export Cable(s) make landfall at Saunton Sands on the North Devon coast. The Project location is illustrated in **Figure 3.1**.

30. Above MHWS at Landfall, it will be connected to the Onshore Export Cable via a TJB located in Saunton Sands Car Park. The Onshore Export Cable travels approximately 8km at its maximum inland to a high voltage alternating current (HVAC) onshore substation. This will include a crossing below the Taw Estuary via trenchless technology. A new White Cross Onshore Substation will be constructed to accommodate the connection of the Project to the existing East Yelland Substation and grid connection. Further detail of these onshore components are presented in **Section 3.8**.

31. Once built, the Project will have a generating capacity of up to 100MW, with the key offshore components comprising:

- Six to eight semi-submersible floating platforms and Wind Turbine Generators (WTGs)
- One mooring system per substructure comprised of mooring lines (catenary, taught or semi-taught) and seabed anchors (drag embedment anchors or suction, driven pin or drilled piles)
- Up to ten dynamic inter-array cables and associated cable protection
- OSP (if required) with a fixed jacket substructure
- Other associated offshore infrastructure, such as navigational markers
- Offshore Export Cable connecting the offshore wind farm to the landfall and associated cable protection.

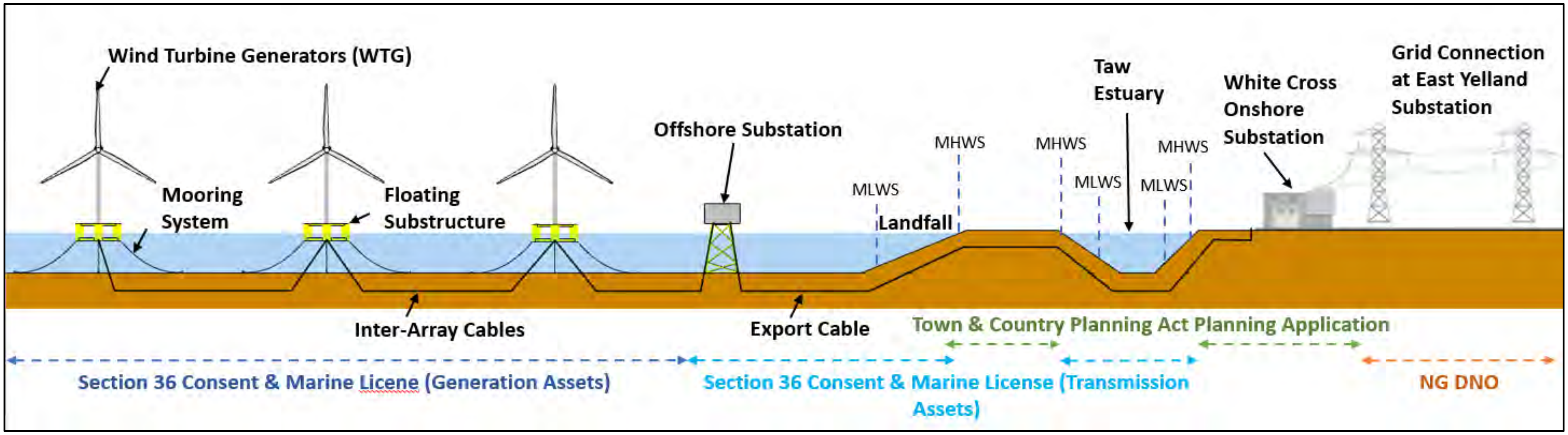
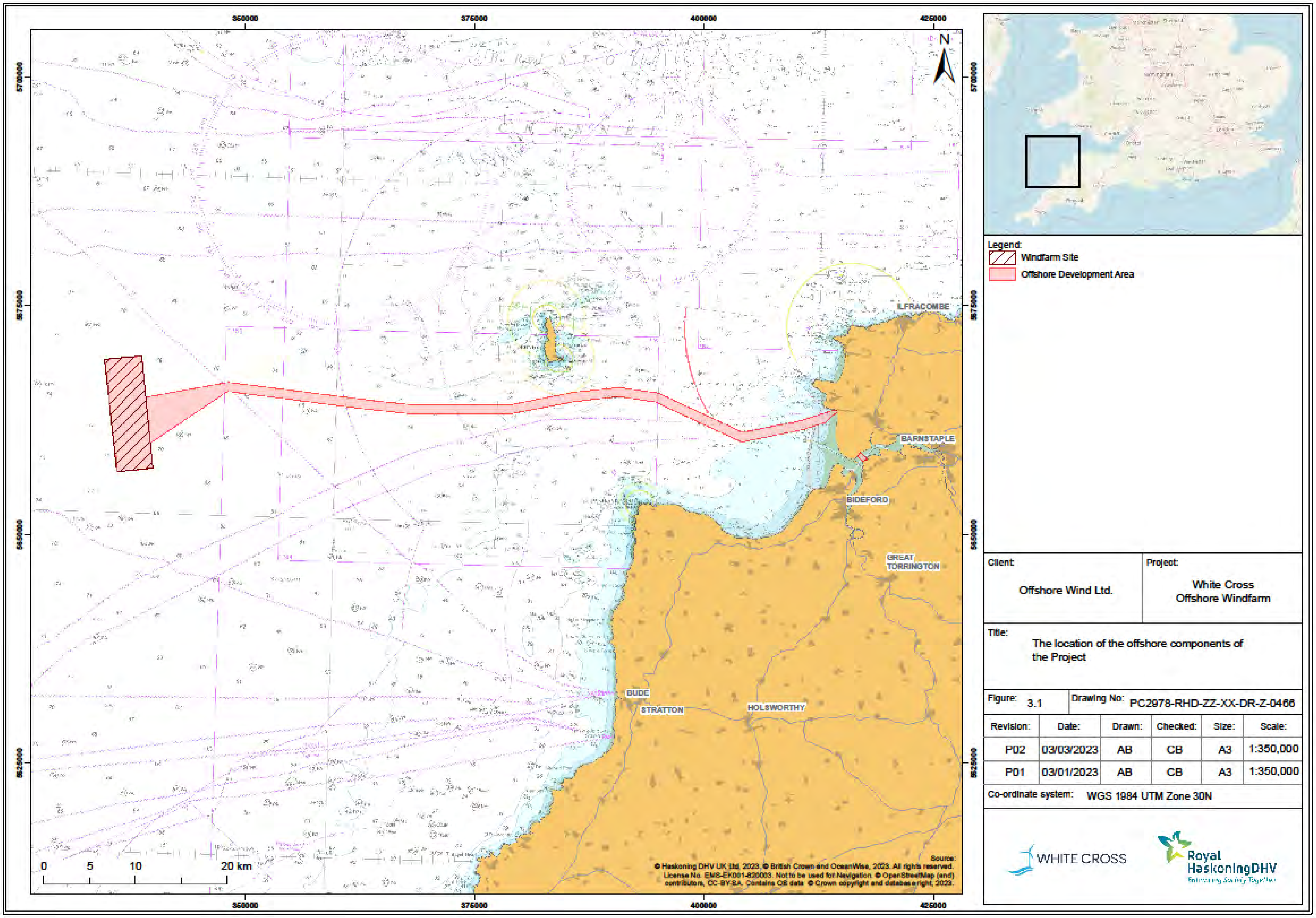


Plate 3.1 Project Infrastructure

Figure 3.1 The location of the offshore components of the Project



Revision:	Date:	Drawn:	Checked:	Size:	Scale:
P02	03/03/2023	AB	CB	A3	1:350,000
P01	03/01/2023	AB	CB	A3	1:350,000

Source:
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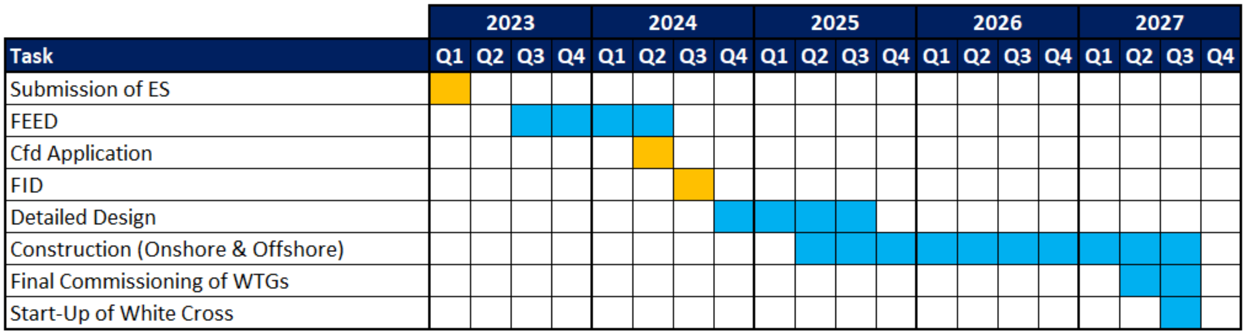
3.3.2 Overview of programme

32. It is anticipated that the realistic worst-case for construction of the Project will take 28 months (18 months for onshore fabrication and assembly of floating substructures and 16 months offshore construction activities). The operational phase of the Project will last for a minimum of 25 years, and up to 18 months for decommissioning the Project.

33. A high-level development and installation programme is provided in **Plate 3.2**.



	2023				2024				2025				2026				2027			
Task	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Submission of ES	🟨																			
FEED			🟦	🟦	🟦	🟦														
Cfd Application						🟨														
FID							🟨													
Detailed Design								🟦	🟦	🟦	🟦									
Construction (Onshore & Offshore)										🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦	
Final Commissioning of WTGs																		🟦	🟦	
Start-Up of White Cross																			🟦	

Plate 3.2 Indicative development and installation programme for the Project

3.4 Offshore Development Area – Generation Assets

3.4.1 The Windfarm Site

34. The Windfarm Site, is located approximately 52km north-west of the Cornwall and Devon coastline in a water depth of 69m – 78m LAT. The Windfarm Site covers approximately 50km^2. It is proposed an Agreement for Lease will be entered into with The Crown Estate to facilitate its use.

35. The key characteristics of the Windfarm Site are summarised in **Table 3.1**.

Table 3.1 White Cross Offshore Windfarm Site Overview

Area	Parameters	Values
AfL/Windfarm Site	Area	49.35km^2
	Closest distance to shore	52.5km
	Water depth	69m - 78m LAT

3.4.2 Wind Turbine Generators

36. The size and capacity of the WTGs that will be utilised in the Windfarm Site has yet to be selected and as such the Offshore Design Envelope is necessarily broad to accommodate the range of WTGs under consideration and innovations in currently

available WTG technologies. Each WTG will follow conventional offshore design architecture with three blades and a horizontal rotor axis. The Project Design Envelope covers a range of parameters and the worst-case impacts on the relevant receptor(s) have been assessed based upon these. Indicative parameters for the wind turbine generator design envelope for the Project are illustrated in **Plate 3.3** and **Table 3.2**.

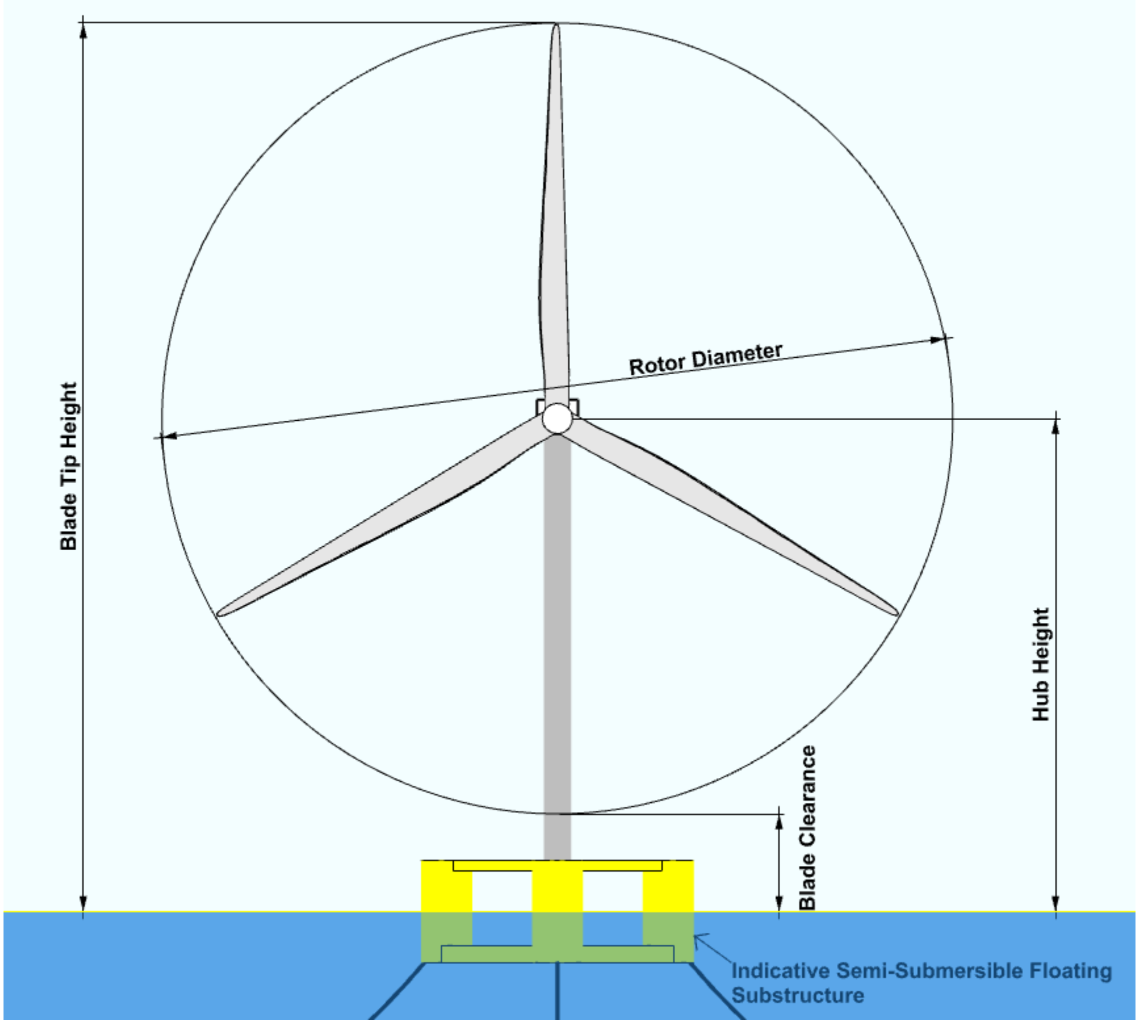


Plate 3.3 Illustration of the design parameter definition for a WTG

Table 3.2 Wind Turbine Generator Worst-case Parameters

WTG Parameter	Minimum	Maximum	Justification
WTG capacity (MW)	12	18	Theoretical maximum of 18MW WTG included to account for anticipated WTG technology development throughout Project design, noting this will be capped to the agreed total

WTG Parameter	Minimum	Maximum	Justification
			export capacity of the Project of up to 100MW where necessary.
Hub height (from MSL) (m)	n/a	153	Maximum is based on 18MW WTG.
Rotor diameter (m)	n/a	262	Maximum is based on 18MW WTG.
Rotor speed (rpm)	n/a	9	Based on information received from supplier.
Number of wind turbines	n/a	8	Maximum is based on eight 12MW WTGs.
Total rotor swept area (m^2)	n/a	323,477	Maximum is based on six 18MW WTGs with individual rotor swept areas of 53,913m^2 each. This individual rotor swept area value only applies to an 18MW WTG option. Although there could be a higher number of smaller capacity WTG, their corresponding individual total swept area are smaller and therefore the total rotor swept area will not exceed this value.
Tower diameter at top (m)	5	8	Based on information received from supplier.
Tower diameter at bottom (m)	6	10	Based on information received from supplier.
Max tip height (m) above MHWS	n/a	284	Maximum is based on an 18MW WTG height.
Air gap above MHWS (m)	22	n/a	22m is the minimum. 22m is set by the Marine and Coastguard agency for avoidance of collisions with vessels.
Indicative separation distance between turbines (in row) (m)	1,100	n/a	This value is based on 5 x the smallest rotor diameter under consideration.
Indicative separation distance between turbines (inter-row) (m)	2,200	n/a	This value is based on 10 x the smallest rotor diameter under consideration.

3.4.2.1 Lubricating oils, hydraulic oils and coolants

37. Components within each WTG will require lubricating oils, hydraulic oils and coolants for operation. Indicative maximum requirements for these oils and fluids for a single WTG are shown in **Table 3.3**.

38. These values are based on a realistic worst-case using a geared system, rather than a direct drive which would require less. All oils and fluids will be contained within the WTG in case of a spill.

Table 3.3 Indicative maximum requirements of lubricants within each WTG

Parameter	Maximum
Lubrication oil (Grease) per WTG (litres)	1,200
Synthetic oil / Hydraulic oil per WTG (litres)	20,000
Nitrogen (litres)	120,000
Cooling agent per WTG (Water/Glycerol) (litres)	16,000
Silicone Oil (litres)	14,000

39. All WTGs may also have diesel generators for construction, O&M activities. Generators are typically used for back-up power supply at the platform (crane lifting, etc.). Battery packs may also be used which can provide up to 60 hours of back-up power supply.

3.4.2.2 WTG Control System

40. Each WTG will operate automatically and have the ability to yaw (rotate the nacelle so the rotor blades face into the wind) and pitch its blades (where the blades rotate in to or out of the wind depending on wind speed). Each WTG is self-starting when the wind speed reaches the WTG cut-in speed (average of 3 metres per second (m/s) to 5 m/s [~10mph]). The power output increases with the wind speed until the wind speed reaches the WTG rated wind speed (typically 10 m/s to 13 m/s [~25 mph]). From this point as wind speed increases the power is regulated at rated (maximum) power. When the maximum operational wind speed (cut-out speed) is reached, typically 25 m/s to 30 m/s (about 60 mph), the WTG will cut-out (stop rotation and pitch blades out of wind). The maximum power and different wind speed regions are dependent on the WTG design.

41. All the WTGs will be connected to a central Supervisory Control and Data Acquisition (SCADA) system for the control of the windfarm remotely (via fibre optic cables, microwave, or satellite links). Fibre optic will be bundled with the electrical cores in a single cable (one cable per circuit). The SCADA monitors and controls the output from each WTG and has an integrated alarm system that will be automatically triggered in the event of a fault. Individual WTGs can also be controlled manually from within the WTG nacelle or tower base to control the WTG for commissioning or maintenance.

3.4.2.3 Adaption for climate change

42. The WTGs, floating substructures, moorings and inter-array cables will be designed considering environmental loads derived from a hindcast model. Hindcast models provide synthesised long term time series of wind, waves and currents that are correlated to measured conditions near to the project site. The Project design will

be based upon using a time series of data for the period 1979-2022. Therefore, the data captures the effects of climate change over this period. From this data WCOWL will determine the 10-year, 50-year and 100-year extreme event parameters for wind, wave and current and the offshore infrastructure will be designed to withstand these events. Through this WCOWL can be confident that the offshore infrastructure can maintain integrity throughout its minimum 25-year design life. There will also be annual inspections of the structures throughout their life cycle. Metocean monitoring systems are being considered which would allow WCOWL to monitor how conditions change throughout the project’s life.

3.4.3 Array Layout Description

43. An indicative WTG array layout is shown in **Figure 3.2**. This layout will be subject to an iterative optimisation process where refinement is made during each project design stage. The final layout selection will balance key project sensitivities such as WTG model choice, predominant wind direction, geophysical characteristics, metocean conditions, benthic habitats, floating substructure and anchor design, and navigational safety considerations. The array layout will consider the requirements of Marine Guidance Note MGN654 (MCA, 2021; and any subsequent versions) and the final array layout is proposed to be confirmed in consultation with the Regulator post consent and prior to the commencement of construction.

3.4.3.1 WTG Navigational Lighting Requirements and Colour Scheme

44. With respect to lighting and marking, the wind turbines and OSP topsides will be designed and constructed to satisfy the requirements of the Civil Aviation Authority (CAA), MCA and Trinity House Lighthouse Service (THLS).

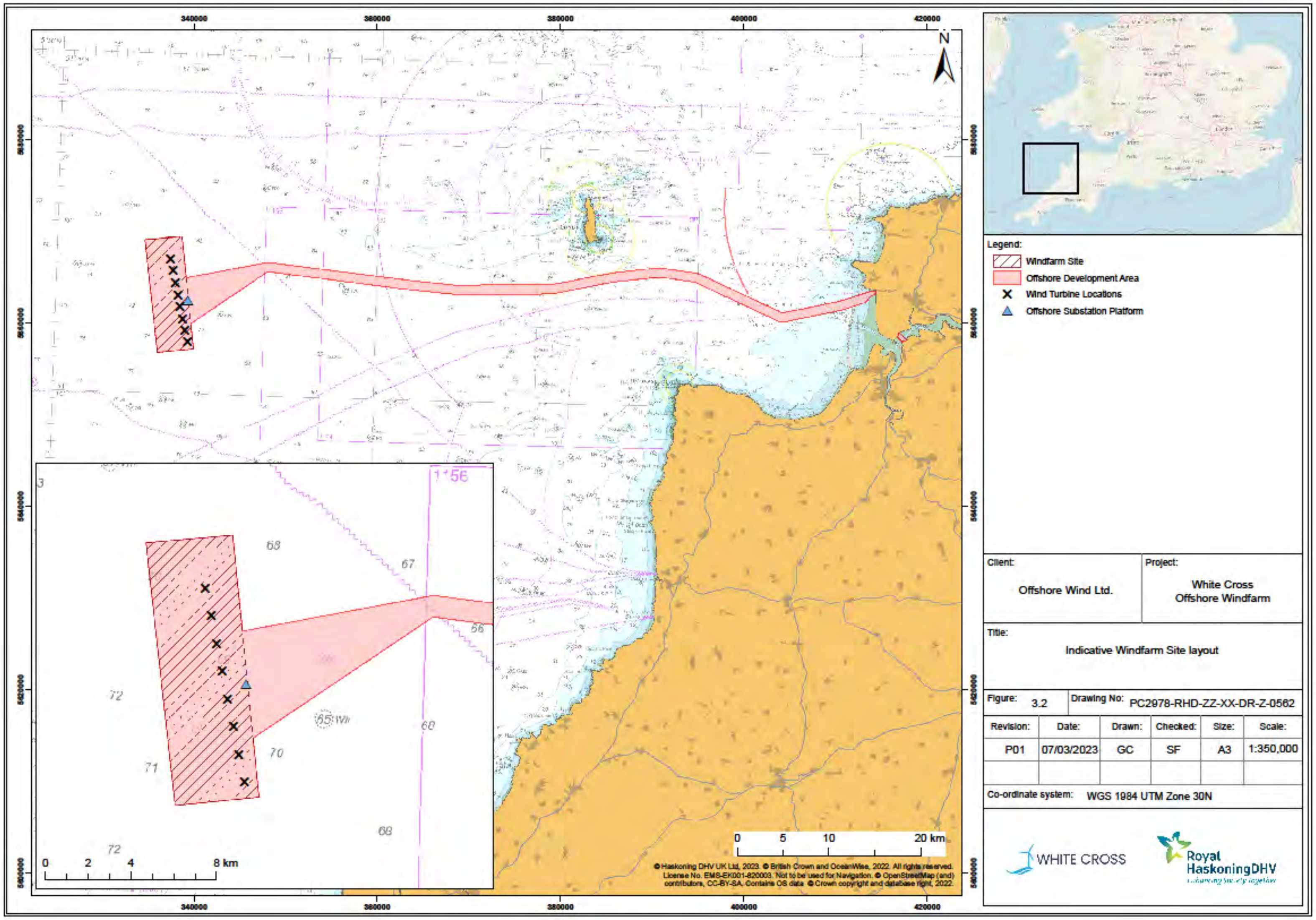
45. Further details including reference to the relevant guidance and regulations is presented in **Chapter 15: Shipping and Navigation** and **Chapter 17: Civil and Military Aviation** of the Offshore ES.

46. The colour scheme for nacelles, blades and towers is expected to be RAL 7035 (light grey).

3.4.3.2 Wind measurements

47. A fixed bottom offshore metmast will not be installed for wind measurements at site due to the prohibitively deep-water depth. Wind measurements are instead being collected by a floating LiDAR deployed within the Windfarm Site. The installation of floating LiDAR has been subject to a separate marine licence (reference: L/2022/00221/1).

Figure 3.2 Indicative Windfarm Site layout



3.4.4 Floating Substructures

48. The WTGs will be supported by floating substructures, the specific concept for which has not yet been selected. With many substructure concepts currently available on the market, each at varying stages of development, the project has completed a selection process and feasibility studies to understand which substructure types and concepts will be most suitable for the project. Through this selection process the number of substructure types has been reduced to one, semi-submersibles.

49. Each semi-submersible substructure concept has varying shapes and dimensions as a result of their particular approach to meeting the unique engineering challenges associated with floating WTGs and project-specific requirements. The floating substructure design envelope has been formulated to cover the range of technologies under consideration and largest WTG scenario.

50. Conventional fixed substructures were deemed not suitable for the project due to the prohibilitively deep water depth (>60m). Floating substructure enable WTGs to be installed in deeper waters further from shore where wind resource is larger. Floating substructures offer additional benefits in that their construction is largely onshore yard based, with significantly less offshore construction activity required. This reduces the environmental impacts of the offshore construction campaign and the cost and scheduling uncertainties traditionally associated fixed offshore windfarm construction.

3.4.4.1 Semi-Submersible Floating Substructure

51. A semi-submersible substructure is a buoyancy stabilised platform which floats semi-submerged on the surface of the ocean whilst anchored to the seabed (see illustration in **Plate 3.4**). The substructure gains its stability through the buoyancy force associated with its large footprint and geometry, which ensures the wind loadings on the structure and WTG are countered / dampened by the equivalent buoyancy force on the opposite side of the structure. These can be constructed in various configuration (varying number of columns arranged in varying layouts) but are typically comprised of several buoyancy columns interconnected by either pontoons, beams or braces (see illustration in **Plate 3.4**).

52. Semi-submersible substructures will also feature secondary structures such as boat landings, deck space, stairs/ladders and railings (for personnel access) and associated equipment (onboard davit crane, array cable hang-off etc.).

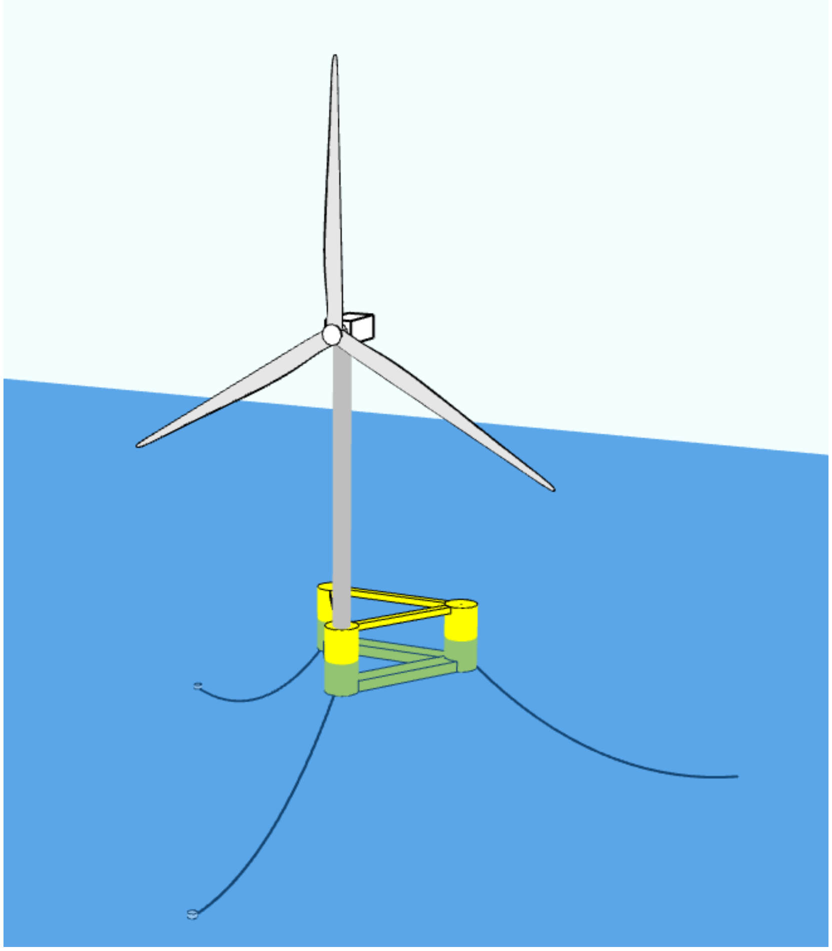


Plate 3.4 Illustration of characteristic semi-submersible floating substructure

53. A summary of the semi-submersible floating platform dimensions within the PDE are set out in **Table 3.4**.

Table 3.4 Semi-submersible floating platform parameter summary

Parameter	Minimum	Maximum
Number of columns per substructure	3	4
Overall length of each face (m)	n/a	125
Draft in operation (m)	n/a	20
Total substructure unit height (m)	25	35
Freeboard (in operation) (m)	10	20
Maximum footprint per substructure (base of hull assumed) (m^2)	1000	6600
Total maximum volume for floating substructures in operation (m^3)	50,000	110,000
Maximum excursion of hull from slack line position/neutral (m)	n/a	40
Primary material, colour & coating	Steel, RAL 1032 (traffic yellow), low-toxicity anti-fouling marine grade paint	

Parameter	Minimum	Maximum
Lighting	All walkways and boat landing, access platform/davit crane. All sensor activated. An 'Aids to Navigation Management Plan' will be developed with associated navigation markers and lighting (will require approval by the MCA and Trinity House post consent and prior to construction).	

3.4.5 Mooring Systems

54. The mooring system keeps the floating substructure in position during operation and extreme storm events (station-keeping) through a fixed connection to the seabed and is comprised of:

- Anchor
- Mooring line comprising the following single or combined material solutions:
    - Steel Chains
    - Steel Wire Ropes / Cables (multiple configurations)
    - Synthetic Ropes, such as nylon, polyester, polypropylene, kevlar, and high-density polyethylene.
- Various connectors and ancillaries to connect the mooring components and adjust the behaviour of the system:
    - Long-term shackles / links
    - Clump weights
    - Buoys / buoyancy elements
    - Tensioners.

55. There are several options available for each of these components as discussed in the following sections. The type and number of anchors and moorings used for the Project will depend on the type of floating substructure, loads imposed on the mooring system by the substructure/WTG assembly in the metocean conditions prevailing on site, in addition to geotechnical and environmental considerations. The final design of the mooring system will be determined during the FEED and detailed design phases.

56. There are three types of mooring configuration that are suitable for use with a semi-submersible substructure (illustrated in **Plate 3.5** and **Plate 3.6**):

- Catenary mooring: Predominantly steel chains but can also include some sections of synthetic elements. The weight of the catenary mooring in the water column provides the restoring force that maintains the position of the floating substructure. A large section of the mooring chain lies on the seabed in order to remove any vertical load acting on the anchors and thus enabling the use of conventional and more cost-effective anchor types (drag embedment anchors). These systems typically have larger footprints but can be reduced through the attachment of clump weight and/or heavy chain sections near to where the mooring line comes into contact with the seabed.

- Semi-taut mooring: A combination of synthetic fibres and steel chain, where the chain sections provide the restoring and anchoring benefits of the Catenary system and the synthetic fibres, under some tension, limit the amount of steel chain required, providing benefits in the overall footprint of the mooring system.
- Taut spread mooring: Synthetic fibres or wires with small link elements of chain arranged in a non-vertical configuration (unlike Tension Leg). The system is placed under significant tension to create a stable mooring system where all of the stability comes from the tension held within the taut mooring line.

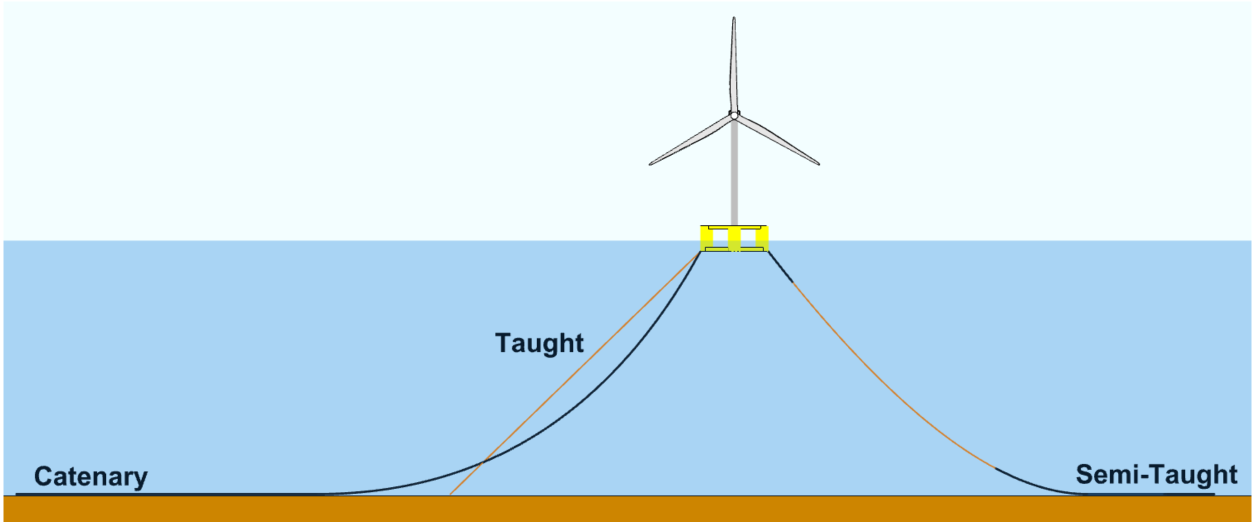


Plate 3.5 Mooring Configurations

57. The mooring system configurations under consideration are detailed in **Table 3.5**, with an illustration of the types shown in **Plate 3.5**.

58. **Table 3.6** presents the range of mooring system footprints considered within the design envelope.

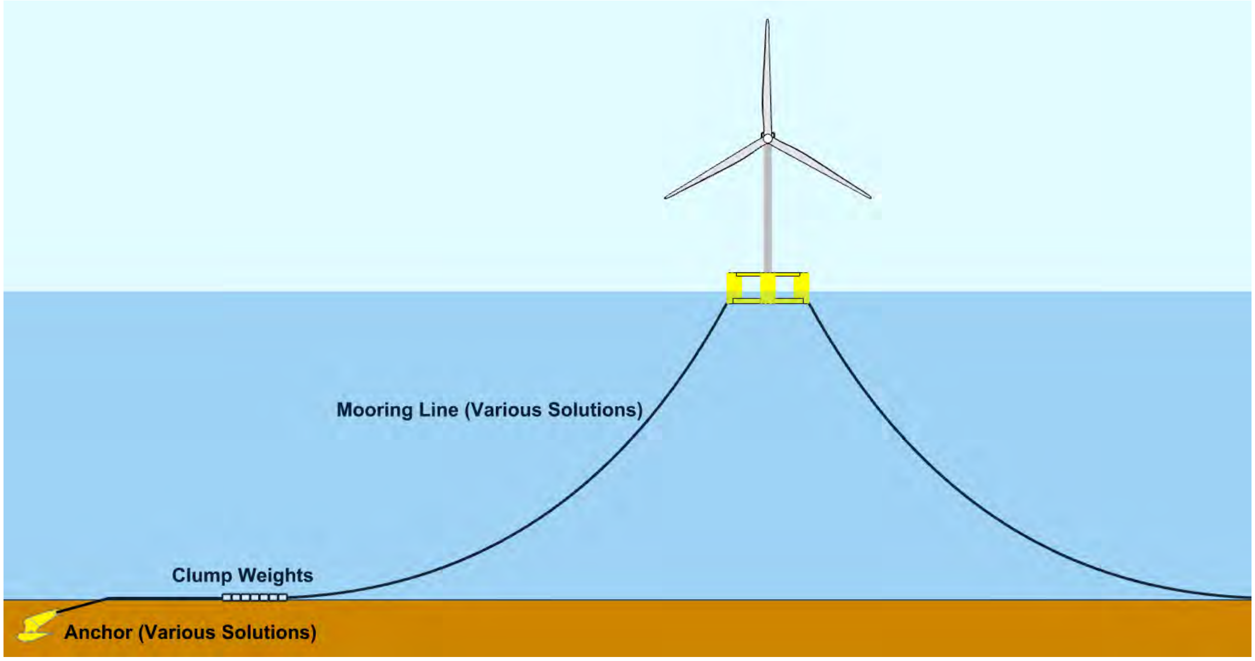


Plate 3.6 Mooring System Components

Table 3.5 Indicative Mooring Configuration

Mooring Parameter	Taught	Semi-Taught	Catenary
Maximum number of moorings per WTG	6	6	6
Maximum mooring line length (m/line)	600	680	760
Maximum mooring anchor radius (m)	600	650	750
Maximum proportion of mooring line that may come into contact with seabed (%)	15	50	80
Anchor types	Suction anchor, driven piles or drilled piles	Suction anchor, driven piles or drilled piles	Drag embedment anchor, Suction anchor, driven piles or drilled piles
Maximum number of clump weights per mooring line	N/A	30	30
Max individual clump weight	N/A	20Te	20Te
Maximum seabed footprint of each clump weight (m^2)	N/A	2	2

Mooring Parameter	Taught	Semi-Taught	Catenary
Material of mooring lines	Chains – Steel Cables – Steel Synthetic Rope – Nylon, Polyester or other synthetic equivalent Connectors – Steel	Chains – Steel Cables – Steel Synthetic Rope – Nylon, Polyester or other synthetic equivalent Connectors – Steel	Chains – Steel Cables – Steel Connectors – Steel
Maximum thickness of mooring lines	Chains – 175 mm Synthetic – 350mm	Chains – 175 mm Synthetic – 350mm	Chains – 175 mm

Table 3.6 Wind Turbine Anchoring Systems Parameters

Mooring System Parameter	Minimum	Maximum
No. of mooring lines per WTG	3	6
No. of anchors per WTG	3	8
Estimated area of mooring line in contact with seabed per mooring line (m^2)	90	304
Clump footprint per mooring line (m^2)	0	60
Anchor footprint (m^2)	3.14	100
Mooring System footprint per WTG (m^2)	144	2984
Footprint for Total WTGs (m^2)	867	23872
Seabed preparation per WTG mooring system (m^2)	N/A	1383

3.4.5.1 Drag Embedment Anchors

59. Drag embedment anchors are similar in concept to the anchors used on vessels (see example shown in **Plate 3.7**). Drag embedment anchors are held in position in the seabed through the resistance between the anchor and seabed substrate which is applied due to the tension of the mooring line. The drag embedment anchor will penetrate the seabed to depths of 8 to 25m, depending on the sediment thickness, with no part of the anchor anticipated to be above the seabed surface once installed.

60. Each mooring line will be attached to at least one drag embedment anchor, where required for increased load capacity, a piggyback option consisting of two drag embedment anchors, one in front of the other along the mooring line, will be used on the upwind mooring lines only.

Plate 3.7 Drag Embedment Anchor Example (Source: Vyrhof, 2021)

61. A summary of the drag embedment anchor parameters is provided in **Table 3.7**.

Table 3.7 Drag embedment anchor parameter summary

Parameter	Minimum	Maximum
Number of drag embedment anchors per WTG	3	8
Total Number of drag embedment anchors	18	64
Drag embedment anchor dimensions (LxWxH) (m)	5x5x5	10x10x8
Total drag embedment anchor footprint (m^2)	450	6400
Drag embedment anchors penetration depth (depended on sediment thickness) (m)	8m	25m

3.4.5.2 Suction Anchors

62. Suction anchors (also known as suction buckets or suction caissons) are a capped steel cylinder. The open end of the cylinder is initially penetrated into the seabed using gravity. The seawater trapped inside the cylinder is then pumped out of the capped end causing negative pressure, which sucks the anchor into the seabed causing it to penetrate to its target depth at which point the anchor is sealed off using grout and its valve. An example of a suction anchor is shown in **Plate 3.8**.

Plate 3.8 Suction Anchor Example (Source: Offshore-Engineer, 2020)

63. The technology is only feasible in particular seabed types, including sands and clays and was originally developed for the oil and gas industry. Recently the technology has been used as the anchor solution for the Hywind Floating Offshore Windfarm in Scotland. The main benefit of suction buckets is the avoidance of piling and the associated noise impacts.

Table 3.8 Suction anchors parameter summary

Parameter	Minimum	Maximum
Number of suction anchors per WTG	3	6
Total number of suction anchors	18	48
Suction anchor dimensions (DxL) (m)	6.5 x10	10 x 15
Total suction anchor footprint (m^2)	597	3770

3.4.5.3 Driven Pile Anchor

64. Driven piles are commonly used as foundations in fixed offshore structures and can also be used as an anchor for the mooring lines. A steel cylindrical pile is driven into the seabed using an external force, such as a hammer (impact piling) or vibration depending on the ground conditions. An example of a driven pile anchor is shown in **Plate 3.9**.

Plate 3.9 Driven Pile Example (Pile.com, 2022)

65. The need for driven piles will be confirmed through the results of detailed geotechnical surveys and they will only be utilised where all other options are not viable for the seabed conditions.

66. A precautionary approach will be undertaken, and the use of driven piles will only implemented where it can be demonstrated that there is no other best available technology not entailing excessive costs (BATNEEC) solutions. If required, driven piles would be located within discrete locations within the Windfarm Site. However, a worst-case of all anchors has been used in the PDE. The worst-case scenario differs by technical topic and as such, different mooring system anchors/piles have been assessed.

Table 3.9 Driven pile parameter summary

Parameter	Minimum	Maximum
Number of driven piles per WTG	3	6
Total number for driven piles	18	42
Driven pile dimensions (DxL) (m)	2 x 20	2.5 x 50
Total driven pile footprint (m^2)	56.55	235.6

3.4.5.4 Drilled Pile Anchor

67. Depending on the soil and the metocean conditions at the project site, drilled pile mooring anchors may be used. Instead of the pile being driven into the seabed, a pile or ground anchor is drilled into the seabed using a subsea drill rig and then sealed with grout. The drill rig required to complete the drilling activity can either

be a subsea drill rig or drill rig deployed from the vessel deck. An example of a Drilled Pile Anchor in **Plate 3.10**.

Plate 3.10 Drilled Pile Anchor Example (ABC Moorings, 2022)

68. A precautionary approach will be undertaken, and the use of drilled piles will only be implemented where it can be demonstrated that there are no other BATNEEC solutions. Should piling be required, the realistic worst-case scenario, depending on the receptor assessment, will use driven pile parameters as these are generally greater than for drilled piles.

Table 3.10 Drilled pile parameter summary

Parameter	Minimum	Maximum
Number of drilled piles per WTG	3	6
Total number for drilled piles	18	42
Drilled pile dimensions (DxL) (m)	2 x 20	2.5 x 50
Total drilled pile footprint (m^2)	56.55	235.6

3.4.6 Inter-Array Cables

69. The inter-array cables will connect the WTGs to each other and to the OSP or export cable connection point. The WTGs will be laid out in either a two-way split radial array (as is shown in **Plate 3.11**) or in a looped circuit. The inter-array cables will consist of three-core dynamic High Voltage Alternating Current (HVAC) subsea cables rated up to 66kV with a bundled fibre optic system. The cables will be comprised of dynamic sections and sections buried or laying on the seabed.

70. The dynamic section of each inter-array cable will be freely suspended in the water column below each substructure and will adopt a lazy or pliant wave configuration. In this configuration buoyancy modules are attached to the mid portion of the dynamic cable creating a mid-water arc. This de-couples the motion of the cable from the motion of the floating substructure, which reduces the loads on the cables. The cables will also feature bend restrictors at the interface to the floating substructures in order to further reduce cable loads.

71. The on-seabed section of inter-array cables will be buried where possible, typically to a depth of 1m, but may range from 0.5m - 3m, and can be buried via several techniques depending on the seabed conditions along the route. The depth will be determined by a Burial Assessment Study (BAS) and a Cable Burial Risk Assessment (CBRA). These techniques can be ploughing and mechanical cutting, jetting or trenching. Where cable burial is not possible alternative cable protection measures will be used. This includes rock placement or mattresses.

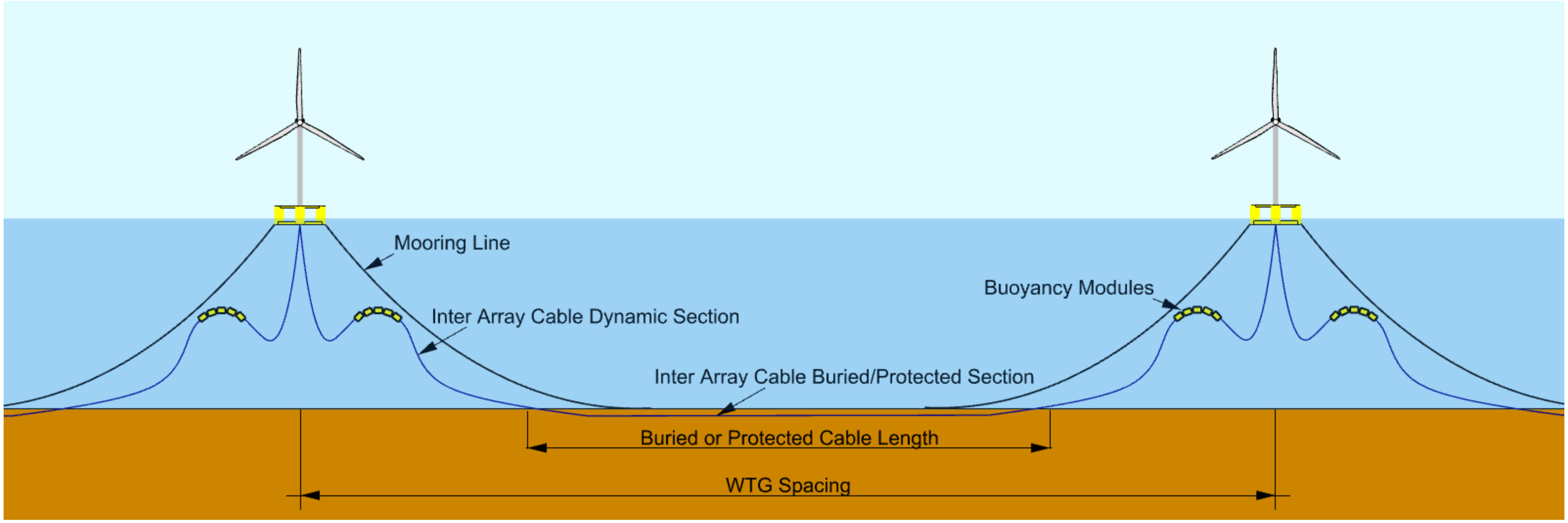
72. An indicative cross-section of the inter-array cable layout is shown in **Plate 3.11**. The length of each inter-array cable will depend on the final layout.

73. A realistic maximum distance of inter-array cables will be defined for the purposes of the EIA and used as the basis for the assessments. The parameters relating to inter-array cables are outlined in **Table 3.11**.

Table 3.11 Inter-array cable worst-case scenario summary

Parameter	Worst-case
Number of inter-array cables	10
Length of individual inter-array cable (m)	3000
Total length of inter-array cables (km)	29.8
Total length of on seabed protected inter-array cable (km)	24
Total length of suspended inter-array cable (km)	5.8
Burial depth (m)	3
Indicative Installation Corridor width + spoil (m)	20
Area of seabed disturbance (m^2)	480,000
Volume of sediment disturbance during inter-array cable installation (assuming plough trencher) (m^3)	216,000
Seabed preparation for inter-array cables (m^2)	12,000

Plate 3.11 Inter-array cable schematic



3.5 Offshore Development Area –Transmission Assets

74. The electrical transmission system will collect the power produced at the WTGs and transport it to the UK electricity transmission network. The transmission system will be constructed by WCOWL.

3.5.1 OSP

3.5.1.1 Overview

75. It is assumed that the inter-array cables from the WTGs will be brought to an OSP. The current assumption for the Project is that one OSP is required. However, the requirement for an OSP will not be confirmed until after the consent application. The location of the OSP (if required) will be confirmed during the detailed design process and will be determined based upon local water depth and geotechnical conditions, while trying to optimise the inter-array cable and Offshore Export Cable lengths. At the substation, the generated power will be stepped up to a higher AC voltage. This higher voltage will be determined by detailed studies, although it is expected that the OSP will step up the 66kV inter-array cable voltage up to 132kV for the Offshore Export Cable.

76. The OSP will typically comprise components including, but not limited to:

- High voltage (HV) power transformers
- Batteries
- Generators
- Instrumentation, metering equipment and control systems
- HV Switchgear and busbars
- Fire systems
- Navigation, aviation and safety marking and lighting
- Systems for vessel access and/or retrieval
- Communication systems and control hub facilities
- Modular facilities for operational and maintenance activities.

3.5.1.2 Offshore Substation Platform footprint

77. The typical footprint plan of the OSP will be a maximum of 50m by 40m with maximum topside height of 80m above Lowest Astronomical Tide (LAT). The OSP will comprise a topside platform installed on a fixed foundation. The OSP foundation type will likely be a fixed jacket substructure. The jacket foundation will have up to 4 legs and will be secured to the seabed through suction anchors, drilled or driven

piles. Leg spacing at the seabed will be up to 40m. **Table 3.12** describes the OSP foundation parameters for jacket foundation option.

Table 3.12 OSP foundation options parameters

OSP Foundation Options Parameters	Maximum (unless specified)
Footprint (inc. foundation structure & scour protection) (m^2)	1,257
Volume of OSP in water column (m^3)	15,000
Volume of scour protection (m^3)	2,513
Jack up vessel footprint – OSP installation (m^2)	314
Prepared seabed area (m^2)	1,257
Prepared area % total seabed taken	0.00%
Depth of seabed preparation (m)	1.00
Seabed volume removed (m^3)	1,257

3.5.1.3 Fluids used on OSP

78. Some of the equipment at the OSP would contain fluids that are used for a variety of purposes. The key types of fluids that may be used include:

    - Diesel fuel for the emergency generators (in diesel storage tanks)
    - Oil for the transformers (oil will be monitored and filtered, top-up may be required)
    - Engine oil
    - Glycol
    - Lead acid contained within batteries
    - Sulphur Hexafluoride (SF6).

79. It is highly unlikely a spill will occur, however a number of measures will be in place to deal with potential spills. The OSP design will include self-contained bunds to collect any possible oil spill. Transfer of oil/fuel between the OSP and service vessels will follow best practice procedures, with additional procedures in place should there be a spill to the marine environment.

80. Any oil spillage would be collected in a separate oil waste tank. Both oil waste and other wastes (wastewater, etc.) would be brought to shore in a secure container and disposed of according to industry best practice procedures.

81. All other waste streams would be processed on the OSP or transferred to shore as required.

3.5.1.4 Scour protection for OSP

82. Scour protection may be required around the base of the foundations to protect against localised erosion of the seabed. The types of scour protection are:

- Rock or gravel placement
- Concrete mattresses
- Flow energy dissipation devices (used to describe various solutions that dissipate flow energy and entrap sediment, and including options such as frond mats, mats of large, linked hoops, and structures covered with long spikes). It is noted that these technologies are often only appropriate for use in areas with significant mobile seabed sediments, and examples such as the spiked designs are only appropriate for use in areas which are not trawled
- Protective aprons or coverings (solid structures of varying shapes, typically prefabricated in concrete or high-density plastics)
- Bagged solutions, (including geotextile sand containers, rock-filled gabion bags or nets, and grout bags, filled with material sourced from the site or elsewhere).

83. The installation method will depend on the scour protection system selected. Rock would be placed by dynamically positioned fall pipe vessel, whilst the other options would be more suited to the use of a smaller crane vessel or similar. The diameter, area and volume requirements for scour protection will be discussed once it is confirmed whether an OSP will be required and that this OSP is not floating.

3.5.2 Offshore Export Cable

84. Electricity from the Windfarm Site will be transmitted via one or two subsea export cable(s) to shore depending on whether an OSP is required. Each offshore export circuit would have three conductors (one for each phase) and a fibre-optic bundled/ wrapped into one cable.

85. For a two-circuit design there would be two cables. In this scenario the configuration could change when transitioned to the Onshore Export Cables, at which point the cables may split into individual phases and become arranged in a trefoil formation. The circuits may then be bundled, but this will be determined based on thermal properties and cable derating. The final arrangement will be subject to outputs of detailed design post-consent.

86. If an OSP is required, the Offshore Export Cable (up to 132kV AC) is likely to run from the OSP to a TJB at the Landfall above MHWS. However, if an OSP is not required, the Offshore Export Cable will run from the Windfarm Site to the TJB. The TJB connects the Offshore Export Cable and Onshore Export Cable. Each Offshore

Export Cable will be installed in an individual trench and protected in line with good industry practice. **Table 3.13** describes the main cable parameters, details of how the export cable has been developed are provided in **Volume Chapter 4: Site Selection and Alternatives** of the Offshore ES.

87. The cable will be buried where possible to ensure that the cable is protected from damage by external factors. Typical burial depth is 1m but may range from 0.5m - 3m. The depth will be determined by a BAS and CBRA. The cable will be delivered in sections and jointed in-situ due to the distance from the Windfarm Site to the TJB. If seabed conditions make burial unfeasible, as well as in the immediate proximity of turbine foundations, cable may be protected by a hard-protective layer such as rock or concrete mattresses. The appropriate level of protection will be determined based on an assessment of the risks posed to the Project in specific areas.

88. It is likely that the Offshore Export Cable will have to cross other subsea cables. Formal agreements with regards to existing cable crossings will be entered into by WCOWL and the existing owners / operators. Installation techniques will be discussed and agreed to ensure integrity of the existing infrastructure and any new cables associated with the Project Several techniques can be utilised, including concrete mattresses and rock placement.

Table 3.13 Offshore Export Cable parameters (based on an HVAC export cable system)

Parameter	Minimum	Maximum
Export cable/trench	1*	2
Export cable burial depth (m)	0.5	3
Fibre optic cables	Bundled in export cable	
Export cable route standard working width (m)	25	50 (25m width per export cable)
Export cable length (km)	70	93.6
Total Offshore Export Cable Corridor Area (m^2)	1,750,000	4,680,000
Number of Cable & pipeline crossings	3	8
Total area of Offshore Export Cable protection due to cable crossings (m^2)	5,250	14,000
Total volume of Offshore Export Cable protection due to cable crossings (m^3)	3,000	14,400

* The baseline assumption is that the project will feature **one OSP** and therefore only one Offshore Export Cable will be required. However, if an OSP is not included in project design, this may result in the need for two separate Offshore Export Cables.

3.5.2.1 Seabed preparation

89. Pre-lay intervention activities may be required prior to the installation of cables including grapnel run, boulder removal, sand wave clearance, installation of equipment at crossings and the cutting and removal of any out-of-service cables.

90. There will be no separate cables for fibre optics. Fibre optics will be integrated with the Offshore Export Cable. **Table 3.14** outlines the maximum area required for seabed preparation for Offshore Export Cable installation.

Table 3.14 Seabed preparation for Offshore Export Cable installation

Infrastructure	Maximum footprint (m^2)
Estimated Seabed preparation for Offshore Export Cable Corridor (sand wave levelling & boulder clearance)	842,400

3.5.2.2 Offshore Export Cable Corridor lifetime footprint

91. **Table 3.15** describes the maximum footprints for the protection of the Offshore Export Cable. The Offshore Export Cable will be buried for the majority of its length. However, there will be some areas where this is not possible due to seabed characteristics or where it is crossing existing subsea cables. In these locations external cable protection may be used. The cable will be buried at the trenchless technique exit.

Table 3.15 Maximum lifetime footprints for Offshore Export Cables protection

Infrastructure	Maximum footprint
External cable protection for unburied cables (m^2)	99,400
External cable protection at cable crossings (m^2)	14,000
Total external cable protection (m^2)	114,800

3.5.2.3 Cable crossings

92. The Celtic Sea has a significant number of cables, primarily telecommunication connections between the UK and north America and Europe. No cables are present within the Windfarm Site (see **Chapter 18: Infrastructure and Other Users** of the Offshore ES). Four telecommunications cables traverse the Offshore Export Cable Corridor Area of Search (AoS), these include:

- Ormonde UK-Ireland 2 Crossing (Active)
- TAT 11 (Decommissioned)
- TATA Atlantic South (Active)
- TATA W.Europe UK-Spain (Active).

93. Within the export cable corridor, up to eight (**Table 3.13**) cable crossings have been identified. Crossings are designed to protect the obstacle being crossed, as well as the Project's cables once they have been installed. Detailed methodologies for the crossing of cables and pipelines will be determined in consultation with the owners of the infrastructure to be crossed. However, a number of techniques may be utilised, including:

- Pre-lay and post lay concrete mattresses
- Pre-lay and post lay rock placement.

3.6 Landfall (up to MHWS)

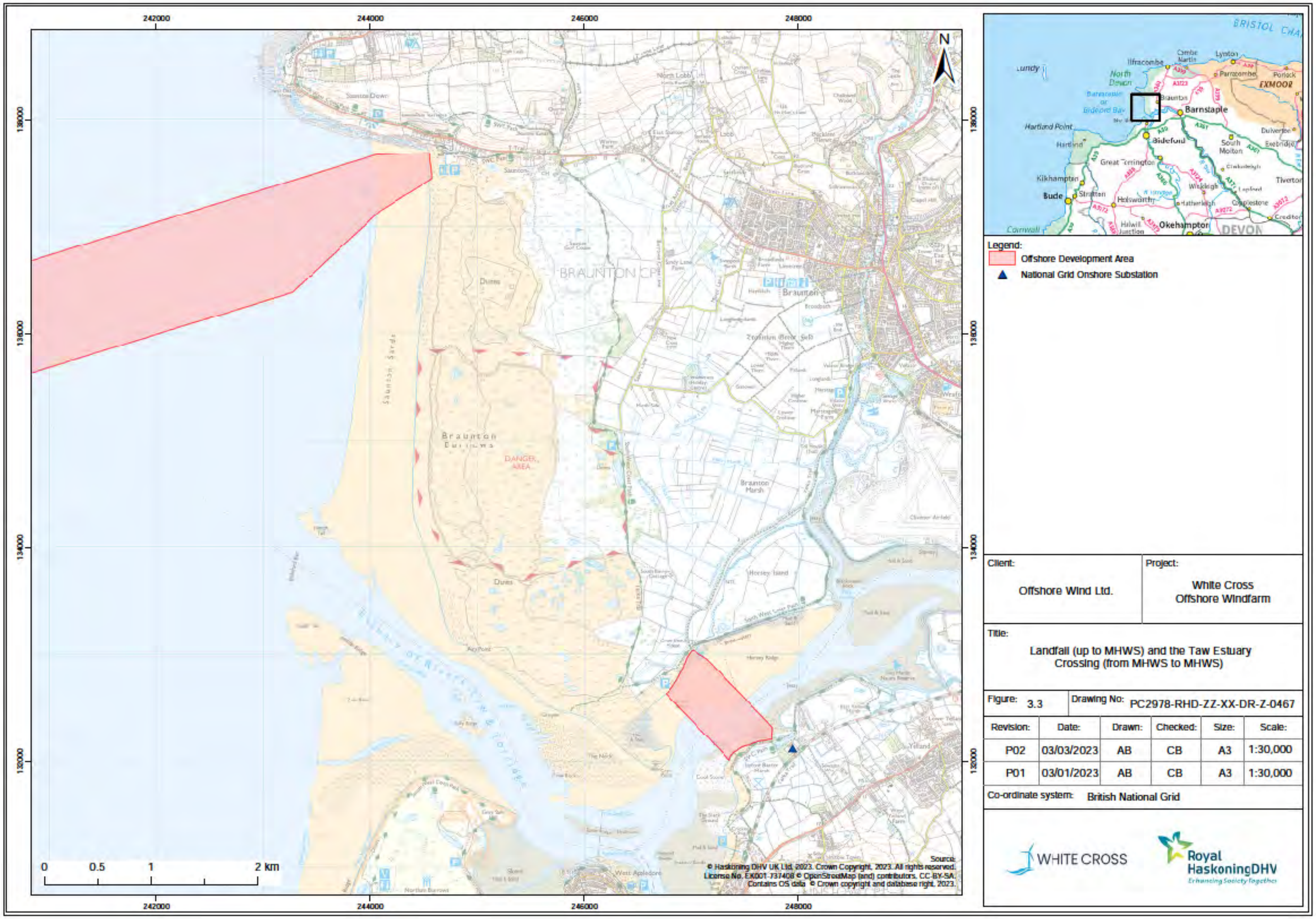
94. **Table 3.16** shows the main construction parameters for the Landfall up to MHWS. The Landfall above MHWS has been considered in detail within the Onshore ES supporting the White Cross OWF TCPA application. **Figure 3.3** shows the location of the Landfall.

Table 3.16 Landfall construction parameters

Landfall	Minimum	Maximum
Landfall installation method	Trenchless technique between entry and exit point	
Number of drills	1	2
Trenchless technique compound area (above MHWS at Landfall) (length x width) (m)	50 x 50	100 x 50
Trenchless technique horizontal length (m)	n/a	1,860

95. Trenchless crossing techniques have been proposed for the landfall, with two options being considered. Both options will utilise the same location for the entry and exit points and involve a drill length of approximately 0.85km from the Saunton Sands Car Park to the shallow subtidal zone. Cable installation works will be undertaken from car park, with temporary compound area and access requirements for the entry. The cable bores will exit the seabed in an exit pit at a suitable water depth, whereby the ducting will be floated offshore (from a location nearby) and pulled through from the exit pit to the entry pit within Saunton Sands Car Park.

Figure 3.3 Location of Landfall (up to MHWS) and the Taw Estuary Crossing (from MHWS to MHWS)



This location was determined based on an appraisal of constraints and engineering feasibility from both offshore and onshore perspectives. The location of the Landfall is shown in **Figure 3.3**. Further information of the design, drilling methodology and approach to geotechnical investigation is presented in **Appendix 5.A: Braunton Burrows and Taw Estuary Crossing Method Statement** of the Onshore ES. This presents the preliminary hydrofracture assessment that has been undertaken to determine the risk of drill fluid breakout to the surface at the Braunton Burrows (Landfall) trenchless crossing. Hydrofracture occurs if during the drilling process the drilling fluid pressure in the borehole exceeds the resistance of the overburden soils resulting in a breakout at the surface. At the Landfall, the assessment demonstrates that there is no significant risk of hydrofracture along the bore profiles with the exception of the final stages of the bore where the profiles begin to rise resulting in loss of cover. This is unavoidable but can easily be controlled by site measures such as sandbagging and casing in line with general working methodologies. A key measure being embedded within the design, whereby the contractor will account for hydrofracture by ensuring that there is adequate cover depth of the bore path, best mitigating hydrofracture by providing a larger overburden pressure.

96. WCOWL’s commitment to the use of trenchless crossing techniques at the Landfall ensures that potential impacts on designated sites and the wider estuarine and riverine environment are avoided as part of the Project’s embedded mitigation. This commitment is anticipated to:

- Avoid direct physical disturbance to the natural environment and non-statutory and statutory designated sites of ecological importance, including the Braunton Burrows SAC. Mitigate disturbance or harm to species such as waterfowl and potential destruction, damage or disturbance to habitats
- Mitigate the risk of contaminants supply to the North Devon Streams groundwater catchment.

3.7 Taw Estuary Crossing (MHWS to MHWS)

97. A section of the Onshore Export Cable Corridor re-enters the marine environment where the Export Cable crosses underneath the Taw Estuary (MHWS north of the estuary to MHWS south of the estuary) (hereafter referred to as ‘the Taw Estuary Crossing’).

98. Trenchless crossing techniques have been proposed for the Taw Estuary Crossing, with two options being considered. Both options will utilise the same location for the entry and exit points and involve a drill length of approximately 1.3km below

the River Taw. Cable installation works will be undertaken from south to north, with temporary compound area and access requirements for the entry and exit points. Construction parameters are detailed in **Table 3.17**.

Table 3.17 Taw Estuary Crossing construction parameters

Taw Estuary Crossing	Minimum	Maximum
Landfall installation method	Trenchless technique from inland entry and exit pits behind the flood embankments bordering the estuary	
Number of drills	1	2
Trenchless technique compound area (above MHWS at Taw Estuary Crossing) (length x width) (m)	n/a	50 x 50
Trenchless technique horizontal length (m)	n/a	1,200

99. The crossing site is located at a natural narrowing of the River Taw. This site was determined based on an appraisal of constraints and engineering feasibility from both offshore and onshore perspectives. The location of the Taw Estuary Crossing is shown in **Figure 3.3**. Further information of the design, drilling methodology and approach to geotechnical investigation is presented in **Appendix 5.A: Braunton Burrows and Taw Estuary Crossing Method Statement** of the Onshore ES.

100. WCOWL's commitment to the use of trenchless crossing techniques at the Taw Estuary Crossing ensures that potential impacts on designated sites and the wider estuarine and riverine environment are avoided as part of the Project's embedded mitigation. This commitment is anticipated to:

- Avoid direct physical disturbance to the natural environment and non-statutory and statutory designated sites of ecological importance, including specifically the Braunton Burrows SAC adjacent to the crossing. Mitigate disturbance or harm to species such as waterfowl and migratory salmon and potential destruction, damage or disturbance to priority habitats such as coastal grazing marsh and mudflats
- Avoid direct disturbance to the River Taw's sediment transport pathways
- Avoid direct disturbance of the Taw/Torridge surface water catchment and the potential to alter the geomorphology and hydrology of the watercourse
- Mitigate increased sediment supply to the Taw/Torridge surface water catchment
- Mitigate the risk of contaminants supply to the Taw/Torridge surface water catchment and the River Taw and North Devon Streams groundwater catchment

- Avoid direct disturbance to surface drainage patterns and surface flows of the Taw/Torridge surface water catchment and therefore its associated flood risk
- Avoid the need for cable protection measures across the river bed.

101. WCOWL will consult stakeholders and seek agreement on the design and methodology set out in **Appendix 5.A: Braunton Burrows and Taw Estuary Crossing Method Statement** of the Onshore ES prior to the commencement of construction works at the Landfall. Where conflict arises between environmental constraints or obligations, WCOWL will liaise with the relevant stakeholders to determine the optimal, acceptable solution for the Landfall cable installation.

3.8 Onshore Components of the Project

3.8.1 Overview of the onshore components of the Project

102. Above MHWS at Landfall, the Offshore Export Cable will be connected to the Onshore Export Cable via a TJB located within Saunton Sands Car Park. The Onshore Export Cable travels approximately 8km inland to a high voltage alternating current (HVAC) onshore substation. This will include the crossing below the Taw Estuary via trenchless technology (see **Section 3.7**). A new White Cross Onshore Substation will be constructed to accommodate the connection of the Project to the existing East Yelland substation and Grid Point of Connection.

103. The key onshore infrastructure is:

- Onshore Export Cables (2 x 66kV or 1 x 132kV) from Landfall to the White Cross Onshore Substation and 132kV from the White Cross Onshore Substation to existing East Yelland substation and the Grid Point of Connection)
- (TJB, joint bays and link boxes installed along the Onshore Export Cable
- Trenchless crossing at certain locations such as sensitive habitats and large watercourse crossings
- Open cut trenching where possible
- Temporary main construction compound and up to four temporary construction compounds
- Temporary access roads and haul roads
- A new White Cross Onshore Substation and associated planting
- Connection to the National Grid Onshore Substation and Grid Connection Point
- Permanent access to the White Cross Onshore Substation during its operation.

3.8.2 Overview of the Programme

104. A high-level indication of the programme is provided in **Plate 3.2**. The total duration of the onshore works is around 20.5 months. The crossings would be carried out in sequence with Landfall, then Saunton Golf Course, then Taw Estuary carried out. All the other cable construction and onshore substation construction would take place within the 20.5 months. The duration of specific crossings are:

- Landfall – 4.5 months (overlaps 2 weeks with Golf Course Crossing for mobilisation / de-mobilisation)
- Saunton Golf Course Crossing – 8 months (including demobilisation and reinstatement)
- Taw Estuary Crossing – 8 months (including demobilisation and reinstatement).

3.9 Town and Country Planning Act Application Development Area

105. The jurisdiction of onshore planning extends down to MLWS[1]. Therefore, the Onshore Development Area is defined as the point from MLWS at Landfall to the Grid Point of Connection at the existing East Yelland substation. To aid environmental assessment and design development the Onshore Export Cable Corridor has been divided into seven sections as illustrated in **Figure 3.4** and an overview provided within the following sections.

3.9.1 Landfall (Section 1)

106. Section 1 runs eastwards inland from MLWS to the eastern end of the Saunton Sands Car Park. The construction methodology at Landfall along the beach and into the car park will be undertaken using trenchless techniques (as described in **Section 3.6** and further detail is presented in **Appendix 5.A: Braunton Burrows and Taw Estuary Crossing Method Statement** of the Onshore ES) within the spatial extent defined by the Onshore Development Area are shown in **Figure 3.4**.

107. The phases of work which would be carried out over 4.5 months are:

- Mobilisation
- Duct welding and testing
- First cable drive
- Pull back (of ducting)

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[11] Certain works will span across the Onshore Development Area and Offshore Development Area and BOTH consent boundaries, through the intertidal area, such as trenchless techniques and/or open cut trenching.

- Second cable drive
- Pull back (of ducting)
- Demobilisation and reinstatement.

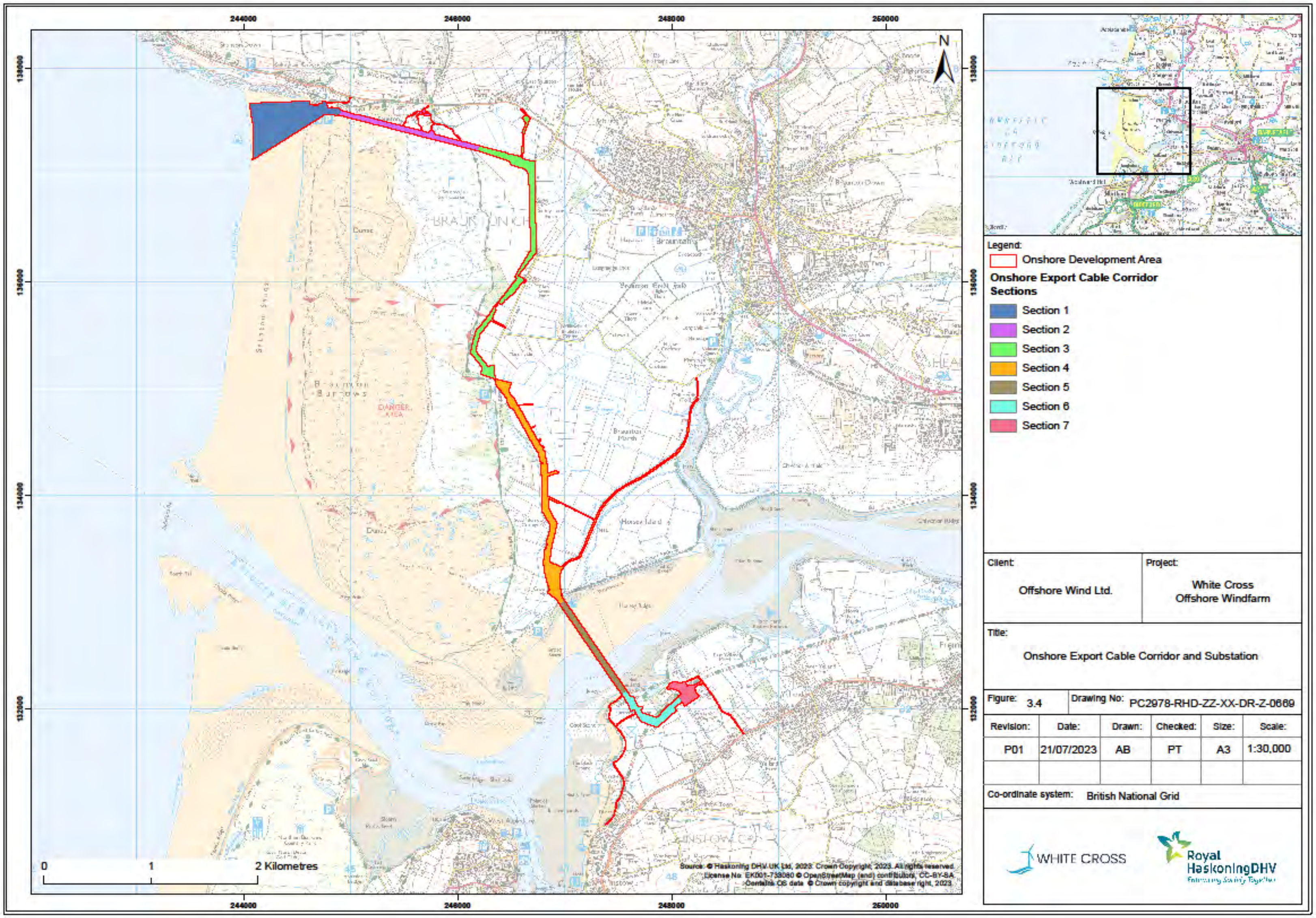
108. The car park is the proposed location of the temporary Landfall compound, trenchless installation rig, and the TJB. From there, it turns south-east to cross Saunton Golf Course using a trenchless technique. The sequence of work would therefore be to construct the Landfall crossing first, then switch around to carry out the Saunton Golf Club (and Braunton Burrows SAC) crossing. Further details are provided in **Appendix 5.A: Braunton Burrows and Taw Estuary Crossing Method Statement** of the Onshore ES.

3.9.2 Saunton Golf Club Trenchless Crossing (Section 2)

109. Section 2 runs southeast crossing Saunton Golf Club (see **Figure 3.4**). Access routes required for geotechnical investigation and for maintenance activities is provided from the existing access to Saunton Golf Club from Saunton Road. Careful environmental and technical consideration will be taken to determine the access route of least impact to Braunton Burrows SAC.

110. Similar to the Landfall as detailed in **Section 3.6**, further information of the design, drilling methodology and approach to geotechnical investigation for the Braunton Burrows SAC crossing at the Golf Club is presented in **Appendix 5.A: Braunton Burrows and Taw Estuary Crossing Method Statement** of the Onshore ES. This presents the preliminary hydrofracture assessment that has been undertaken to determine the risk of drill fluid breakout to the surface at the Braunton Burrows (Saunton Golf Club) trenchless crossing. Hydrofracture occurs if during the drilling process the drilling fluid pressure in the borehole exceeds the resistance of the overburden soils resulting in a breakout at the surface. At the Saunton Golf Club crossing, the assessment demonstrates that there is no significant risk of hydrofracture along the bore profiles with the exception of the final stages of the bore where the profiles begin to rise resulting in loss of cover. This is unavoidable but can easily be controlled by site measures such as sandbagging and casing in line with general working methodologies. A key measure being embedded within the design, whereby the contractor will account for hydrofracture by ensuring that there is adequate cover depth of the bore path, best mitigating hydrofracture by providing a larger overburden pressure.

Figure 3.4 Onshore Export Cable Corridor and Substation



111. WCOWL’s commitment to the use of trenchless crossing techniques at the Landfall ensures that potential impacts on designated sites and the wider estuarine and riverine environment are avoided as part of the Project’s embedded mitigation. This commitment is anticipated to:

- Avoid direct physical disturbance to the natural environment and non-statutory and statutory designated sites of ecological importance, including the Braunton Burrows SAC. Mitigate disturbance or harm to species such as waterfowl and potential destruction, damage or disturbance to habitats.
- Mitigate the risk of contaminants supply to the North Devon Streams groundwater catchment.

112. The Onshore Export Cable in this section will be installed using trenchless techniques within the spatial extent defined by the Onshore Development Area, with further detail provided in **Appendix 5.A: Braunton Burrows and Taw Estuary Crossing Method Statement** of the Onshore ES. This would take eight months duration. **Table 3.18** shows the main construction parameters for the Saunton Golf Club Trenchless Crossing.

Table 3.18 Saunton Golf Club Trenchless Crossing construction parameters

Saunton Golf Club Crossing	Minimum	Maximum
Landfall installation method	Trenchless technique from inland entry and exit pits behind the flood embankments bordering the estuary	
Number of drills	1	2
Trenchless technique compound area (above MHWS at Taw Estuary Crossing) (length x width) (m)	n/a	50 x 50
Trenchless technique horizontal length (m)	n/a	1,300

3.9.3 Onshore Cable Corridor (Sections 3, 4 & 6)

113. Section 3 runs southeast and then south from the eastern edge of Saunton Golf Club through arable fields and crossing 11 field boundaries and drainage ditches before extending to Sandy Lane Car Park (see **Figure 3.4)**.

114. The construction methodology within this section is still to be determined but will be undertaken using both open cut and trenchless techniques within the spatial extent defined by the Onshore Development Area. Micro-siting during detailed design will seek to ensure the route of least impact is chosen.

115. To the north of Section 3 is a new temporary access route that will be utilised to provide access to Onshore Development Area during the cable installation.

116. Section 4 passes south extending from the east of Sandy Lane Car Park to the Taw Estuary Crossing (**Figure 3.4**). The Onshore Export Cable Corridor will cross from Section 3 to the pastural fields to the east of Sandy Lane Car Park using trenchless technology to avoid disturbance to vegetation on the boundaries of Braunton Burrows SAC.

117. The construction methodology within these sections is still to be determined but will be undertaken using either open cut or trenchless techniques within the spatial extent defined by the Onshore Development Area. Micro-siting during detailed design will seek to ensure the route of least impact is chosen.

118. Section 6 runs southeast from the southern edge of the Taw Estuary Crossing towards the White Cross Onshore Substation (see **Figure 3.4**). The Onshore Export Cable installation methodology in this section is expected to be a combination of opencut and trenchless technique but is yet to be determined.

119. The crossing of the Tarka Trail and below the existing Overhead Lines (OHL) from the East Yelland substation will be via a trenchless technique.

3.9.4 Taw Estuary Trenchless Crossing (Section 5)

120. Section 5 contains the Taw Estuary Crossing and extends from the northern edge to the southern edge of the River Taw (see **Figure 3.3** and **Figure 3.4**). The methodology to install the Onshore Export Cable underneath the river is via a trenchless technique. A temporary construction compound will be required at both ends of this crossing to facilitate the trenchless solution. A construction method statement for the Taw Estuary Crossing is provided in **Appendix 5.A: Braunton Burrows and Taw Estuary Crossing Method Statement** of the Onshore ES. This would take 8 months duration.

3.9.5 Onshore Substation and Grid Connection Point (Section 7)

121. The White Cross Onshore Substation will be located to the west of the Estuary Business Park partly on the site of a former oil storage depot. Cables will exit the onshore substation running east/north for 350m towards the grid connection point at East Yelland substation. This section will be installed by a combination of open cut and trenchless techniques, including a crossing of the Tarka Trail via a trenchless technique.

4. Approach to HRA

4.1 Overview of HRA Process

122. The HRA process is carried out in a sequential manner by the Marine Management Organisation (MMO) (the competent authority for the Section 36 and Marine Licence applications) and NDC (the competent authority for the TCPA application). The HRA process is informed and assisted by the Applicant. It is the responsibility of the Applicant to include 'sufficient information' within the application to inform the HRA of the Project.

123. The Conservation of Habitats and Species Regulations 2017 (2017 No. 1012) (as amended), The Conservation of Offshore Marine Habitats and Species Regulations 2017 (2017 No. 1013) (as amended) are the principal pieces of secondary legislation which, prior to the UK's departure from the European Union, transposed the terrestrial and offshore marine aspects of the EU Habitats Directive (Council Directive 92/43/EEC) and certain elements of the EU Wild Birds Directive (Directive 2009/147/EC) into the domestic law. Together, these regulations are collectively known as the "Habitats Regulations". The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019 (2019 No. 579) set out the changes that apply now that the UK has left the European Union. These confirmed that:

- All protected sites and species retain the same level of protection
- Among other things, the requirement for HRA to be undertaken continues to apply.

124. Unless the UK government implements further legislative changes, the obligations, process and terminology of the Habitats Regulations will, for the purposes of this report, remain as set out in existing legislation and regulations.

125. The HRA process typically follows a four-staged approach, entailing:

- Stage 1 Screening: The process of identifying potentially relevant European sites, and whether the proposed project is likely to have a significant effect on the qualifying interest features of the European site, either alone or in-combination with other plans and projects. If it is concluded at this stage that there is no potential for Likely Significant Effect (LSE), there is no requirement to carry out subsequent stages of the HRA
- Stage 2 Appropriate Assessment: Where an LSE for a European site(s) cannot be ruled out, either alone or in-combination with other plans and projects, assessment of the potential effects of the project on the integrity of the European site(s), in view of its qualifying interest features and associated

conservation objectives, is required. Where it is concluded that there would be an adverse effect on site integrity (or where such an effect cannot be discounted) an assessment of mitigation options is carried out and mitigation measures (where available) are proposed to address the effects. If, having considered mitigation, the potential for adverse effects on integrity remains, the HRA must progress to Stages 3 and 4

- Stage 3 Assessment of Alternative Solutions: Identifying and examining alternative ways of achieving the objectives of the Project to establish whether there are solutions that would avoid, or have a lesser effect, on the European site(s)
- Stage 4 Imperative reasons of overriding public interest (IROPI): Where no alternative solution exists, the next stage of the process is to assess whether the project is necessary for IROPI and, if so, the identification of compensatory measures needed to maintain the overall coherence of the National Site Network.

4.1.1 Stage 1 – Screening

126. In Stage 1, designated sites are screened for LSE resulting from the 'project alone' scenario and in-combination with other projects. Where it can be determined that there is no potential for LSE to occur to interest features of a designated site and the achievement of the sites' conservation objectives, that site is sought to be 'screened out'.

127. Mitigation measures intended to avoid or reduce the harmful effects of a plan or project are not taken into account at Stage 1 but are identified and applied during the Stage 2 assessment, where they are necessary.

128. The Planning Inspectorate advises that for those projects where no LSE is predicted, this should be reported in the form of a No Significant Effects Report (NSER) and there is no requirement to undertake the Stage 2 assessment (Planning Inspectorate, 2017).

4.1.2 Stage 2 – Appropriate Assessment

129. The purpose of the HRA process is to identify where potential LSE may occur and to provide information to the competent authority so that they can determine whether LSE is expected to occur, through an Appropriate Assessment (this report).

130. For those sites where LSE cannot be excluded in Stage 1 screening, further information to inform the assessment is prepared. This assessment will determine whether the Project, alone or in-combination, could adversely affect the integrity of

the site in view of its conservation objectives. This assessment includes a description of any mitigation measures proposed that avoid or reduce each effect, and any remaining residual effects.

131. Where the appropriate assessment identifies the potential for an adverse effect on the integrity of a designated site (or cannot rule one out), the assessment will proceed to Stage 3.

4.1.3 Stage 3 – Assessment of Alternatives

132. Stage 3 investigates alternatives that could be applied to reduce the potential for effects. The Planning Inspectorate advises that alternative solutions can include a proposal of a different scale, a different location and an option of not having the scheme at all – the 'do nothing' approach. Provided this test for alternatives is achieved, then the HRA will proceed to Stage 4.

4.1.4 Stage 4 – Assessment of Imperative Reasons of Overriding Public Interest (IROPI)

133. If it is demonstrated that there are no alternative solutions to the proposal that would have a lesser effect or avoid an adverse effect on the integrity of the site(s), then a case will be prepared that the scheme should be carried out for IROPI. The IROPI justification must relate to either:

- human health, public safety or beneficial consequences of primary importance to the environment, or
- having due regard to any opinion from the appropriate authority, any other imperative reasons of overriding public interest.

134. If the conclusion of Stages 3 and 4 is that there is no alternative and that the project has demonstrated IROPI, then the project may proceed with a requirement that appropriate compensatory measures are delivered.

4.1.5 Compensatory Measures

135. If HRA Stage 2 identifies an adverse effect on the integrity of a designated site, an assessment of compensatory measures must also be included in the HRA Report. Compensatory measures should be determined through consultation with the relevant stakeholders, including SNCBs and landowners.

4.2 Consultation

136. Consultation has been a key part of the development of the Project A summary of the key issues raised during consultation specific to sites and qualifying features is outlined below in **Table 4.1, Table 4.2, and Table 4.3**.

Table 4.1 Annex I habitats and Annex II - Ecology and ornithology consultation responses

Consultee	Date, Document, Forum	Comment	Where addressed in the RIAA
Natural England	20/05/2022, Onshore ecology ETG	Route across Braunton Burrows likely to cause the most environmental harm. Recommend considering biodiversity net gain as early as possible. Main NE concerns for potential impacts: • Landfall: disturbance to birds, mudflats and sandflats and component communities; sediment composition and important to look at topography hydrodynamic regime and turbidity. • Onshore cabling route: habitat damage/ loss and fragmentation • Cable laying: routing along the path is avoiding surface vegetation communities, but there are certain substrate properties that would still need consideration. • Community compositions, species compositions, would need to look at any natural zonation and transitions as well. • Consider sand movement and stability, vascular plant assemblies as well geomorphological processes. • Topography needs to be included which will link to how resilient the dune system is. • Need to consider the impacts on those long-term monitoring results of the dunes because this is a nationally important site. • Hydrology impacts should be included too, including subsurface hydrology and the knock-on effects.	Route across central Braunton Burrows has now been discounted and is no longer being considered. The export cable will instead be installed via trenchless technology below the northern extent of Braunton Burrows (underneath Saunton Golf Club). Potential impacts raised by Natural England to be included within assessments. Consideration of sand lizards to remain within assessments. To include embedded biodiversity net gain considerations.

Consultee	Date, Document, Forum	Comment	Where addressed in the RIAA
		Consider groundwater dependent habitats and species. - For the Taw/Torridge estuary SSSI, you already have those impacts scoped in To highlight that sand lizards are known to be present within the survey area and despite them not having been recorded during the surveys to date, consideration of this species should remain.	
Natural England	09/09/2022 Ornithology ETG	Uncertain about the cable route across Braunton Burrows, but yet to provide a formal response to the short list report.	Route across central Braunton Burrows has now been discounted and is no longer being considered. The export cable will instead be installed via trenchless technology below the northern extent of Braunton Burrows (underneath Saunton Golf Club).
Devon Wildlife Trust	09/09/2022 Ornithology ETG	Not supportive of the preferred cable route option through Braunton Burrows.	Route across central Braunton Burrows has now been discounted and is no longer being considered. The export cable will instead be installed via trenchless technology below the northern extent of Braunton Burrows (underneath Saunton Golf Club).

Consultee	Date, Document, Forum	Comment	Where addressed in the RIAA
RSPB	09/09/2022 Ornithology ETG	Need to ensure any operations have secure biosecurity measures in respect of rats to ensure no risk to colonies on Lundy. Reconsider survey efforts for certain species, particularly species hard to detect, such as Balearic shearwater, storm petrels. Also consider surveys for nocturnal species.	Consideration of storm petrel species and Balearic shearwater for the HRA are discussed in **Section 5.3.1.3** and **Section 170** respectively. As detailed in **Section 13.6** of **Chapter 13: Offshore Ornithology** of the Offshore ES, the Applicant's Project Environmental Management Plan will be agreed prior to the start of construction which will include biosecurity measures.

Table 4.2 Annex II Species - Marine mammal consultation responses

Consultee	Date, Document, Forum	Comment	Where addressed in the RIAA
North Devon Council	05/04/2022, Scoping Opinion	HRA Screening Report The HRA screening report appears comprehensive and provides an appropriate screening of all potential receptor sites and species.	
MMO	14/03/2022 Scoping opinion, section 6.6.5	Balearic shearwater regularly occurs within the Celtic Sea, and the number of seabirds (including Manx shearwater) that reach the qualifying figure for SPA designation on Lundy should be addressed as part of the impact assessment process. The RSPB should be contacted for further information on this.	Consideration of Balearic shearwater connectivity with the Project is presented in **Section 5.2**.
RSPB	14/03/2022 Scoping opinion, section 6.6.8	Regarding light pollution, the RSPB have advised that Manx shearwaters are known to be attracted to light, and so should be considered within the assessment.	The potential for lighting effects on Manx shearwater are considered in **Section 5.2**.
RSPB	14/03/2022 Scoping opinion, section 6.6.9	"There is a lack of evidence presented for Balearic shearwater and storm petrel and the potential impacts of the scheme on these two species. Please contact the RSPB to access the information on populations of cliff nesting seabirds on Lundy from 2021, which is not yet published. It should also be noted that evidence for the importance of the Celtic Sea for some species (e.g. Wakefield et al., 2017 which covered four species: kittiwake, shag, guillemot and razorbill) should be used with caution based on the age of the colony data used in the modelling. Where modelling is based upon old datasets (e.g. Seabird 2000), and where the populations of seabirds at colonies such as Lundy have	The potential for the Project to impact Balearic shearwater and storm petrel are considered in **Section 5.2**.

Consultee	Date, Document, Forum	Comment	Where addressed in the RIAA
		changed significantly, re-modelling should be undertaken to use the latest census data. The RSPB advises that the origin of seabirds using the Celtic Sea is not well known, and only a limited number of species have been tracked. The origin of species observed within the site should be well evidenced and this is not the case for all species. For example, the foraging ranges provided for breeding Manx shearwater from Lundy are only for the chick rearing period and do not include the incubation period when foraging flights may differ spatially and temporally from those during chick rearing. In other instances, there is speculation over the origin of the birds in the documentation so further work may need to be commissioned."	
MMO Marine Conservation Team	17/03/2022, Scoping Opinion	Seals are protected from injury, but not disturbance, under the Conservation of Seals Act 1970, except within a Site of Special Scientific Interest (SSSI) where they are listed as a special feature. From 0-12 nautical miles seals are protected from prohibited methods of killing or capturing under regulation 45 of the Conservation of Habitats and Species Regulations 2017 (CHSR). From 12-200 nautical miles seals are protected from prohibited methods of killing or capturing under regulation 47 of the Conservation of Offshore Marine Habitats and Species Regulations 2017 (COHSR). Please see the MMO's webpage guidance with details of offences for seals here.	See **Section 7**.

Consultee	Date, Document, Forum	Comment	Where addressed in the RIAA
MMO Marine Conservation Team	17/03/2022, Scoping Opinion	Cetaceans are protected from injury, disturbance and damage or obstruction to places of breeding or resting under the CHSR and the Wildlife and Countryside Act 1981 (as amended) (WCA) from 0-12 nautical miles, and from injury, disturbance and damage or obstruction to places of breeding or resting from 12-200 nautical miles under regulations 45 and 47 of COHSR. Please see the MMO's webpage guidance with details of offences for cetaceans here.	See **Section 7**.
MMO Marine Conservation Team	17/03/2022, Scoping Opinion	Turtles are protected from injury, disturbance and damage or obstruction to places of breeding or resting under regulations 43 and 45 of CHSR, sections 9(4)(b), (c) and 9(5) of WCA from 0 to 12 nautical miles and under regulations 45 and 47 of COHSR from 12 to 200 nautical miles. Please see the MMO's webpage guidance with details of offences for turtles here.	See **Section 7**.
MMO Marine Conservation Team	17/03/2022, Scoping Opinion	The assessment notes that there is potential for increased injury and mortality risk from vessel collisions to marine mammals during the construction, operation and decommissioning phases of the project due to increased vessel activity. There is also a perceived potential for injury or mortality due to entanglement in the mooring systems of the floating turbines during operation.	See **Section 7**.
MMO Marine Conservation Team	17/03/2022, Scoping Opinion	Risk of disturbance due to underwater noise is also considered to be a possibility, with construction, unexploded ordnance (UXO) clearance, foundation installation, vessel noise, operational noise and movement of floating turbine moorings on the seabed as significant factors. Maintenance activities, such as cable re-burial and rock placement and operation and maintenance vessel activity are also factors, as is the	See **Section 7**.

Consultee	Date, Document, Forum	Comment	Where addressed in the RIAA
		increased levels of underwater noise that might occur during decommissioning.	
MMO Marine Conservation Team	17/03/2022, Scoping Opinion	Physical and auditory barrier effects as a form of disturbance are also considered, with the potential for barring marine mammals from migration to feeding and breeding areas. Similarly, there is thought to be a risk of changes in water quality and cumulative changes to prey habitats causing disturbance. It was also noted that there is potential for disturbance due to increased vessel and human activity near seal haul out sites, particularly during sensitive periods, such as breeding or moult seasons. The applicant should identify if any SSSI including seals as a listed feature may be impacted from disturbance. If this is the case, the applicant should contact Natural England, who are responsible for SSSI assent.	See **Section 7**.
MMO Marine Conservation Team	17/03/2022, Scoping Opinion	While the assessment notes that site specific mitigation measures will be undertaken to assess impacts – including underwater noise modelling and a Marine Mammal Mitigation Protocol (MMMP) to reduce risk of physical injury and mortality - based on the information provided, and the significant level of marine development being undertaken, MCT are minded to consider that a wildlife licence is likely required for this application for disturbance and injury offences relating to the identified protected species. It is the applicant’s responsibility to identify which activities and species are likely to require a wildlife licence to avoid an offence.	See **Section 7**.

Consultee	Date, Document, Forum	Comment	Where addressed in the RIAA
MMO Marine Conservation Team	17/03/2022, Scoping Opinion	We would advise that any statutory nature conservation body (SNCB) and specialist advice is taken into account when considering this application and note that the applicant is reminded that they are responsible for satisfying themselves that their activities will not result in an offence. If the applicant deems their activities may cause an offence, it is their responsibility to consider the need for a wildlife licence. If any concerns regarding protected species are brought to the attention of the Marine Licensing Team from SNCBs, please re-consult us.	See **Section 7**.
Natural Resource Wales (NRW)	15/03/2022, Scoping Opinion	At this stage, given that the project is wholly within English waters, NRW Advisory are inclined to defer advice to Natural England (and JNCC if and where applicable). NRW Advisory would, however, be grateful where relevant, if we can continue to be consulted with regards the project due to the potential for cross-border issues arising at a later date – for example in respect to mobile species and cumulative / in-combination impacts. This will become increasingly pertinent with the advent of Floating Offshore Wind Projects within Welsh waters of the Celtic Sea. NRW Advisory have already been in contact with Natural England and JNCC to this effect.	See **Section 7**.
NRW	15/03/2022, Scoping Opinion	In the meantime, we would note the use of Marine Mammal Management Units (MMMU) in Welsh waters, and I attach NRW's Position Statement on the use of MMMU's for screening and assessment in Habitats Regulations Assessments for SACs with marine mammal features.	See **Section 7**.

Consultee	Date, Document, Forum	Comment	Where addressed in the RIAA
Natural England	17/03/2022, Scoping Opinion	Designated nature conservation sites / International and European sites In accordance with your EIA scoping report, the development site is within or may impact on the following European/internationally designated nature conservation sites: Braunton Burrows Special Area of Conservation (SAC) Culm Grassland SAC Tintagel Marsland Clovelly Coast SAC Bristol Channel Approaches/Dynesfeydd Mor Hafren SAC Lundy SAC Tamar Estuaries Complex SPA Isles of Scilly SPA.	See **Section 7**.
MMO formal response	30/05/2022, Scoping Opinion	Conservation of Habitats and Species Regulations 2017 In accordance with the Scoping Report, the development site is within or may impact on the following European/Internationally designated nature conservation sites: Braunton Burrows SAC Culm Grassland SAC Tintagel Marsland Clovelly Coast SAC Bristol Channel Approaches/Dynesfeydd Mor Hafren SAC Lundy SAC Tamar Estuaries Complex SPA Isles of Scilly SPA.	See **Section 7**.

Consultee	Date, Document, Forum	Comment	Where addressed in the RIAA
MMO formal response	30/05/2022, Scoping Opinion	While the assessment notes that site specific mitigation measures will be undertaken to assess impacts, including underwater noise modelling and a MMMP to reduce risk of physical injury and mortality, based on the information provided, and the significant level of marine development being undertaken, the MMO consider that a wildlife licence is likely to be required for this application for disturbance and injury offences relating to the identified protected species. It is the Applicant's responsibility to identify which activities and species are likely to require a wildlife licence to avoid an offence.	See **Section 7**.
MMO formal response	30/05/2022, Scoping Opinion	The Applicant is responsible for satisfying themselves that their activities will not result in an offence. If the Applicant deems their activities may cause an offence, it is their responsibility to consider the need for a wildlife licence.	See **Section 7**.
MMO formal response	30/05/2022, Scoping Opinion	Underwater noise during UXO clearance – operation and decommissioning. The MMO agrees that this can be scoped out as UXO operations are not expected to take place during operation and decommissioning.	See **Section 7**.
MMO formal response	30/05/2022, Scoping Opinion	Underwater noise during foundation installation – operation, decommissioning. The MMO agrees that this can be scoped out as there will not be any foundations installed during the operational or decommissioning phases.	See **Section 7**.

Consultee	Date, Document, Forum	Comment	Where addressed in the RIAA
MMO formal response	30/05/2022, Scoping Opinion	Underwater noise from operational wind turbines – construction and decommissioning The MMO agrees that this can be scoped out as there will not be any operational wind turbines during the construction and decommissioning phases.	See **Section 7**
MMO formal response	30/05/2022, Scoping Opinion	Entanglement – construction, decommissioning The Applicant states "Depending on the method used, there is the perceived potential for entanglement in the mooring systems for floating offshore wind turbines. To date, there have been no recorded instances of marine mammal entanglement from mooring systems of renewable devices (Sparling *et al.*, 2013; Isaacman and Daborn, 2011), or for anchored FPSO vessels in the oil and gas industry (Bejamins *et al.*, 2014) with similar mooring lines as proposed for floating turbine structures." The MMO does not agree that entanglement to WTG mooring systems can be scoped out during construction and decommissioning as the risk will be present during the construction period and decommissioning period whilst turbine are being transported to site and in place prior to becoming operational and also whilst they are being decommissioned.	See **Section 7**.
Natural England	14/11/2022, Marine Mammal ETG	Recommend to not scope out any species, such as striped dolphins and harbour seals due to the large number of unidentified species from the surveys.	See **Section 7**.
Natural England	14/11/2022, Marine Mammal ETG	Recommended to consider the seal linkages between SSSI sites, significant haul out site in north Cornwall.	See **Section 7**.

Consultee	Date, Document, Forum	Comment	Where addressed in the RIAA
Natural England, MMO and Cefas	14/11/2022, Marine Mammal ETG	Stakeholders recommend looking at the whole of the English Channel for Bottlenose dolphin due to their linkages up to Kent area. Coastal west channel MU for Bottlenose dolphin the IAMMWG are currently revising the extent of that MU boundary, looking at extending it further East towards Kent but also further North round the coast of Cornwall towards Padstow. Although it may not overlap with the currently boundary of the project, it would still be beneficial to include this updated boundary in the assessments. JNCC may be able to provide the project team with a figure of this new boundary, depending on when it is finalised.	See **Section 7**.
Natural England	14/11/2022, Marine Mammal ETG	NE recommend reconsidering the thought of harbour porpoise being excluded from nearby disturbance (would want to see monitoring in place otherwise); also reconsider using less ADDs particularly as within EPS licences the project will need to show they are doing as much as possible to avoid injury.	See **Section 7**.
Natural England	14/11/2022, Marine Mammal ETG	NE raised point of: If a management measure is used within assessment to conclude no effect on some of the SACs, then the management measure would need to be secured.	See **Section 7**.

Consultee	Date, Document, Forum	Comment	Where addressed in the RIAA
Natural England	14/11/2022, Marine Mammal ETG	NE recommends to take note for assessments that if there is any distance between the piling locations that might occur within any 24 hour period, this then would cover a larger area to assess. Data from the marine noise registry has been used looking at noise activity that has overlapped with this SAC in the past between 2015 and 2020, it may be published soon if it isn't already so this may be beneficial to include within the assessments. The need for a SIP would depend on the in-combination assessment in the HRA if you identify there is a risk of the thresholds being exceeded. An in principal SIP will be added in with the application if it is thought the project needs a SIP.	See **Section 7**.
Natural England	14/11/2022, Marine Mammal ETG	There is a high amount of bycatch of grey seal in this region so in theory this population is declining as a result, how would this be taken into account in the assessment. As the projects magnitude is based on removal of 1% but in theory tis removal of 1% is already occurring. NRW have looked into this specifically, Ophelie will ask contacts to see if there is a report that can be publicly shared. This will be taken into consideration for the assessments.	See **Section 7**.

Table 4.3 Annex II Species - Fish consultation responses

Consultee	Date, Document, Forum	Comment	Where addressed in the RIAA
MMO	Scoping Opinion May 2022	"In addition the MMO draws particular attention to the need to consider the following: Dartmoor and River Camel SAC – Atlantic salmon are a designated feature of Dartmoor SAC, for which the Taw Torridge Estuary is a migratory route and the River Camel SAC. The EIA should take note of the Conservation Objectives and Supplementary Advice for Dartmoor SAC: European Site Conservation Objectives for Dartmoor SAC - UK0012929 (naturalengland.org.uk) and the River Camel SAC: European Site Conservation Objectives for River Camel SAC - UK0030056 (naturalengland.org.uk). Please note that many of the targets for salmon are in the ʻrestoreʼ category, which reflects unfavourable condition of populations in both sites."	Both Dartmoor and River Camel SACs have been screened into this this RIAA for assessment, and the conservation objectives of these sites are considered.
Natural England	02/05/2023	Clarifications were sought from Natural England on: • the input parameters and planned approach to be used for any future Collision Risk Modelling that may be required; and • the Applicant's interpretation of Natural England's best practice guidance on apportionment, which was used to justify screening out North Sea Special Protection Areas (SPAs) from assessment within the Report to Inform Appropriate Assessment (RIAA). The following response was provided was received from Natural England via email on 30/06/2023: "**Collision Risk Modelling**	The Applicant has undertaken revised collision risk modelling (CRM) using the updated recommended input parameters presented within Natural England's interim guidance on collision risk modelling avoidance rates (Natural England, 2023). The results of this updated CRM are

Consultee	Date, Document, Forum	Comment	Where addressed in the RIAA
		Regarding the Collision Risk Modelling Approach, Natural England's current advice is to use the interim guidance which is attached separately to this response. The CRM guidance is referenced in Table 2 of the clarification note supplied by APEM and so there is no need to also model another set of parameters (e.g. Table 1 in the note, which looks to come from an older version of Natural England's phase 3 best practice advice). A joint SNCB Collision Risk Modelling guidance note is currently in the final stages of production. While NE cannot guarantee that no changes will be made to the advice provided in this interim note, it is considered unlikely. NE advise that these parameters are used for the PIER and any updates should then be reflected in the Environmental Statement submission, if necessary. **Review of NE's Best Practice Guidance** The review of interpretation of the Best Practice Advice within the Clarification note regarding the screening of North Sea Special Area's of Conservation has highlighted a lack of clarity in the example quoted which NE will work to address. While it is true that 8 of 10 SPAs are screened in for connectivity, it appears this decision was not based on geographic location of those SPAs. Table 14, Appendix A of Furness (2015) confirms that two of the SPAs do not contribute adult birds to the relevant seasonal BDMPS population. Those SPAs are designated based on numbers of breeding individuals. This is the basis for screening those SPAs out for connectivity. It is Natural England's advice that Likely Significant Effect should be treated as a coarse screening filter to identify all instances of qualifying features with potential protected site connectivity and an impact pathway. If any Likely Significant Effect cannot be excluded on the basis of objective information without extensive investigation, further assessment should be presented in an Appropriate	presented within **Appendix 13.C: Revised Collision Risk Modelling** of the Offshore ES includes summarisation of any implications the revised modelling has on the conclusions made within the ES. In line with the request from Natural England to consider the potential impact of the Project upon migratory birds, the Applicant has also undertaken modelling of migratory CRM. Results of this modelling are presented in **Appendix 13.B: Migratory Birds Report** of the Offshore ES. A summarisation of the conclusions drawn from the additional modelling are provided within

Consultee	Date, Document, Forum	Comment	Where addressed in the RIAA
		Assessment. Natural England understands it is likely that impacts on North Sea SPAs at White Cross OWF will be small, however due to the in-combination Adverse Effect on Integrity already identified for features of Flamborough and Filey Coast SPA (e.g., kittiwake) it is appropriate to properly quantify these risks to enable an informed consideration of them, to better understand whether White Cross could make a meaningful contribution to the in-combination total."	**Chapter 13: Offshore Ornithology** of the Offshore ES.

5. Screening Conclusions

137. The Project HRA Screening process has been undertaken in consultation with relevant stakeholders, as detailed in **Section 4.2**. The following sub-sections identify the sites and features screened into the need for Appropriate Assessment in relation to the Project alone or in-combination, with the features and sites screened in summarised in **Table 5.1**, **Table 5.2**, **Table 5.3**, **Table 5.4** and **Table 5.5**.

5.1 Annex I Habitats (and associated Annex II species)

138. The HRA Screening Report and subsequent Scoping Opinion (MMO, 2022) identified Annex I habitats and Annex II species associated with those sites as having a potential likely significant effect as a result of the Project's construction, operation and maintenance, and decommissioning, either alone or in-combination with other projects and plans, as indicated by the Zone of Influence and the Study Area. The sites were:

- Braunton Burrows SAC
- Tintagel-Marsland-Clovelly Coast SAC
- Lundy SAC.

139. The potential Landfall zone identified at the Scoping Stage extended down to the Tintagel-Marsland-Clovelly Coast SAC, however, following further refinement of the Landfall location, the preferred Landfall at the northern end of Saunton Sands is now located 13.4km away. The Offshore Export Cable Corridor is located 8.75km off the Tintagel-Marsland-Clovelly Coast SAC at its nearest point. Given the offshore works are temporary and a significant distance from the Tintagel-Marsland-Clovelly Coast SAC, no likely significant effect is expected on the site or its features or the achievement of the conservation objectives for those features. Similarly, for the Landfall works at Saunton Sands, the significant distance along with the temporary nature of any disturbance activities on the beach would result in no likely significant effect on the site or its features or the achievement of the conservation objectives for those features. The same is concluded in-combination with other projects as the Project alone would have no effects that could be expected to result in additive or synergistic effects from other proposed projects. Overall, given no likely significant effect is therefore expected, the Tintagel-Marsland-Clovelly Coast SAC is therefore screened out from further assessment in this report.

140. The remaining Annex I habitats and Annex II species associated with those sites that are assessed in this report are listed in **Table 5.1**.

Table 5.1 Designated sites where Annex I habitats and associated Annex II species screened into this RIAA for assessment

Designated site	Features	Reason for screening in
Braunton Burrows SAC	Shifting dunes along the shoreline with *Ammophila arenaria* ("white dunes") Fixed coastal dunes with herbaceous vegetation ("grey dunes") Dunes with *Salix repens* ssp. *Argentea Salicion arenariae* Humid dune slacks Mudflats and sandflats not covered by seawater at low tide Petalwort	Habitat loss (operation).
		Disturbance to habitats (construction and operation).
		Alteration to habitats (disturbance to contaminants and accidental / incidental discharges during construction).
		In-combination effects regarding all the above.
	Shifting dunes along the shoreline with *Ammophila arenaria* ("white dunes") Mudflats and sandflats not covered by seawater at low tide	Alteration to habitats (coastal process change during construction).
		Alteration to habitats (coastal process change during operation).
	Mudflats and sandflats not covered by seawater at low tide	Alteration to habitats (suspended sediment and deposition during construction).
		Alteration to habitats (suspended sediment and deposition during operation).
Lundy SAC	Reefs Sandbanks which are slightly covered by sea water all the time Submerged or partially submerged sea caves	Alteration to habitats (coastal process change during operation).
		Alteration to habitats (suspended sediment and deposition during construction).
		Alteration to habitats (suspended sediment and deposition during operation).
		Alteration to habitats (disturbance to contaminants and accidental / incidental discharges during construction).
		In-combination effects regarding all the above.
	Grey seal	Underwater noise.
		Vessel interactions.
		Entanglement.
		Barrier effects due to the physical presence of offshore infrastructure

Designated site	Features	Reason for screening in
		Disturbance at seal haul-out sites
		Changes to prey resources
		Changes to water quality
		In-combination effects

5.2 Annex II Species – Marine Mammals

141. For marine mammals (harbour porpoise; *Phocoena phocoena*, bottlenose dolphin; *Tursiops truncatus*, and grey seal; *Halichoerus grypus*), the approach to HRA screening focused on the potential for connectivity between individual marine mammals from designated populations and the offshore sites (i.e. demonstration of a clear source-pathway-receptor relationship). This was based on the distance of the offshore sites from the designated site, the range of each effect and the potential for animals from a site to be within range of an effect.

142. The area over which sites were considered varied for each species. For harbour porpoise, connectivity was considered to be possible between the Windfarm Site, and designated sites within the Celtic & Irish Sea (CIS) Management Unit (MU). For bottlenose dolphin connectivity was considered for the Offshore Channel and South West England (OCSW) and Irish Sea (IS) MUs. For grey seal, all designated sites within the Southwest (SW) England and Wales MUs regions were considered to have the potential for connectivity. See the **HRA Screening Report** for more information on the screening process for marine mammals (see **Figure 5.1** of the **HRA Screening Report**).

143. Following submission of the **HRA Screening Report**, subsequent information on the foraging ranges of grey seal was published, which reported that the maximum foraging range of grey seal could be as high as 448km from their main haul-out sites (Carter *et al.,* 2022; Russell, 2016). In addition, further consultation was undertaken for the Project, and following Expert Topic Group (ETG) 2 for marine mammals (in November 2022), the HRA screening area for grey seal was expanded to include the south and east coast of Ireland, as well as the north-west coast of France (**Section 12.5** of **Chapter 12: Marine Mammal and Marine Turtle Ecology** of the Offshore ES). This is in line with results of tagging studies of grey seal from the north coast of France (e.g. Vincent *et al.*, 2017), and as presented in Carter *et al.*, (2022). This HRA Screening was also updated to take into account *NRW's Position Statement on the use of Marine Mammal Management Units for screening and assessment in Habitats Regulations Assessments for Special Areas of Conservation with marine mammal features* (NRW, 2021) which was provided through consultation.

144. The outcome of the screening exercise, recent information and subsequent consultation and updates to the HRA screening result in the designated sites being screened in for marine mammals as presented in **Table 5.2**.

Table 5.2 Designated Sites Where Marine Mammals are a Qualifying Feature (or Feature of Interest) Screened into the HRA for Further Assessment

Designated Site	Marine Mammal Feature Screened In	Distance to array and cable corridor (km)
Bristol Channel Approaches / Dynesfeydd Môr Hafren SAC	Harbour porpoise	Within designated site
Lundy Island SAC	Grey seal	1
West Wales Marine / The Gorllewin Cymru Forol SAC	Harbour porpoise	38
Pembrokeshire Marine / Sir Benfro Forol SAC	Grey seal	60
Cardigan Bay SAC	Bottlenose dolphin	120
Saltee Islands SAC	Grey seal	123
Nord Bretagne DH	Harbour porpoise Bottlenose dolphin	164
Récifs et landes de la Hague	Bottlenose dolphin Grey seal	217
Mers Celtiques -Talus du golfe de Gascogne	Harbour porpoise Bottlenose dolphin	219
Côte de Granit rose-Sept-Iles	Harbour porpoise Bottlenose dolphin Grey seal	220
Anse de Vauville	Bottlenose dolphin Grey seal	222
Tregor Goëlo	Harbour porpoise Bottlenose dolphin Grey seal	228
Rockabill to Dalkey Island SAC	Harbour porpoise	231
North Anglesey Marine / Gogledd Môn Forol SAC	Harbour porpoise	235
Banc et récifs de Surtainville	Bottlenose dolphin Grey seal	237
Baie de Morlaix	Harbour porpoise Grey seal	243
Récifs et marais arrière-littoraux du Cap Lévi à la Pointe de Saire	Bottlenose dolphin	244
Lambay Island SAC	Grey seal	257
Abers -Côte des legends	Harbour porpoise Bottlenose dolphin Grey seal	260
Baie de Seine occidentale	Bottlenose dolphin	270

Designated Site	Marine Mammal Feature Screened In	Distance to array and cable corridor (km)
Roaringwater Bay and Islands SAC	Harbour porpoise Grey seal	279
Quessant-Molène	Harbour porpoise Bottlenose dolphin Grey seal	280
Chausey	Bottlenose dolphin Grey seal	282
Côte de Cancale à Paramé	Bottlenose dolphin Grey seal	307
Blasket Islands SAC	Harbour porpoise	308
Baie du Mont Saint-Michel	Bottlenose dolphin Grey seal	310
North Channel SAC	Harbour porpoise	336
Chaussée de Sein	Harbour porpoise Grey seal	336
Blasket Islands SAC	Harbour porpoise Grey seal	361

145. While a number of marine mammal designated sites have been screened in for further assessment, a number of these sites are a considerable distance from the Project, and would be sufficiently far that direct effects to the designated sites would not occur (**Table 5.2**). The assessments provided within this RIAA focus on those sites that are either the closest for each designated feature, or still considered close enough that there is potential for effect to the designated feature of the site as a worst-case. These key designated sites assessed are (**Figure 7.1**):

- Bristol Channel Approaches / Dynesfeydd Môr Hafren SAC for harbour porpoise
- Cardigan Bay / Bae Ceredigion SAC for bottlenose dolphin
- Lundy Island SAC for grey seal
- Pembrokeshire Marine / Sir Benfro Forol SAC for grey seal.

146. As harbour porpoise are wide-ranging, no discrete population can be assigned to an individual designated site. It is, therefore, assumed that at any one time, harbour porpoise within or in the vicinity of the Project area are associated with the nearest SAC, the Bristol Channel Approaches SAC (as they cannot simultaneously be part of the population of multiple designated sites, although all are part of the larger MU population).

147. The remainder of the designated sites that have been screened in for further assessment, as have the potential for LSE, have also been assessed. The assessment on these other designated sites is provided in **Section 7.2.5**. It should be noted that the highest potential effect would be at those sites that are closest to

the Project for each marine mammal species, and it is assumed that all individuals affected would be from the closest designated site as a worst-case and precautionary approach. Therefore, those designated sites that are further from the Project would be potentially affected to a lesser degree than the designated sites that have been assessed as a key designated site.

148. The designated sites that have been screened out of Appropriate Assessment due to the conclusion of no LSE are listed in **Annex A: HRA Screening Report** (noting the changes described in **Section 4.2**).

149. For the marine mammal designated sites screened in for further assessment, the screening exercise concluded the potential for LSE for the effects as listed in **Table 5.3** (as agreed with Natural England – see **Chapter 12: Marine Mammal and Marine Turtle Ecology** of the Offshore ES).

Table 5.3: Summary of Potential Effects to Marine Mammals Screened into Appropriate Assessment

Potential Effects	Construction	Operation and Maintenance	Decommissioning
Underwater noise including barrier effects (all potential sources during operation, operation and maintenance, and decommissioning)	✓	✓	✓
Collision risk with vessels	✓	✓	✓
Disturbance at seal haul-out sites	✓	✓	✓
Entanglement	✓	✓	✓
Barrier effects due to the physical presence of offshore infrastructure	✓	✓	✓
Changes to prey availability	✓	✓	✓
Changes in water quality	✓	✓	✓
EMF (direct effects)	✓	✓	✓
In-combination effects from underwater noise	✓	✓	✓
In-combination effects from collision risk and entanglement	✓	✓	✓
In-combination effects from disturbance at seal haul-out sites	✓	✓	✓
In-combination effects to prey availability (including habitat loss)	✓	✓	✓

Potential Effects	Construction	Operation and Maintenance	Decommissioning
Transboundary effects	✓	✓	✓

150. As agreed with stakeholders at the marine mammals and marine turtles ETG 2 on the 14th of November 2022, the potential effects from Unexploded Ordnance (UXO) clearance will be assessed in a separate Marine Licence (ML) and also as part of the current submission (however, marine mammal assessments for potential UXO clearance impacts have been provided in **Chapter 12: Marine Mammal and Marine Turtle Ecology** of the Offshore ES for information only). The potential in-combination effects from UXO clearance at other Offshore Wind Farms (OWFs) during piling at the Project are assessed.

5.3 Annex II Species – Ornithology

5.3.1 Summary and Updates to Stage 1 Screening

151. In relation to offshore ornithology features, the Project's HRA Screening Report (MMO Case reference: EIA/2022/00002) identified 40 designated sites for which the potential for LSE could not be discounted at the screening stage and for which assessment is required. Since drafting the HRA Screening Report updates to screening have been made based on consultation responses, review of the full 24 months of site-specific aerial digital survey data and predicted impacts from the Project being available as summarised below.

152. The final designated sites and qualifying ornithology features screened into the Appropriate Assessment are presented in **Table 5.4**. The sites and features screened out of the need for an Appropriate Assessment (i.e. where no LSE was concluded) are listed in **Appendix 13.A: Offshore Ornithology Technical Report** of the Offshore ES.

5.3.1.1 Updates following consultation responses

153. In response to the MMO's/RSPB Scoping Opinion comments presented in **Section 4.2**, the Applicant has further considered the potential impact from the Project on the following ornithological receptors and implications for HRA assessments:

- Lighting Effects (Pollution) on Manx shearwaters
- Potential impacts on Balearic shearwaters
- Potential impacts on European storm petrels.

5.3.1.2 Consideration of Lighting Effects (Pollution) on shearwaters and petrels

154. There is the potential for some species of birds to be attracted to or deterred by artificially illuminated structures in the offshore environment, such as oil and gas platforms, during the hours of darkness or poor weather conditions which result in restricted visibility. Impact effects maybe positive; as they may provide opportunities for extended feeding periods, shelter and resting places or navigation aids for some migrating birds, or negative; causing change in course direction during migration and increased energy expenditure or displacement during nocturnal foraging. Predicting behavioural changes to artificial lighting may also require consideration of species, age and season.

155. The majority of offshore evidence on lighting effects is compiled from studies from oil and gas platforms (reviewed in Ronconi *et al.*, 2015). However, WTGs are not as extensively lit or intensively lit, compared to oil and gas platforms which may also include gas flares. Benefits relating to increased provision of foraging opportunities or drawbacks, such as disorientation effects during the hours of darkness are unlikely to be of the same magnitude at WTGs. Any benefits of lighting from OWFs, however, may be outweighed by increased risks of collision with rotating blades of WTGs for species that fly at the rotor swept height.

156. Disturbance effects of lighting may derive from changes in orientation, disorientation and attraction or repulsion from the altered light environment, which in turn may affect foraging, migration and communication (Longcore and Rich, 2004). These behavioural effects tend to be reported predominantly in poor visibility i.e., impacting flight behaviours when visibility is low during overcast nights with drizzle and fog. At these times lighting is enhanced because the moisture droplets in the air refract the light and greatly increase the illuminated area (Hill *et al.*, 2014). Therefore, the likelihood of behavioural effects from lighting should consider the occurrence of glare and not simply its intensity. The hours of darkness in which intense illumination has the greatest effect is the period after nautical twilight when the horizon is no longer clearly visible, and structures cannot be seen against a contrasting background. Therefore, the extent to which nocturnally active seabirds such as shearwaters and storm-petrels are at risk to artificial lighting depends on the frequency and duration of the conditions that effect behaviour. These conditions may vary considerably between seasons, i.e., mid-winter vs mid-summer and their geographical location.

157. When considering shearwater and petrel species at potential risk from artificial lighting from the Project, Manx shearwater is the predominant species to be considered. Aerial digital surveys recorded this species from March to September

with peak abundance recorded within May 21 (return migration/breeding season). Vulnerability of Manx shearwaters to lighting at OWFs will be dependent on the time spent at sea during the hours of darkness, which varies considerably during the months they are present within the breeding season in UK waters. Female Manx shearwaters during their pre-laying exodus spend a protracted period travelling extensive distances to productive feeding grounds, although during the brooding period parents return to the nest at least every two days. However, it is not until the post-brooding period that parents spend longer periods at sea.

158. Manx shearwaters may gather in dense flocks on the sea (rafting behaviour) in the vicinity of breeding colonies from late afternoon, before coming ashore after nightfall to avoid being preyed on by predatory species (e.g., peregrines). Birds tend to roost on the sea within 20km of the colony prior to Landfall and resume roosting on the sea adjacent to the colony after their visit (Dean *et al.*, 2013). The maximum extent of rafts of birds from Skomer was 4km (note that the Project is located approximately 67km distant from Skomer at the closest point), which would suggest local birds are not usually in the vicinity of the Project during the hours of darkness. Although foraging has been reported to occur at night (as reported for birds from a colony on the west coast of Ireland, by Kane (2020), foraging activities for Manx shearwaters at Skomer occurred almost entirely within daylight, whilst birds roosted on the water during the evening and at night (Dean *et al.*, 2013). Manx shearwaters from colonies with connectivity to the Project, such as Skomer Island, constrain their dives to daylight hours which corresponds to the diurnal diel movements of their primary prey at that colony, clupeid fish (Shoji *et al.*, 2016; Dean, 2012).

159. There is considerable uncertainty regarding nocturnal behaviours of seabirds such as their avoidance rate, attraction and flight heights on approach to illuminated structures, making potential impact consequences highly speculative. Manx shearwater is considered to have low collision risk as it usually flies less than 20 m above sea level; below blade tip height (Furness *et al.*, 2013, Bradbury *et al.*, 2014; Johnston *et al.*, 2014). Flight height data for Manx shearwater is based on aerial or ship-based at-sea surveys, which take place during daylight and in relatively calm weather. There is less certainty if this may represent the behaviour of Manx shearwaters under all conditions, particularly since the species engages in slope-soaring. However, it has been shown that birds are likely to remain low to the sea surface where the shear is strongest (Spivey *et al.*, 2014), despite weather conditions or visibility.

160. Evidence of light-induced disorientation for Manx shearwaters is derived from effects of brightly lit coastal structures and buildings on adults returning to burrows during the breeding season or specifically to grounding or attraction in fledglings. Disorientation of adults to these types of artificial lights on approach to burrow sites was demonstrated to be on birds already in the vicinity or at the colony attempting to land and not attracted from large distances (Guilford *et al.,* 2019). Studies on light attraction in juvenile birds tend to be restricted to birds on maiden flights (Brown *et al*., 2023). Furthermore, attraction of fledglings to intensely illuminated structures such as lighthouses is predominantly seen in weather conditions involving very poor visibility (Archer *et al*., 2015).

161. Therefore, current evidence would suggest the potential for Manx shearwaters to be attracted or disorientated by artificial light is predominantly in low ambient light and poor weather conditions in either adults approaching burrow sites or in fledglings on maiden flights.

162. OWF sites are marked in accordance with current aviation and navigational lighting guidance and policy. In general aviation and navigational lighting, requirements are that peripheral structures such as WTGs, where more than 900m apart, are lit with a single medium intensity (2000 candela) flashing red aviation light at the top of the nacelle. When visibility exceeds 5km light intensity is reduced to 10% (200 candela). Therefore, studies of bird collisions with other anthropogenic structures such as buildings, towers or offshore oil and gas platforms (Ronconi *et al*., 2015) that have been found to cause a high risk of collision may not necessarily reflect the situation at OWFs.

163. Studies on nocturnal flight at colonies to examine the response of adult Manx shearwaters to different intensities, wavelengths and durations of light showed that birds were more responsive to high intensity light, least responsive to red light and that longer continuous light durations elicited stronger responses (Syposz *et al*., 2021). This lower sensitivity to red light has been demonstrated at Bardsey lighthouse, which changed to a red flashing light in 2014 and resulted in a huge reduction in collisions of Manx shearwaters (Deakin *et al*., 2022).

164. Outside the breeding season during periods of nocturnal migration, collision risk would be expected to be higher if migratory routes pass through OWF sites, although no studies specifically on Manx shearwaters have been undertaken. However, while artificial light from structures such as lighthouses, communications towers and oil and gas platforms have been reported to attract nocturnal migrating birds, especially passerines, the evidence for this potential impact on nocturnal migratory birds at WTGs is somewhat less than predicted. For example, a radar

study at the Nysted OWF by Desholm and Kahlert (2005) and Kahlert *et al*., (2004) reported a shorter response distance at night to the presence of the windfarm and a larger proportion of the birds fly within the wind farm at night compared with day time, but counteract this higher risk of colliding with the turbines in the dark by increasing their distance from individual turbines. Data from studies conducted at 30 terrestrial wind farms revealed no significant differences between fatality rates of night migrants at WTGs with lights as opposed to WTGs without lighting at the same wind farm (Kerlinger *et al*., 2010). Welcker *et al*., (2017) found nocturnal migrants do not have a higher risk of collision with WTGs than do diurnally active species, but rather appear to circumvent collision more effectively. Observations from these studies are likely to be explained by the type of illumination used at OWFs; intermittent red light. For example, Rebke *et al*., (2019) tested different intensities and wavelengths of light offshore on attraction to nocturnal migrants, which concluded that illuminated structures generally attract nocturnal migrants under adverse weather conditions. Red or intermittent light had the least effect on attraction.

165. There is insufficient evidence from current literature or any existing OWF to suggest any significant impacts on Manx shearwater occur as a result of aviation and navigation lighting that is typical for UK OWFs. Light-induced disorientation to the navigation lights on WTGs based on studies on attraction to lighthouses, buildings, offshore oil and gas platforms or other species' responses is entirely speculative and contrary to evidence on Manx shearwater behaviour to red light or flashing lights. Furthermore, there is a low likelihood of routine nocturnal foraging far offshore and during poor visibility when the species is known to be rafting close to colonies. it's the low flying characteristics also suggest that the risk of lighting impacts from OWFs in both the breeding season and migratory seasons would be considered low for Manx shearwater. As a result, no LSE can confidently be concluded.

5.3.1.3 Consideration of storm petrel species for HRA assessment

166. A single unidentified storm petrel species was recorded in May 2021 within the Project area. The unidentified petrel species is likely to be one of the two species of storm petrel that breed in the UK: Leach's (*Hydrobates leucorhous*) or European (*Hydrobates pelagicus*). Leach's storm petrel do not breed in England or Wales and, given the breeding season for Leach's storm petrel is from May to mid-October (NatureScot, 2020) and the location of the bird recorded, it would be likely to be on passage to a breeding colony further north.

167. The majority of the UK population of European storm petrel breed in Scotland, with small colonies also found in England confined to the Isles of Scilly and Lundy, and

in Wales in Gwynedd and Dyfed with the largest colony at Skokholm. The breeding season for European storm petrel is from mid-May to October (NatureScot, 2020), suggesting that the bird recorded would likely be on passage to a colony further north. There were no other records of storm petrel species from the aerial digital surveys to suggest breeding birds from the nearest colonies were regularly foraging in the area of the Project.

168. Although there is sparse historical data that covers the Project area, further evidence that infers low usage of the Project area by storm petrel species is supported by several sources such as ebird relative density range maps (Fink *et al.*, 2022; **Figure 5.1a** and **Figure 5.1b**). This conclusion is further bolstered by Trektellen coastal count data (Trektellen, 2023; **Figure 5.2a** and **Figure 5.2b**) and distribution densities predicted for this area for European storm petrel of <0.1 birds/km^2 by Waggitt *et al.*, (2020). These sources would predict very low occurrence of Leach's storm petrel over the Project area and only on passage, which would be in agreement with a single record in May 2021 during aerial digital surveys. In the case of European storm petrel it may have been expected to have recorded this species on more than one occasion such as during the breeding season as the Project area is within the mean maximum plus one standard deviation foraging distance (1346.8±1018.7km (Woodward *et al.*, 2019)) of colonies in the Isles of Scilly, Lundy and Skokholm. However, available evidence would suggest that areas to the north and south of the Project are more important foraging areas for this species rather than the Project area itself. (**Figure 5.1b**).

*Figure 5.1 ebird relative density range maps (Fink et al., 2022), A; Leach's storm petrel and B; European storm petrel. * approximate location of the Project*

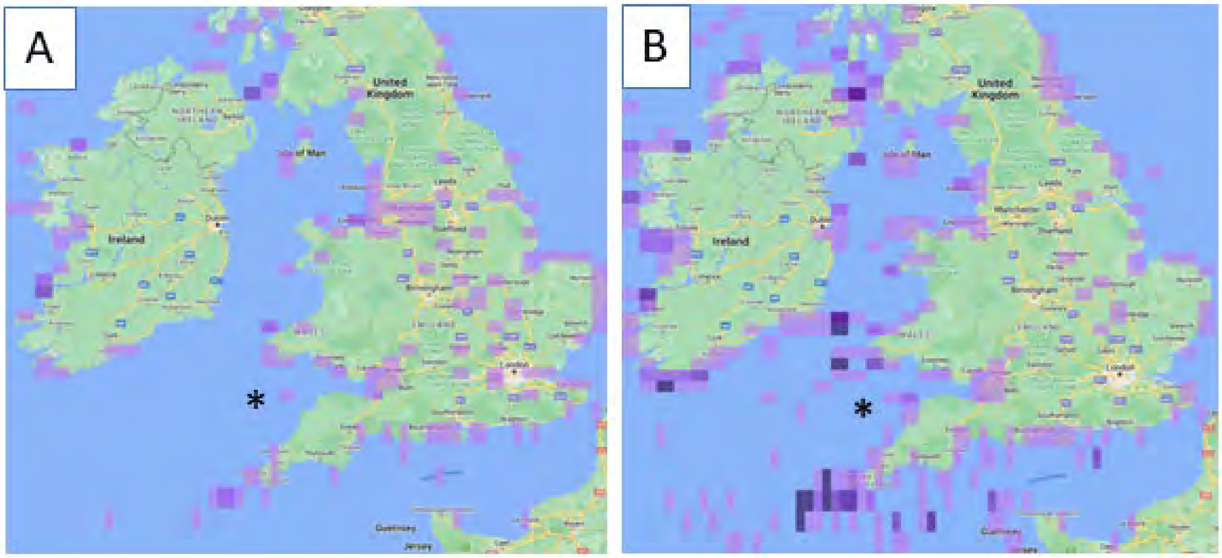
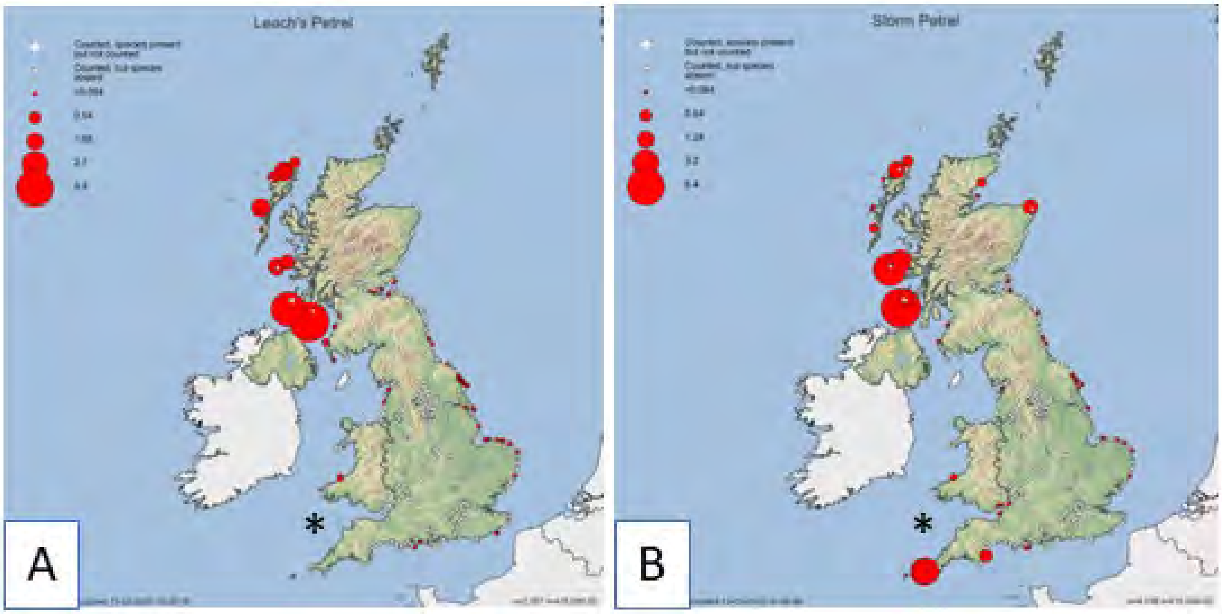


*Figure 5.2 Trektellen coastal counts per hour at sites in the vicinity of the Project (Trektellen, 2023) are given; A; Leach's storm petrel maximum count of <1 bird/hr and B; European storm petrel, maximum count of ~3 birds/hr. * approximate location of the Project*



169. It can be confidently concluded that the Project area is not an area of importance to either storm petrel species. Connectivity is considered low for both storm petrel species when considering the results of the site-specific aerial digital surveys and above additional evidence. Therefore, the Applicant remains of the position that an LSE can be confidently dismissed for Leach's and / or European storm petrel qualifying features identified within the HRA Screening Report.

5.3.1.4 Consideration of Balearic shearwater for HRA assessment

170. Note that there is currently no designated site within the UK for which Balearic shearwater is a qualifying feature, named component or non-named component of a qualifying seabird assemblage feature. This means this is no requirement for the species to be considered with respect to HRA. The Applicant, therefore, remains of the position that there is no requirement to consider Balearic shearwater within this report. This is due to the species having only limited connectivity to the Project area and not being a qualifying feature of any SPA screened in for consideration within the HRA Screening Report. The below information is presented in the interest of clarity and is beyond what is required for this report.

171. No Balearic shearwaters (*Puffinus mauretanicus*) were recorded in 24 months of site-specific aerial digital survey data of the Windfarm Site and a 4km buffer. However, a raw count of 10 (an estimated abundance of 77 individuals) unidentified shearwaters were recorded in October 2020, a period in which Balearic shearwaters are recorded on passage in the wider area (Trektellen 2023; **Figure 5.4c**). This would suggest that Balearic shearwaters may potentially pass through the site in low numbers during the non-breeding season, the only time that they are typically present in UK waters after breeding around the Balearic Islands in the western Mediterranean. There are no historical records of sightings in the vicinity of the Project area, although the area is sparsely covered by ESAS. However, estimated passage rates around the southern Cornish headland to the south of the Project (approximately 52.5km distant at the closest point) between July to October range from 0.3 to 2.4 birds per hour based on land survey observations (Parsons *et al.*, 2019). Additionally, recent coastal surveys have recorded up to 3.8 birds per hour. This is compared to ~6,400 bird/hr for Manx shearwater (Trektellen, 2023), though passage rates are not known from the coasts of north Cornwall and Devon, which are more relevant to the Project area.

*Figure 5.3 ebird relative density range maps (Fink et al., 2022), C; Balearic shearwater and for purposes of context D; Manx shearwater. * approximate location of proposed Project*

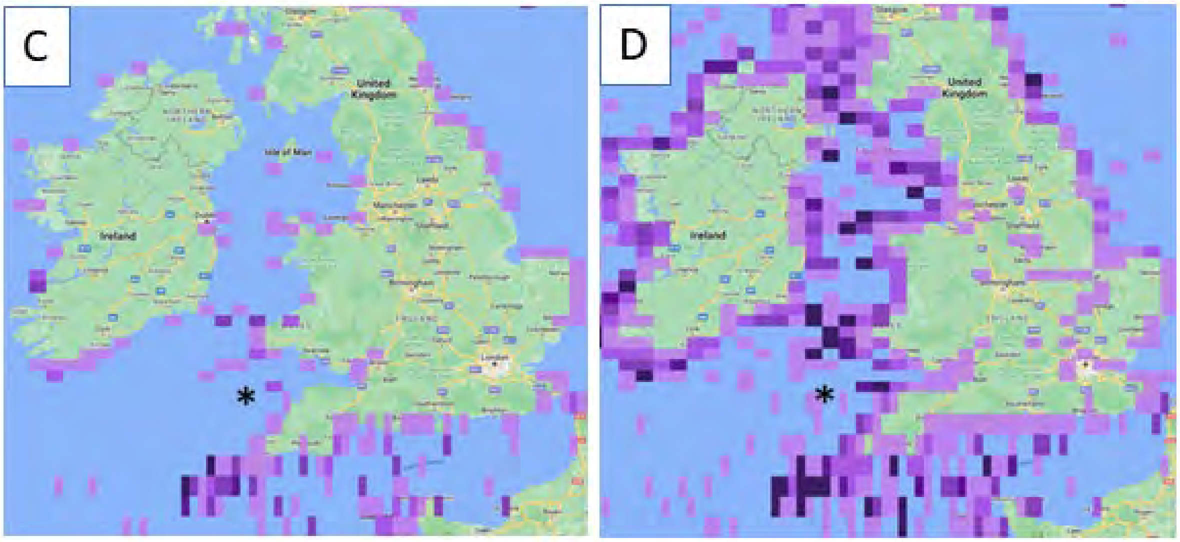
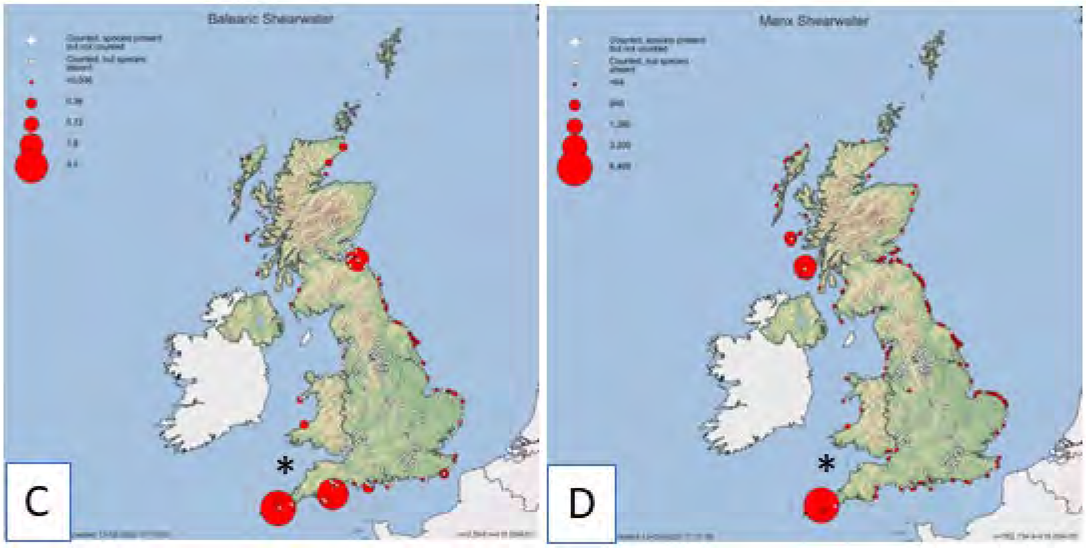


*Figure 5.4 Trektellen coastal counts per hour at sites in the vicinity of the Project (Trektellen, 2023) are given; C; Balearic shearwater maximum count of ~3 birds/hr and for purposes of context D; Manx shearwater. maximum count of ~6,400 birds/hr * approximate location of proposed the Project*



172. Of the abundance estimate of 77 unidentified shearwaters recorded in October 2020 from the site-specific aerial digital surveys it can be estimated that a small proportion of these birds may be Balearic shearwaters. However, based on the results of unidentified shearwater species apportionment, certainly not all are Balearic shearwaters due to the low numbers of this species that are found in UK waters, especially when compared to other shearwater species. Note that no population estimates for this species in the UK are available due to its scarcity.

173. After the breeding season birds move into Atlantic waters, primarily off Iberia and western France but also into UK waters (mainly along the south and south-west English coasts) during June to October. Peak numbers are usually observed in September to October (Trektellen, 2023). The UK wintering population of Balearic shearwaters is not well known and is difficult to estimate with accuracy. However, it is believed to be relatively small, with year-to-year variations influenced by feeding opportunities and weather patterns (Parsons *et al.*, 2019). The species regularly passes along the coastline of north Cornwall and Devon (**Figure 5.5**). However, there are low numbers of records of birds remaining in an area for some time, engaging in feeding or other types of behaviour, suggesting that some sites hold important wintering foraging aggregations (Parsons *et al.*, 2019).

*Figure 5.5 ebird non-breeding season relative density map for Balearic shearwater (Fink et al., 2022). * approximate location of the Project*

174. Therefore, the evidence would suggest that although a small number of Balearic shearwater may potentially pass through the Project area, this is likely to be limited to migratory months only whilst flying to more important winter foraging areas and numbers are likely to fluctuate considerably from year to year.

5.3.1.5 Updates following completion of the site-specific surveys

175. The HRA Screening Report provided for a precautionary assessment of the potential for LSE to occur to a wide number of bird species associated with multiple designated sites. The decisions made at the screening stage included assumptions on the potential for some species to be present that may be at risk from the Project ahead of site-specific data and corresponding assessments being available. In order to undertake a proportionate assessment within this Appropriate Assessment, consideration was given to the full 24 months of site-specific aerial digital survey data for offshore ornithology receptors and subsequent assessment results. This was undertaken to ensure the Appropriate Assessment is only focused on the relevant key sites and receptors. Therefore, a number of updates to the HRA screening conclusions have been made based on review of these data sources, due to either the absence of a species entirely or where they have been recorded in such low numbers that the resulting effect levels would almost certainly be immaterial.

176. As presented within **Appendix 13.A: Offshore Ornithology Technical Report** and **Appendix 13.C: Revised Collision Risk Modelling** of the Offshore ES, the annual predicted collision mortality for lesser black-backed gulls from the Project is at most less than a single individual (0.3) per annum.

177. When considering the low level of impact (well under a single breeding adult per annum) which would be subsequently apportioned to any single SPA, the potential for an LSE can, therefore, be confidently ruled out for the following sites:

- Skomer, Skokholm and the Seas off Pembrokeshire SPA
- Isles of Scilly SPA
- Ribble and Alt Estuaries SPA
- Bowland Fells SPA.

178. As presented within the **Appendix 13.A: Offshore Ornithology Technical Report** and **Appendix 13.C: Revised Collision Risk Modelling** of the Offshore ES, the annual predicted collision mortality for great black-backed gulls from the Project during the non-breeding season is zero individuals. The potential for an LSE can, therefore, be confidently ruled out with respect to the great black-backed gull feature of the Isles of Scilly SPA.

179. Puffin were only recorded within the Windfarm Site plus 2km buffer in seven out of 24 months with a breeding season mean peak abundance of 49 individuals and a non-breeding mean peak abundance of 31 individuals. As presented within the **Chapter 13 Offshore Ornithology** of the Offshore ES, the EIA predicted an effect that equates to 2.2 individuals during the breeding season and 3.4 individuals predicted mortalities as a consequence of disturbance and displacement when considering the worst-case scenario of 70% displacement and 10% mortality. When considering the low level of impact (well under a single breeding adult per annum) which would be subsequently apportioned to any single SPA, the potential for an LSE can, therefore, be confidently ruled out for the following sites:

- Skomer, Skokholm and the Seas off Pembrokeshire SPA
- Shiant Isle SPA
- St Kilda SPA
- Flannan Isle SPA
- Sule Skerry and Sule Stack SPA

5.3.1.6 Updates to consideration of UK North Sea SPAs

180. As detailed within the HRA Screening Report, the following North Sea SPA colonies were screened in for assessment. This is due to the fact that greater than 1% of

the colony population are thought to have connectivity to the western waters BDMPS within the non-breeding season (Furness, 2015) As a result, LSE could not initially be ruled out for the following sites (see **Table 5.4**):

- Flamborough and Filey Coast SPA: gannet & kittiwake during the non-breeding season
- Farne Islands SPA: puffin during the non-breeding season
- Forth Islands SPA: gannet and puffin during the non-breeding season
- Fowlsheugh SPA: kittiwake during the non-breeding season
- Buchan Ness to Collieston Coast SPA: kittiwake during the non-breeding season
- Troup, Pennan and Lion's Heads SPA: kittiwake during the non-breeding season
- East Caithness Cliffs SPA: fulmar and kittiwake during the non-breeding season
- North Caithness Cliffs SPA: fulmar and kittiwake during the non-breeding season
- Hoy SPA: fulmar during the non-breeding season;
- West Westray SPA: kittiwake during the non-breeding season
- Fair Isle SPA: fulmar during the non-breeding season
- Foula SPA: fulmar and puffin during the non-breeding season
- Noss SPA: gannet during the non-breeding season
- Hermaness, Saxa Vord and Valla Field: gannet and puffin during the non-breeding season.

181. However, when considering the size of the Project's offshore array area (50km^2) in relation to the entire western waters BDMPS, combined with the low abundance of the above species recorded during the non-breeding season, the potential for any impact to be apportioned to North Sea SPAs can be considered so low that an LSE can confidently be ruled out. Therefore, none of the above North Sea SPAs are considered further. This conclusion adheres to the non-breeding season apportionment guidance as detailed within Natural England's best practice guidance (Parker *et al.*, 2022).

Table 5.4 Summary of ornithological sites and features screened in to the Appropriate Assessment

Site	**Qualifying feature(s) screened in (b=breeding, nb=non-breeding)**	**Disturbance and Displacement (Including Barrier Effects)**			**Collision**			**Entanglement**			**Indirect Effects****		
		C	**OM**	**D**	**C**	**OM**	**D**	**C**	**OM**	**D**	**C**	**OM**	**D**
Sgomer, Sgogwm a Moroedd Penfro / Skomer, Skokholm and the Seas off Pembrokeshire	Manx shearwater (b)	✓	✓	✓		✗			✓		✓	✓	✓
	Short-eared owl (b)	✗	✗	✗		✓*			✗		✗	✗	✗
	Seabird assemblage (b)	✓	✓	✓		✗			✓		✓	✓	✓
Grassholm	Gannet (b)	✓	✓	✓		✓			✓		✗***	✗***	✗***
Burry Inlet	Arctic tern (passage)	✗	✗	✗		✓*			✗		✗	✗	✗
	Black tern (passage)	✗	✗	✗		✓*			✗		✗	✗	✗
	Common tern (passage)	✗	✗	✗		✓*			✗		✗	✗	✗
	Curlew (nb)	✗	✗	✗		✓*			✗		✗	✗	✗
	Dunlin (nb)	✗	✗	✗		✓*			✗		✗	✗	✗
	Greenshank (passage)	✗	✗	✗		✓*			✗		✗	✗	✗
	Grey plover (nb)	✗	✗	✗		✓*			✗		✗	✗	✗
	Knot (nb)	✗	✗	✗		✓*			✗		✗	✗	✗
	Little tern (passage)	✗	✗	✗		✓*			✗		✗	✗	✗
	Oystercatcher (nb)	✗	✗	✗		✓*			✗		✗	✗	✗
	Pintail (nb)	✗	✗	✗		✓*			✗		✗	✗	✗
	Redshank (nb)	✗	✗	✗		✓*			✗		✗	✗	✗
	Sandwich tern (passage)	✗	✗	✗		✓*			✗		✗	✗	✗
	Shelduck (nb)	✗	✗	✗		✓*			✗		✗	✗	✗
	Shoveler (nb)	✗	✗	✗		✓*			✗a		✗	✗	✗
	Teal (nb)	✗	✗	✗		✓*			✗		✗	✗	✗
	Turnstone (nb)	✗	✗	✗		✓*			✗		✗	✗	✗
	Whimbrel (passage)	✗	✗	✗		✓*			✗		✗	✗	✗
	Wigeon (nb)	✗	✗	✗		✓*			✗		✗	✗	✗
Tamar Estuaries Complex	Avocet (nb)	✗	✗	✗		✓*			✗		✗	✗	✗
	Little egret (nb)	✗	✗	✗		✓*			✗		✗	✗	✗

Site	Qualifying feature(s) screened in (b=breeding, nb=non-breeding)	Disturbance and Displacement (Including Barrier Effects)			Collision			Entanglement			Indirect Effects**		
		C	OM	D	C	OM	D	C	OM	D	C	OM	D
Glannau Aberdaron ac Ynys Enlli / Aberdaron Coast and Bardsey Island	Manx shearwater (b)	✓	✓	✓		✗			✓		✓	✓	✓
Strangford Lough	Sandwich tern (b)	✗	✗	✗		✓*			✗		✗	✗	✗
Copeland Islands	Manx shearwater (b)	✓	✓	✓		✗			✓		✓	✓	✓
Larne Lough	Sandwich tern (b)	✗	✗	✗		✓*			✗		✗	✗	✗
Ailsa Craig	Gannet (b)	✓	✓	✓		✓			✓		✗***	✗***	✗***
	Guillemot (b)	✓	✓	✓		✗			✓		✗	✗	✗
Rathlin Island	Guillemot (b)	✓	✓	✓		✗			✓		✗	✗	✗
	Kittiwake (b)	✗	✗	✗		✓			✗		✗	✗	✗
	Razorbill (b)	✓	✓	✓		✗			✓		✗	✗	✗
North Colonsay and Western Cliffs	Guillemot (b)	✓	✓	✓		✗			✓		✗	✗	✗
	Kittiwake (b)	✗	✗	✗		✓			✗		✗	✗	✗
Mingulay and Berneray	Guillemot (b)	✓	✓	✓		✗			✓		✗	✗	✗
	Kittiwake (b)	✗	✗	✗		✓			✗		✗	✗	✗
	Razorbill (b)	✓	✓	✓		✗			✓		✗	✗	✗
Rum	Manx shearwater (b)	✓	✓	✓		✗			✓		✓	✓	✓
Canna and Sanday	Guillemot (b)	✓	✓	✓		✗			✓		✗	✗	✗
Shiant Isles	Fulmar (b)	✗	✗	✗		✗			✗		✗***	✗***	✗***
	Guillemot (b)	✓	✓	✓		✗			✓		✗	✗	✗
	Razorbill (b)	✓	✓	✓		✗			✓		✗	✗	✗
St Kilda	Fulmar (b)	✗	✗	✗		✗			✗		✗	✗	✗
	Gannet (b)	✓	✓	✓		✓			✓		✗***	✗***	✗***
	Guillemot (b)	✓	✓	✓		✗			✓		✗	✗	✗
	Manx shearwater (b)	✓	✓	✓		✗			✓		✗	✗	✗
Handa	Guillemot (b)	✓	✓	✓		✗			✓		✗	✗	✗
	Razorbill (b)	✓	✓	✓		✗			✓		✗	✗	✗

Site	Qualifying feature(s) screened in (b=breeding, nb=non-breeding)	Disturbance and Displacement (Including Barrier Effects)			Collision			Entanglement			Indirect Effects**		
		C	OM	D	C	OM	D	C	OM	D	C	OM	D
Flannan Isles	Fulmar (b)	✗	✗	✗		✗			✗		✗***	✗***	✗***
	Guillemot (b)	✓	✓	✓		✗			✓		✗	✗	✗
Cape Wrath	Guillemot (b)	✓	✓	✓		✗			✓		✗	✗	✗
	Kittiwake (b)	✗	✗	✗		✓			✗		✗	✗	✗
	Razorbill (b)	✓	✓	✓		✗			✓		✗	✗	✗
Sule Skerry and Sule Stack	Gannet (b)	✓	✓	✓		✓			✓		✗***	✗***	✗***
	Guillemot (b)	✓	✓	✓		✗			✓		✗	✗	✗
North Rona and Sula Sgeir	Fulmar (b)	✗	✗	✗		✗			✗		✗	✗	✗
	Gannet (b)	✓	✓	✓		✓			✓		✗***	✗***	✗***
	Guillemot (b)	✓	✓	✓		✗			✓		✗	✗	✗
Saltee Islands (transboundary site)	Fulmar (b)	✗	✗	✗		✗			✗		✗***	✗***	✗***
	Gannet (b)	✓	✓	✓		✓			✓		✗	✗	✗
Lambay Island (transboundary site)	Fulmar (b)	✗	✗	✗		✗			✗		✗***	✗***	✗***

Table Notes: *Assessment of collision risk whilst species is undertaking bi-annual migratory flight only. ** Indirect effects limited to species within the mean max plus 1SD foraging range of the Project only. *** When considering distance from the colony, the species large foraging range and diverse diet, the potential for a LSE in relation to indirect effects can confidently be ruled out.

5.4 Annex II Species – Fish

182. The HRA Screening Report and subsequent Scoping Opinion (MMO, 2022) identified Annex II fish species (and sites for which they are a qualifying feature or feature of interest) as having a potential likely significant effect as a result of the Project's construction, operation and maintenance, and decommissioning, either alone or in-combination with other projects and plans, as indicated by the Zone of Influence and the Study Area. The designated sites and the specific Annex II migratory fish qualifying features that have were screened in for assessment are listed in **Table 5.5**.

Table 5.5 Designated sites where Annex II migratory fish species are a qualifying feature screened into this RIAA for assessment

Site	Qualifying feature(s) screened in
River Wye/ Afon Gwy SAC	• Atlantic salmon • Sea lamprey • River lamprey • Twaite shad
River Usk/ Afon Wysg SAC	• Atlantic salmon • Sea lamprey • River lamprey • Twaite shad
Severn Estuary/ Môr Hafren SAC	• Sea lamprey • River lamprey • Twaite shad
River Camel SAC	• Atlantic salmon
Dartmoor SAC	• Atlantic salmon
Severn Estuary Ramsar	• Atlantic salmon • Sea lamprey • River lamprey • Twaite shad • Allis shad • European eel
Carmarthen Bay and Estuaries/ Bae Caerfyrddin ac Aberoedd SAC	• Twaite shad
Afon Tywi/ River Tywi SAC	• Twaite shad

Site	Qualifying feature(s) screened in
Transboundary	
River Slaney SAC	• Atlantic salmon • Sea lamprey • River lamprey • Twaite shad
River Barrow and River Nore SAC	• Atlantic salmon • Sea lamprey • River lamprey • Twaite shad
Lower River Suir SAC	• Atlantic salmon • Sea lamprey • River lamprey • Twaite shad
Blackwater River (Cork/Waterford) SAC	• Atlantic salmon • Sea lamprey • River lamprey • Twaite shad

6. Appropriate Assessment: Annex I Habitats (and associated Annex II species)

6.1 Introduction

183. This section assesses whether the Project is likely to have an adverse effect on the integrity of sites protected for Annex I habitats (and associated Annex II species).

184. For each site designated for benthic habitats screened in for further assessment, the following has been provided:

- A summary of the ecology of the habitats relevant for each European site
- An assessment of the potential effects during the construction, operation, maintenance and decommissioning phases
- An assessment of the potential for in combination effects alongside other relevant developments and projects.

6.2 Screening Conclusions

185. The Braunton Burrows SAC is located within the cable corridor whilst Lundy SAC is located adjacent to the cable corridor. Therefore, there is potential for LSE on the designated features during construction, operation and maintenance or decommissioning of White Cross. This resulted in both Braunton Burrows SAC and Lundy SAC being screened into the assessment through the Habitats Regulations Assessment Screening Report (MMO, 2022).

186. The HRA screening was submitted to the relevant stakeholders on 17th January 2022. Subsequently, it was agreed that the following effects, shown in **Table 6.1**, associated with White Cross have the potential for LSE and therefore require further assessment.

6.2.1 Potential effects during construction

187. There is potential for temporary physical disturbance to Annex I Mudflats and sandflats not covered by seawater at low tide at Landfall as well as to Annex 1 Sandbanks and Reefs due to seabed preparation within the offshore cable corridor. The installation method and target burial depth will be defined post consent based on a cable burial risk assessment, considering ground conditions as well as the potential for impacts upon cables such as from trawling and vessel anchors. It is anticipated that the offshore cables will be installed via either ploughing, jetting, trenching, or a combination of these techniques, depending on ground conditions along the specific cable route. Other options would be considered, where appropriate, such as mass flow excavation.

Table 6.1 Summary of potential effects on Annex I habitats considered in HRA Screening (screened in (✓) and screened out (x))

Potential Effects	Construction	Operation and Maintenance	Decommissioning
Lundy SAC			
Direct Habitat Loss	x	x	x
Disturbance to Habitats	x	x	x
Alteration to Habitats	✓	✓	✓
Transboundary effects	x	x	x
Braunton Burrows SAC			
Direct Habitat Loss	x	✓	x
Disturbance to Habitats	✓	✓	x
Alteration to Habitats	✓	✓	✓

188. The total disturbance footprint for seabed preparation within the offshore cable corridor is 4.68km^2. However, the Lundy SAC lies adjacent to the offshore cable corridor over a distance of 2.5km with no areas of overlap within the works footprint.

6.3 Lundy SAC

6.3.1 Description of designation

189. Lundy is the largest island in the Bristol Channel, between England and Wales, on the west coast of Britain. Lundy is located at the frontier between the Atlantic Ocean and the Bristol Channel; it is located 2.2km north of the offshore export cable corridor and over 41km from the wind farm array. It rises as a granite outcrop about 114 metres above sea level and it has an area of 852 hectares.

190. Lundy was designated as a SAC in recognition of its outstanding marine reef habitats and species. It includes all five British shallow inshore species of stony coral; Devonshire cup coral *Caryophyllia smithii*, and the nationally scarce Scarlet and gold star coral *Balanophyllia regia*, Southern cup coral *Caryophyllia 91nornate*, Carpet coral *Hoplangia durotrix* and Sunset cup coral *Leptopsammia pruvoti*. The site also supports many notable kelp and red algae communities.

191. Lundy was the first Marine Nature Reserve (MNR) in UK waters, designated in 1986. A No Take Zone was established in 2003 through a Devon Sea Fisheries byelaw to provide special protection to key species and habitats off the east coast of the island.

192. In 2013 Lundy was designated as a MCZ under the Marine and Coastal Access Act which automatically converted the Lundy MNR into an MCZ. The Lundy MCZ and the Lundy SAC have the same seaward boundary, covering an area of 3,069 hectares.

193. Lundy is a granite and slate reef system and is selected for its outstanding representation of reef habitats in south-west England. Lundy Island is exposed to a wide range of physical conditions as a result of differing degrees of wave action and tidal stream strength on sheltered and exposed coasts and headlands. This range of physical conditions, combined with the site's topographical variation, has resulted in the presence of an unusually diverse complex of marine habitats and associated communities within a small area. The reefs of Lundy extend well over 1km offshore and drop steeply into deep water in some areas. The variety of habitats and associated species on the reefs is outstanding and includes, for example, a large number of seaweeds and many rare or unusual species, including Mediterranean-Atlantic species representing biogeographically distinct communities at, or very close to, their northern limit of distribution. In particular, fragile long-lived species, such as the soft coral *Parerythropodium coralloides*, sea-fan *Eunicella verrucosa* and a variety of erect branching sponges, are found in deep, sheltered conditions, particularly on the east coast of the island. All five British species of cup-coral are found here, including the scarlet and gold star-coral and the sunset cup-coral.

6.3.1.1 Conservation Objectives

194. Conservation objectives are set to ensure that, subject to natural change, the integrity of the site is maintained or restored as appropriate, and that the site contributes to achieving Favourable Conservation Status of its qualifying features, by maintaining or restoring (Natural England, 2018):

- The extent and distribution of qualifying natural habitats and habitats of qualifying species
- The structure and function (including typical species) of qualifying natural habitats
- The structure and function of the habitats of qualifying species
- The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely
- The populations of qualifying species, and
- The distribution of qualifying species within the site.

195. The Conservation Objectives for the Lundy SAC is to maintain the Annex I Reefs and Sandbanks which are slightly covered by seawater all the time in Favourable Condition. In particular the sub-features:

- Reefs
- Subtidal sandbanks.

196. ‘Favourable Condition’ is the term used in the UK to represent ‘Favourable Conservation Status’ for the interest features of SACs. For an Annex I habitat, Favourable Conservation Status occurs under the Habitats Directive when (JNCC and Natural England, 2013):

- Its natural range and areas it covers within that range are stable or increasing;
- The specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future
- The conservation status of its typical species is favourable.

197. Favourable condition of the sandbanks and reefs is assessed based on the long-term maintenance of the following:

- Extent of the habitat (and elevation and patchiness for reef)
- Diversity of the habitat
- Community structure of the habitat (population structure of individual species and their contribution to the functioning of the habitat)
- Natural environmental quality (e.g. water quality, suspended sediment levels).

6.3.2 Appropriate Assessment

6.3.2.1 Alteration to Habitats – Hydrodynamic change

198. Whilst no structures are expected to be standing above the seabed, exposure of cable or rock protection (or other forms of protection) could result in hydrodynamic change, which though localised could potentially extend into the SAC and impact on the habitats for which the site is designated. This could impact on the extent, physical structure, diversity, community structure and typical species representative of these habitats. The Offshore Export Cable Corridor predominantly passes through areas of sand (megaripples in many places with some sand waves) and the cables would continue to be mainly buried in trenches. Here, cable burial would disturb a 25m-width of seabed over a maximum length of 94km. Burial of two cables would displace a volume of 1,684,800m^3 of sediment assuming 3m-wide, 3m-deep excavations. Similar to the Landfall, the excavated sediment would be backfilled into the trenches to re-instate the seabed close to its original morphology. This activity would result in some localised and short-term disturbance, but there would be no long-term effect on sediment transport processes.

199. As per the assessment in the **Chapter 8: Marine Geology, Oceanography and Physical Processes** of the Offshore ES, in some areas, (one third of Area 3, one third of Area 2, most of Area 1, and about one half of Fan) the cables may pass through sand wave fields that require (partial) levelling before installation. Sand

wave removal could potentially disturb the natural form and function of the sand waves, and interfere with sediment transport pathways that supply sediment to other areas of the seabed. Within the Offshore Export Cable Corridor, sand wave levelling is estimated to require excavation across an area of 320,000m^2 (volume of 960,000m^3). Additional seabed preparation of 11,171m^3 would be required for construction of the substructure mooring and the Offshore Substation Platform. The sediment arising from sand wave removal would be disposed back to the seabed local to its extraction and so there would be no net loss of sediment within the area.

200. The total area of sand waves (and megaripples) along the Offshore Export Cable Corridor is a small proportion of the total area of sand waves adjacent to the corridor. Hence, the effects on the surrounding environment are anticipated to be small because it is likely that the natural changes to the sand waves, through the active physical processes, are far greater than the quantities of sand that would be extracted.

201. During operation and maintenance the presence of infrastructure would present only small obstacles to the passage of waves and currents locally, causing a small modification to current flows as they pass. Generally, currents would decelerate immediately upstream and downstream of each obstacle and accelerate around its sides. Current speeds would return to baseline conditions a short distance downstream and would not interact with changes from adjacent infrastructure due to the separation distances. As Lundy SAC is over 1km from the windfarm site the benthic features of the SAC will not be affected.

202. There is **<u>no potential for the Project alone to have an adverse effect on the integrity (AEoI) of the Lundy SAC from hydrodynamic change through any phase of the Project</u>**.

6.3.2.2 Increase in suspended sediment concentrations

6.3.2.2.1 Construction

203. Increases in suspended sediment concentrations (SSC) and subsequent deposition onto the seabed may occur as a result of seabed preparation and the installation of offshore infrastructure, including cables. Other activities, such as seabed disturbances from offshore support vessels and placement of cable protection are not expected to increase suspended sediment concentrations to the extent which there would be a significant effect to benthic ecology receptors. Increased suspended sediments have the potential to affect benthic ecology receptors by blocking feeding apparatus as well as by smothering sessile species upon redeposition.

204. The construction process has the potential to result in the re-suspension into the water column of contaminated sediments or the release of chemicals used during the construction process. These could extend into and impact indirectly (where they are driven across the site by tidal currents and waves) on the habitats for which the site is designated. This could result in changes to the extent, physical structure, diversity, community structure and typical species representative of these habitats.

205. The worst-case assumption for construction, as assessed in **Chapter 9: Marine Water and Sediment Quality** of the Offshore ES, is that jetting/ploughing will be used to install the cables which is likely to cause the suspension of sediment into the water column. Particle size analysis of sediment samples taken within the wind farm site and export cable corridor show the sediments are dominated by sand, therefore dispersion of fine sediment from these areas would be very low. Whilst the increased mud content closer to land would increase the proportion of finer sediments released into the water, it is predicted that increases for both sand and mud would be short in duration (lasting the maximum duration of cable installation – 22 days for inter array cables and 120 days for the export cables) and disperse over time.

206. Rapid settlement of coarser sediments would likely be close to the point of disturbance and whilst finer sediments would become entrained within a plume, it is predicted that they would quickly be widely dispersed by tidal and wave action.

207. During the operation and maintenance phase, exposure of the cable or presence of rock armour or other forms of cable protection could result in hydrodynamic change and subsequent localised increase in the re-suspension of sediments in the water column. Whilst the scale of this disturbance will vary depending on the substrate and scale of the erosion this could extend into and result in changes within the habitats for which the site is designated. This could impact on the extent, physical structure, diversity, community structure and typical species representative of these habitats.

208. There is **<u>no potential for the Project alone to have an AEoI of the Lundy SAC from increase in the re-suspension of sediments</u>**.

6.3.2.2.2 Operation and Maintenance Phase

209. During the operation and maintenance phase, exposure of the cable or presence of rock armour or other forms of cable protection could result in hydrodynamic change and subsequent localised increase in the re-suspension of sediments in the water column. Whilst the scale of this disturbance will vary depending on the substrate and scale of the erosion this could extend into and result in changes within the

habitats for which the site is designated. There is potential for sediments to be re-suspended by the scouring effects of the catenary action of the mooring lines and around the foundations of the mooring anchors during operation and maintenance. This could impact on the extent, physical structure, diversity, community structure and typical species representative of these habitats. However, particle size analysis of the sediments within the wind farm site show that the sediments are dominated by sand. As such, any sediment suspended during the operation of the wind farm will fall out of suspension shortly after disturbance. Only the finest fractions will reside in the water column and in these cases for short durations and in the lower layers of the water column.

210. Additionally, the total volume of sediment that could be disturbed is relatively low. Even the largest catenary drag footprint of 2,400m^2 per turbine, affecting only a thin layer of surface sediment, equates to a few tens or, at most, a few hundred cubic metres of sediment per turbine, although this could be a frequent disturbance through the operation and maintenance phase. Scour is also only likely to occur during higher energy conditions (i.e. storms) where baseline suspended solids concentrations are also likely to be higher.

211. Maintenance activities undertaken within the wind farm site or along the export cable corridor route may also cause the suspension of sediment. These activities would be localised, short-term and small in scale, representing a much smaller effect than created during construction activities.

212. There is **no potential for the Project alone to have an AEoI of the Lundy SAC from increase in the re-suspension of sediments**.

6.3.2.2.3 Decommissioning Phase

213. Increases in suspended sediments and sediment deposition from the decommissioning works may arise during the removal of infrastructure and disturbance of seabed from jack-up vessels and anchored vessels. However, the magnitude of any effect is likely to be lower than for construction as for example, seabed preparation would not be required, and cables may be left in situ. As a worst-case, the effects of decommissioning activities are considered to be as per construction.

6.3.2.3 Re-suspension of contaminated sediments (all phases)

214. Site specific data collected to inform this ES indicates that for all parameters, sediment contaminant concentrations are low (as described in **Chapter 9: Marine Water and Sediment Quality** of the Offshore ES).

215. Where exceedances of sediment guidelines occur, these are marginal (i.e. only just above the lower guideline level value) which indicates that there is minimal risk to the marine environment. Concentrations of arsenic exceeded Cefas AL1 at four of the offshore stations; ST06, ST08, ST09 and ST10 (and BAC at three of those stations). Mercury was found at levels exceeding BAC at two stations (ST01 and ST09) but did not exceed Cefas AL1. Concentrations of nickel at ST01 very marginally exceeded Cefas AL1. With respect to PAHs, five exceeded the BAC at only two stations (ST08 and ST09) but there were no exceedances of the Cefas AL1.

216. These exceedances are located in a discreet area3 within the wind farm site and along the cable corridor route and as such works within this area will be short term, lasting the duration of the cable installation only.

217. Additionally, sediments are not predicted to remain in suspension for long periods of time given that the seabed material is predominantly sand and as such will settle quickly and be a temporary impact. Therefore, the risk to the water column for partitioning to occur (the transfer of contaminants bound to sediment particles to being dissolved into the water column) is reduced.

218. There is **no potential for the Project alone to have an AEoI of the Lundy SAC from increase in the re-suspension of contaminated sediments**.

6.3.3 Potential effects from the Offshore Project Elements In Combination with other Plans and Projects

219. Projects considered in the in-combination assessment are provided in **Table 6.2** and locations are shown on **Figure 6.1**.

220. As all other projects considered in the in-combination assessment are beyond 10km from the Project, no in-combination effects are predicted. There is **no potential for the Project alone or in-combination with other plans and projects to have an AEoI of the Lundy SAC**.

Table 6.2 Projects considered in the in-combination effect assessment on benthic and intertidal ecology for the Lundy SAC

Project	Status	Distance from windfarm site (km)	Distance from Lundy SAC	Included in the CEA?	Rationale
XLinks	Concept/Early planning	No exact location is publicly available, cable routes do not cross		No	Non-significant: The projects are beyond the 10km Zone of Influence. Additive impacts across the region will be small scale and localised with no overlap of effects for benthic ecology.
The Llŷr projects (floating offshore wind)	Pre-consent	16km	36km	No	
South Pembrokeshire Demonstration Zone	Pre-planning application	30km	27km	No	
Valorous Floating Wind Demo	Pre-planning application	20km	59km	No	
Erebus Floating Wind Demo	Pre-planning application	33km	64km	No	

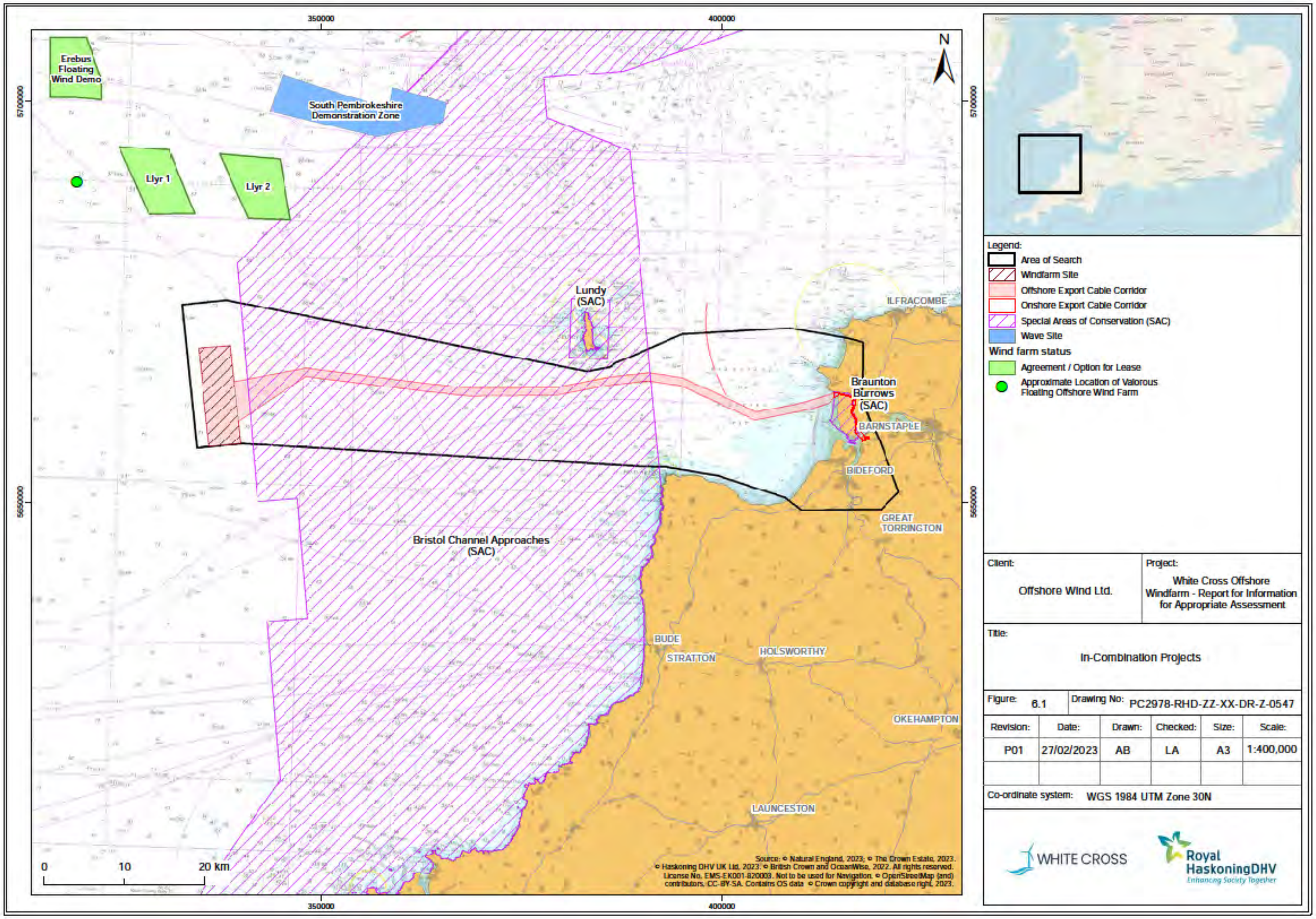
6.4 Braunton Burrows SAC

6.4.1 Description of designation

221. Braunton Burrows SAC is located on the North Devon coast, covering an area of 1339.74ha as well as and residing in the heart of the UNESCO North Devon Biosphere Reserve. The Landfall and Saunton Golf Course Crossing traverse through the SAC (albeit underneath through trenchless techniques) and alongside the boundary at a trenchless crossing at Sandy Lane. At the Taw Estuary Crossing the corridor is situated greater than 40m outside the SAC boundary, and at other locations along the onshore cable corridor the SAC boundary is offset by 5m). The primary Annex 1 habitats are:

- "Shifting dunes along the shoreline with *Ammophila arenaria* (""white dunes"")"
- "Fixed coastal dunes with herbaceous vegetation (""grey dunes"")
- Dunes with Salix repens ssp. argentea (*Salicion arenariae*)
- Humid dune slacks.

Figure 6.1 In-Combination Projects



Source: © Natural England, 2023; © The Crown Estate, 2023. © Haskoning DHV UK Ltd, 2023. © British Crown and OceanWise, 2022. All rights reserved. License No. EMS-EK001-820003. Not to be used for Navigation. © OpenStreetMap (and) contributors, CC-BY-SA. Contains OS data © Crown copyright and database right, 2023.

Client: Offshore Wind Ltd.

Project: White Cross Offshore Windfarm - Report for Information for Appropriate Assessment

Title: In-Combination Projects

Figure: 6.1

Drawing No: PC2978-RHD-ZZ-XX-DR-Z-0547

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
P01	27/02/2023	AB	LA	A3	1:400,000

Co-ordinate system: WGS 1984 UTM Zone 30N

Braunton Burrows SAC has been designated for Annex I habitat: 'Mudflats and sandflats not covered by seawater at low tide'. This is present as a qualifying feature, but not a primary reason for selection of this site.

222. In addition, petalwort *Petalophyllum ralfsii* is an Annex II qualifying species present within the SAC. This species mainly grows in damp, calcareous dune-slack systems but not where *Salix* spp. scrub dominates, or in those slacks which are water-filled (Natural England, 2019).

223. At the Landfall the physical structure of the intertidal flats ranges from mobile, coarse-sand beaches on wave-exposed coasts to stable, fine-sediment mudflats in estuaries and other marine inlets. This habitat type can be sub-divided into two broad categories (or sub-features) (clean and muddy sands; intertidal muds), although in practice there is a continuous and natural gradation between them. Within this range the plant and animal communities present vary according to the type of sediment, its stability and the salinity of the water.

224. Braunton Burrows SAC is located in a highly dynamic, tidally influenced estuary mouth and therefore it is influenced by currents from the Celtic Sea. Within the SAC there are areas of varying sediment type, salinity and exposure to tides and wave action, ultimately supporting different associated biological communities.

6.4.1.1 Conservation Objectives

225. Conservation objectives are set to ensure that, subject to natural change, the integrity of the site is maintained or restored as appropriate, and that the site contributes to achieving Favourable Conservation Status of its qualifying features, by maintaining or restoring (Natural England, 2018):

- The extent and distribution of qualifying natural habitats and habitats of qualifying species
- The structure and function (including typical species) of qualifying natural habitats
- The structure and function of the habitats of qualifying species
- The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely
- The populations of qualifying species
- The distribution of qualifying species within the site.

226. The Conservation Objectives for the Braunton Burrows SAC is to maintain the Annex I Mudflats and sandflats not covered by seawater at low tide in Favourable Condition. In particular the sub-features:

- Intertidal sand and muddy sand
- Intertidal mud.

227. 'Favourable Condition' is the term used in the UK to represent 'Favourable Conservation Status' for the interest features of SACs. For an Annex I habitat, Favourable Conservation Status occurs under the Habitats Directive when (JNCC and Natural England, 2013):

- Its natural range and areas it covers within that range are stable or increasing
- The specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future; and
- The conservation status of its typical species is favourable.

228. Favourable condition of the sandbanks and reefs is assessed based on the long-term maintenance of the following:

- Extent of the habitat (and elevation and patchiness for reef)
- Diversity of the habitat
- Community structure of the habitat (population structure of individual species and their contribution to the functioning of the habitat); and
- Natural environmental quality (e.g. water quality, suspended sediment levels).

6.4.2 Appropriate Assessment

6.4.2.1 Direct Habitat Loss (Operation and maintenance)

229. The Project export cable corridor traverses underneath Braunton Burrows SAC. No structures related to the buried cable are expected to be standing above the intertidal area or along the cable route within the SAC above MHWS (such as through the Saunton Golf Course). Therefore any potential for loss of or alteration to habitat in the nearshore or along the cable route through Saunton Golf Course during the operation phase will be avoided.

230. The intertidal sandflats (Annex 1 habitat 1140 Mudflats and sandflats not covered by seawater at low tide of the Braunton Burrows SAC) and their communities would not be disturbed or experience any form of alteration to the habitat or the geomorphological and physical processes as a result of the buried cable, therefore no change would occur.

231. Overall therefore, the Project alone would not prevent the achievement of the site's conservation objectives, therefore there would be **no potential for an adverse**

effect on the integrity of the Braunton Burrows SAC as a result of habitat loss.

6.4.2.2 Direct Disturbance to Habitats during Construction

232. As stated above, the Project export cable corridor covers Braunton Burrows SAC. Any cable route through or Landfall within the SAC could result in disturbance and/or alteration to the habitats during construction, operation, and decommissioning phases, which could impact on the extent, physical structure, diversity, community structure and typical species representative of the habitat features for which the site is designated.

233. The realistic worst-case scenario from **Chapter 16: Onshore Ecology and Ornithology** of the Onshore ES for direct disturbance within the intertidal zone at the Landfall is that of trenching for the cable laying. The trenching activity would use an excavator to dig a trench up to a point around MHWS where a trenchless approach would be undertaken into the car park avoiding Annex 1 SAC features. Sand would be placed either side (or on one side), following which the cable would be placed in the trench and the sand placed back into the trench to cover. The process would take less than 5 days, though it is noted that where the works would extend over more than one day, the tides would be likely to redistribute any excavated sand and partially refill any open trench above the level of surrounding sand. The excavation of the sand would disturb any invertebrate communities within it.

234. During the trenching works, approximately 700m^2 of intertidal sand would be temporarily disturbed with an assumed doubling of the disturbance to sand either side for placement of excavated material. Consequently, over the works duration a maximum of 2100m^2 would be 'turned' or covered during construction. Due to the sequence of working (as the trench is excavated the cable is laid and then the material is placed back in the trench) the full extent of disturbance would not occur at any one time. Given the very rapid turnover of the work and replacement of the sand (both natural and re-instated), as well as the insignificant scale disturbed compared to the habitat type across Saunton Sands (which includes several kilometres of intertidl habitat along the length of the beach), the magnitude of impact of direct disturbance from construction is considered to be temporary and negligible (de minimis). Whilst the intertidal sand is tidally inundated and experiences diurnal movement of seabed sediment on these tidal cycles, the communities within it are also habituated to disturbance. Any disturbance would be very short term and impacts are likely to be minor and unlikely to be measurable above background levels of disturbance from tides and storms.

235. However, trenchless techniques are proposed to be used at the Landfall following other access concerns as well as potential impacts on the SAC features. The trenchless entry point would be within the Saunton Sands Car Park (inland) and the bore would be located below the ground surface (at a depth of several metres) and would emerge either in the mid to lower intertidal or potentially the shallow subtidal zone, running a length of 1,860m. The only disturbance therefore would be at the emergence point within the intertidal sandflat, or from 'frac-out'. The extent of disturbance at the emergence point would be significantly smaller than that for trenching, as it would be localised around the point of emergence. The ducting would be pulled through the emergence point (via the drilled/bored route), with the ducting floated offshore and transported to the site by sea. This would be expected to take a day. Overall therefore the disturbance to sandflat habitat would be very short in duration and temporary (and as such de minimis). The subsequent cable pulling would also be undertaken from an offshore vessel with the cable pulled through the ducting by a winch based onshore within the Saunton Sands Car Park, outside the SAC boundary. This would similarly result in a very small area of disturbance (clearing the entry of the ducting), which would be very short in duration (again a day is estimated) and temporary. The disturbance in both events would be turning over of the sand, with no removal or loss. Overall therefore the disturbance from physical works would be temporary, negligible and de minimis.

236. Following completion of the Landfall crossing, the equipment within the Saunton Sands Car Park would be turned around and moved to the eastern end of the Car Park to commence trenchless crossing operations under the Saunton Sands Golf Course and Braunton Burrows SAC. This trenchless crossing would be approximately 1,300m in length. The entry point within Saunton Sands Car Park would be located outside the SAC boundary. The exit point would be to the east of and outside the SAC boundary. The site compound will be at the entry area within the Saunton Sands car park, away from the SAC boundary, whilst the exit area site compound will be located outside of the SAC boundary. As all the works and site compounds are located outwith the SAC boundary, there are no sources of direct disturbance to SAC qualifying habitats.

237. The Taw Estuary Crossing corridor is located at least 40m to the east of the Braunton Burrows SAC in the Taw Estuary area. Trenchless crossing is also expected here (with no feasibility for trenched crossing for many technical and environmental reasons). The trenchless crossing entry and exit and site compounds are located 220m and 690m respectively outside the boundary of the SAC. Consequently, as all the works and site compounds are located outwith the

SAC boundary, there are no sources of direct disturbance to SAC qualifying habitats.

238. All three crossings have the potential for a frac-out to occur during trenchless works. These occur when the down hole mud pressure exceeds the overburden pressure (i.e. shallow or loose sections of the bore), or the fluid finds a preferential seepage pathway (such as fault lines and fractures, infrastructure or loose material). These fractures can be natural or induced by over-pressurising the formation. Most frac-outs, usually occur close to the bore entry or exit. The material that can be discharged during a frac-out is inert (usually bentonite) and the main impact associated with it is smothering of any surface vegetation or habitat, in this case the intertidal sandflat. The likelihood of frac-out is considered to be very low. The methodology used would be to include calculations of the subsurface material to determine the pressure required during the trenchless drilling/boreholing. This would be further informed by geotechnical survey being carried out later in 2023. If pressure loss occurs the rig would cease operation to determine whether frac-out has occurred. This would be undertaken by surveying the area of the drill head location. Frac-out would be limited in scale and extent given the monitoring carried out during the drilling activity, and in the event of any surface emergence of discharge (i.e. bentonite) this would be rapidly cleared up. A variety of embedded construction methods and mitigation would be implemented to minimise the risk and scale of any frac-out including:

- Post-consent geotechnical investigations to refine the trenchless technology design. This will include providing calculations of the relevant pressure to use to prevent frac-out during crossing of subsurface material.
- Agreement will be obtained on the trenchless technology methodology and response procedures.
- In the unlikely event of a pressure drop indicating the commencement of a frac-out, the works will respond and either amend approach or recommence through an alternative line
- During works continual monitoring of the bore above ground will be undertaken. If frac-out and surface discharge occurs, the material will be collected, and reinstatement of the surface area carried out immediately.

239. The bentonite is inert and would have no impact on communities other than by smothering habitat but as this would be cleared away immediately the habitat disturbance would be very short term in duration and temporary. Where frac-out occurs the bore/drill location is usually repositioned to avoid continuation of any

frac-out. Overall therefore the disturbance from physical works and any frac-out (considered very low likelihood) would be temporary, negligible and de minimis.

240. The onshore cable installation works entail a combination of trenched and minor trenchless crossings along agricultural lands to the east of the Braunton Burrows SAC, with a number of temporary site compounds along the corridor. The works are generally some distance outside the SAC boundary, with the exception of several stretches which are adjacent to the SAC boundary. These include stretches to the west of Sandy Lane, crossing Sandy Lane near to Sandy Lane Car Park, and works to the south. To the west of Sandy Lane the cable corridor runs parallel to the SAC boundary for a length of 177m at a distance of 4m offset. There is then a pinch point where trenchless crossing of 148m will be undertaken due to constriction between structure and the SAC boundary. This will mean that along a length of 94m the site boundary will be immediately adjacent to the SAC boundary, but the only activity occurring in this area will be the construction and placement of a haul road and its use. No works would extend into the SAC boundary. Beyond this, the cable corridor down to the Sandy Lane crossing does not extend nearer than 4m to the SAC boundary. The cable corridor would then cross Sandy Lane near to the entrance to the Sandy Lane Car Park. The crossing would be from the north-west of the Lane to the south-east of the Lane. The crossing would be undertaken using trenchless techniques to avoid disturbance within the SAC. Whilst the corridor boundary would be immediately adjacent to the SAC boundary, the only activity occurring in this area will be the construction and placement of a haul road and its use. The haul road is offset from the SAC boundary by several metres. To the south of this crossing the cable corridor then runs eastwards of the SAC boundary, extending between 8m and 60m distance from the boundary for around 1.2km. Beyond that the cable corridor does not close to anything less than 100m from the SAC boundary. Whilst some works and traffic movements will occur adjacent to the SAC boundary, the current fencing and safe driving practices along with the additional markings that would be part of site set-up, would ensure that no disturbance would occur within the SAC boundary. Therefore there will be no direct disturbance to SAC qualifying habitats and associated qualifying species such as Petalwort *Petalophyllum ralfsii* which is considered specifically in **Section 6.4.2.2.1**.

6.4.2.2.1 Petalwort *Petalophyllum ralfsii*

241. Braunton Burrows SAC is an important locality for Petalwort *Petalophyllum ralfsii* which is included on Section 41 of the NERC Act 2007 and on Schedule 8 of the Wildlife and Countryside Act. It is not known whether either of the species occurs within the survey corridor. The ideal time to find Petalwort *Petalophyllum ralfsii* is between November and March as it aestivates during the drier months and would

therefore not have been visible during the survey period. Further details of the National Vegetation Classification survey can be found in **Chapter 16: Onshore Ecology and Ornithology Appendix 16.P**.

242. However, since the survey undertaken, design development and consultation has led to the refinement of the cable corridor to be located outside of the boundary of Braunton Burrows SAC with the exception of the intertidal area. Known areas of Petalwort *Petalophyllum ralfsii* are shown in **Figure 6.2** (Natural England, 2020). No petalwort locations were recorded within close proximity to the cable corridor or access route. Therefore, no direct disturbance to petatwort is predicted.

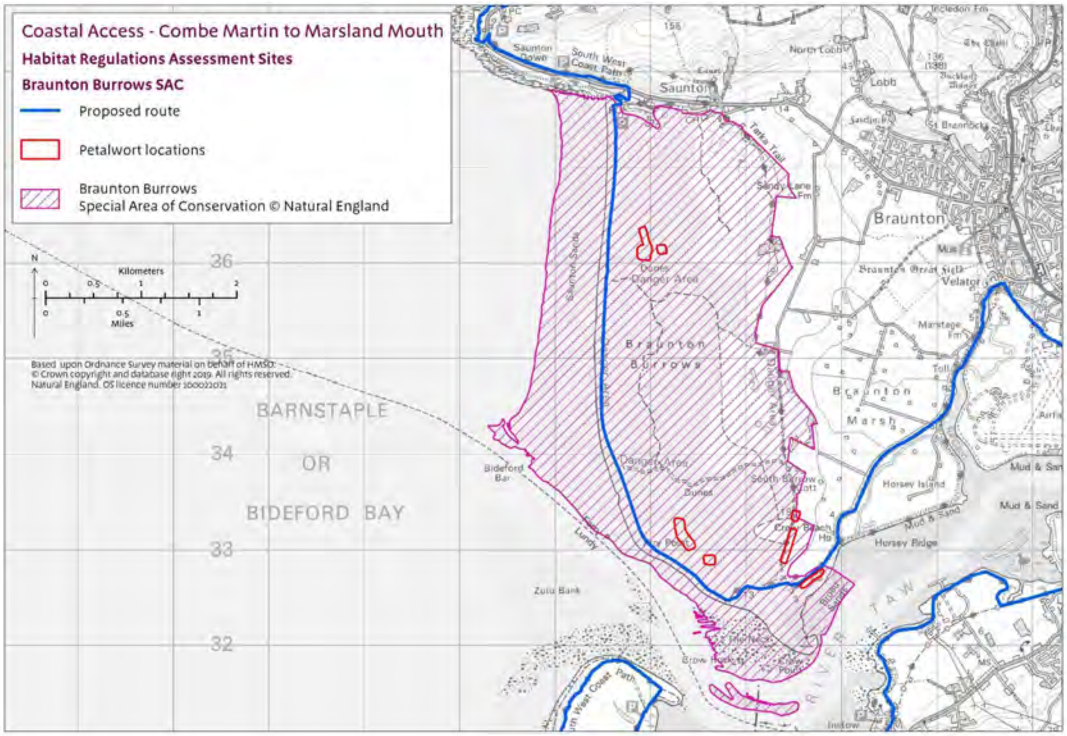


Figure 6.2 Petalwort at Braunton Burrows SAC (Natural England, 2020)

243. The onshore substation is located 1.1km away (to the south-east) of the Braunton Burrows SAC. Therefore, no direct disturbance would occur to the SAC qualifying habitats.

244. Overall therefore, there is **no potential for the Project alone to prevent the achievement of the site's conservation objectives, therefore there would be no AEoI of the Braunton Burrows SAC from direct disturbance**.

6.4.2.3 Indirect Disturbance to Habitats during Construction

245. During construction of the export cable there will be increased traffic, equipment, personnel, lighting, and subsequent emissions to air (noise, dust, and gaseous emissions), land (solid and liquid discharges) and water (liquid discharges).

6.4.2.3.1 Traffic

246. Increased traffic (movement of equipment, transport of personnel or materials) would occur within Saunton Sands Car Park, along the haul road within the onshore cable corridor, and on the local highways. However, the majority of these movements would occur outside the boundary of the SAC, and no qualifying features of the SAC are sensitive to indirect traffic changes. However, there are two activities where vehicles will be present within the SAC boundary during construction, notably during the trenchless exit point within the intertidal/shallow sub-tidal (in a worst case scenario as it is likely the exit point would be further within the sub-tidal and outside the SAC boundary) and use of access tracks within the Saunton Sands Golf Course in the event of frac-out material extending above ground (and requiring clean-up). The former would entail vehicles traversing down the beach (through the SAC) to the exit point, and the latter would entail vehicles using existing access tracks within the golf course to reach any frac-out areas that require clean up. Within the intertidal and upper beach the access across the intertidal sand would cause negligible and temporary disturbance but it would not impact indirectly on any supporting features or species. Within the golf course, all access by vehicles would use existing tracks and greens or fairways, avoiding any notable features. The vehicles would be 4 x 4's and therefore present the same activities as that carried out by the golf course (such as tractors for mowing) and would not result in any disturbance to habitat features or indirect disturbance to supporting features or species. **Therefore, there is no potential for the Project alone to prevent the achievement of the site's conservation objectives, therefore there would be <u>no AEoI of the Braunton Burrows SAC from indirect traffic disturbance</u>.**

6.4.2.3.2 Personnel

247. The qualifying features of the SAC are not sensitive to the additional presence of personnel within site compounds, access areas, or construction areas outside the SAC boundary during the construction phase. However, there are two activities where personnel will be present within the SAC boundary during construction, notably during the trenchless exit point within the intertidal/shallow sub-tidal (in a worst case scenario as it is likely the exit point would be further within the sub-tidal and outside the SAC boundary) and use of access tracks and areas within the

Saunton Sands Golf Course in the event of frac-out material extending above ground (and requiring clean-up). The former would entail personnel traversing down the beach (through the SAC) to the exit point, and the latter would entail personnel using existing access tracks and fairways and greens within the golf course to reach any frac-out areas that require clean up. Within the intertidal and upper beach the access across the intertidal sand would cause negligible and temporary disturbance but it would not impact indirectly on any supporting features or species. Within the golf course, all access by personnel would use existing tracks and greens or fairways, avoiding any notable features. The personnel would present the same activities as that carried out by the golf course (golfers) and would not result in any disturbance to habitat features or indirect disturbance to supporting features or species. **Therefore, there is no potential for the Project alone to prevent the achievement of the site's conservation objectives, therefore there would be no AEoI of the Braunton Burrows SAC from indirect disturbance due to personnel**.

6.4.2.3.3 Lighting

248. No qualifying features of the SAC are sensitive to lighting. Therefore, any temporary lighting at site compounds would result not result in an indirect disturbance to any of the qualifying features of the Braunton Burrows SAC or prevent the achievement of the site's conservation objectives. **As such there would be no AEoI of the Braunton Burrows SAC from indirect disturbance due to lighting as a result of the Project alone.**

6.4.2.3.4 Liquid Discharges / Pollutants

249. During construction activity within the intertidal zone there is the potential for indirect effects to arise from the accidental release of pollutants (lubricants, fuels, oils and drilling fluid) from the plant that are used. Whilst two or three plant would be used within the intertidal (likely 2 excavators and 1 vehicle containing the cable roll) these have the potential to result in accidental (leaks) as any refilling (spillages and storage) would occur within the on-site compound within the Saunton Sands Car Park. Any accidental pollutant discharges have the potential to impact on the sandflat communities in the intertidal zone. The probability of a leak occurring is low given both the short timescale of presence of plant within the intertidal, and would be small in scale given the limited capacity of each type of plant and the liquid pollutants they contain (with fuel being the largest in volume). However, given the porosity of the intertidal sand and subsequent rapid dispersal of liquid if discharged the scale could cover a notable area and volume. However, embedded mitigation would be incorporated into the construction requirements including:

- Implementation of Outline Code of Construction Practice
- Specific checks on vehicles / plant for leaks prior to traversing and working on site (intertidal zone)
- Provision of spillage kits present with each item of plant.

250. Similarly the equipment and vehicles present within the site compound and trenchless working areas within Saunton Sands car park, as well as elsewhere along the cable corridor close to the SAC, could potentially result in liquid discharges which could indirectly enter groundwater and percolate into the SAC, with a potential albeit limited scale of impact. However, the constant checks on vehicles before operating and during operation would be expected to capture any potential events. Furthermore, refuelling would be undertaken in a strictly controlled area, with bunding and drip trays in use along with spillage kits present to mop up any incidental spillage. Overall, given the avoidance measures and low probability of significant spillage occurring, and the presence of kits to mop up immediately any spillage, no influence would be expected to reach any of the qualifying features of the SAC. **Therefore, no indirect disturbance to any of the qualifying features of the Braunton Burrows SAC would occur or prevent the achievement of the site's conservation objectives. As such there would be <u>no AEoI of the Braunton Burrows SAC from indirect disturbance due to discharges as a result of the Project alone</u>.**

251. The potential exists for sediment runoff due the proposed works in close proximity to the SAC, albeit outside the boundary (no sediment runoff would occur within the intertidal). The exposed areas of soil during trenching inland (or within the site compound and trenchless compounds) have the potential to result in the erosion of soil particulates, resulting in an increase in the supply of fine sediment into the SAC and smother habitat supporting qualifying features. Given the topography of the landforms outside the SAC with land generally drained eastwards or where drains are present this is considered unlikely. Furthermore, due to the need to retain soil and material to infill the trenches, management measures would be implemented including shallow bunding if necessary to ensure no transfer of sediment through runoff outwith the works area. **Therefore, no indirect disturbance to any of the qualifying features of the Braunton Burrows SAC would occur or prevent the achievement of the site's conservation objectives. As such there would be <u>no AEoI of the Braunton Burrows SAC from indirect disturbance due to sediment runoff as a result of the Project alone</u>.**

6.4.2.3.5 Dust

252. The presence of the site compound and working area within Saunton Car Park for just over 12.5 months could result in dust emissions from exposed excavations. These could result in deposition of dust within the surrounding habitats, with the potential to impact on flora and subsequently their supported communities. Along the cable corridor there will be trenched and cleared works areas, and these could lead to dust emissions occurring and entering the SAC boundary, full details are presented in *Section 13.5.1* in **Chapter 13 Air Quality** of the Onshore ES. The risks to ecological receptors (notably the qualifying features of the SAC) range from medium to high, with high sensitivity. Consequently, albeit temporary (for 20 months over different locations) some dust soiling could occur within habitats supporting qualifying features of the SAC. This could lead to short-term and temporary (until rainfall and percolation result in runoff of dust) impacts on the vegetation within areas of the SAC in close proximity to the works areas. This has the potential therefore to result in failure to achieve the conservation objectives of the various qualifying features around the site boundary closest to the works. Therefore, a **<u>potential adverse effect on the integrity of the Braunton Burrows could arise due to the Project alone</u>**.

253. A range of mitigation measures are proposed and would be implemented in order to significantly minimise the potential and scale of any dust emissions throughout the construction phase. These include:

    - Develop and implement a Dust Management Plan (DMP) (this will form part of the CEMP), which may include measures to control other emissions, approved by the local authority. The level of detail will depend on the risk and should include as a minimum the highly recommended measures in this document. The desirable measures should be included as appropriate for the site.
    - Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken
    - Make the complaints log available to the local authority and Natural England when asked.
    - Record any exceptional incidents that cause dust and/or air emissions, either on- or off-site, and the action taken to resolve the situation in the logbook.
    - Hold regular liaison meetings with other high risk construction sites within 500m of the site boundary, to ensure plans are co-ordinated and dust and particulate matter emissions are minimised. It is important to understand the interactions of the off-site transport/deliveries which might be using the same strategic road network routes.

- Undertake daily on-site and off-site inspection, where receptors (including roads) are nearby, to monitor dust, record inspection results, and make the log available to the local authority when asked. This should include regular dust soiling checks of surfaces such as street furniture, cars and windowsills within 100m of site boundary, with cleaning to be provided if necessary
- Carry out regular site inspections to monitor compliance with the DMP, record inspection results, and make an inspection log available to the local authority and Natural England when asked.
- Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions.
- Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.
- Erect solid screens or barriers around dusty activities or the site boundary that are at least as high as any stockpiles on site.
- Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period.
- Avoid site runoff of water or mud.
- Keep site fencing, barriers and scaffolding clean using wet methods.
- Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below
- Manage stockpiles to prevent wind whipping
- Ensure all vehicles switch off engines when stationary - no idling vehicles.
- Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable
- Impose and signpost a maximum-speed-limit of 15mph on surfaced and 10mph on unsurfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate)
- Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g., suitable local exhaust ventilation systems
- Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.
- Use enclosed chutes and conveyors and covered skips

- Minimise drop heights from handling equipment and use fine water sprays on such equipment wherever appropriate.
- Ensure equipment is readily available on site to clean any dry spillages and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.
- No bonfires and burning of waste materials.
- Ensure sand and other aggregates are stored in appropriate manner to minimise dust generation for example the use of bunded areas.
- Avoid scabbling (roughening of concrete surfaces) if possible.
- Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored in silos with suitable emission control systems to prevent escape of material and overfilling during delivery.
- For smaller supplies of fine power materials ensure bags are sealed after use and stored appropriately to prevent dust
- Manage earthworks and exposed areas/soil stockpiles to stabilise surfaces.
- Use Hessian, mulches or trackifiers where it is not possible to re-vegetate or cover with topsoil, as soon as practicable.
- Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site.
- Avoid dry sweeping of large areas.
- Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.
- Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.
- Record all inspections of haul routes and any subsequent action in a site logbook.
- Install hard surfaced haul routes where practicable, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned.
- Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits
- Locate access gates at least 10m from receptors where possible.

254. The inclusion and implementation of the above measures will result in minimal dust creation and limited if any emissions into the SAC. Consequently, as no notable build-up of dust would occur no impact on the qualifying habitat features around the site boundary close to the works is expected. **As such the achievement of the site's conservation objectives would not be prevented, and there**

would be no AEoI of the Braunton Burrows SAC from indirect disturbance due to dust emissions as a result of the Project alone.

6.4.2.3.6 Air quality

255. Non-road mobile machinery (NRMM) would be used during construction close to the SAC at the Saunton Sands Car Park and then eastwards of the SAC along the cable corridor. Given the variable wind conditions, emissions will not blow consistently into one part of the SAC for a prolonged period of time. In addition, the intermittent and temporary nature of the NRMM and plant usage during construction landfall, along with the low emission plant used, would reduce the potential for measurable changes in air quality within the SAC (see *Section 13.5.2* in **Chapter 13 Air Quality** of the Onshore ES for detail). As no significant change would occur, no effects on vegetation growth and community composition would occur within areas supporting qualifying habitat features. **Therefore, the achievement of the site's conservation objectives would not be prevented, and there would be no AEoI of the Braunton Burrows SAC from indirect disturbance due to NRMM vehicle emissions as a result of the Project alone**.

256. The movement of traffic during the construction process to deliver equipment, materials, and personnel, has the potential to result in increased emissions of nitrogen oxides (NO_X), ammonia (NH_3), nutrient nitrogen (N-dep) and acid deposition. These emissions could extend into the SAC boundary and result in changes in growth and therefore floral community of habitats that are a qualifying feature of the SAC. Calculations carried out indicate that whilst the Project alone emissions are not significant in concentration levels, combined with the 'indicated' background levels from Defra the levels of ammonia are seen to exceed the 1% of Critical Load (CL) or Level (see *Section 13.5.3.2* in **Chapter 13 Air Quality** of the Onshore ES). It is however noted that the background level is measured on the basis of a 5km x 5km square and therefore averages what would be higher levels across aggregations of roads, whereas these are generally distant from the SAC boundary. Furthermore, the existing background level of ammonia at Braunton Burrows SAC is identified as 1.1µg/m^{-3} (see *Table 13.28* in **Chapter 13 Air Quality** of the Onshore ES), whilst with the Project in-combination (with other works relating to the project) this would be 1.13µg/m^{-3} (see Table 13.28 in **Chapter 13 Air Quality** of the Onshore ES). Given the very low increase, the variability of the wind conditions, and the temporary nature of any increase, no effects on vegetation growth and community composition would occur within areas supporting qualifying habitat features. **Therefore, the achievement of the site's conservation objectives would not be prevented, and there would be no AEoI of the**

Braunton Burrows SAC from indirect disturbance due to vehicle emissions as a result of the Project alone.

6.4.2.4 Disturbance to Habitats during Operation and Maintenance

257. The cable and associated ducting would be buried within the intertidal habitat at a depth at or exceeding 1.2m below current bed level. At the trenchless crossings the cable would be located between 1.2m and 10m below current ground level. Maintenance during the operational phase would entail a walkover of the buried cable route which would result in no disturbance to the intertidal habitats or any other dune habitats within Saunton Golf Course. Emergency works would be unlikely to occur and would likely arise at the transition points (the transition point east beyond the Golf Course, the TJB within Saunton Sands Car Park), the transition point offshore where the cable connection occurs before the cable enters the ducting and under the beach. It is expected that the latter would occur within the subtidal zone and thus outside the site, with no expected disturbance to habitats within the SAC. **There is therefore no potential for the operational and maintenance phase of the Project alone to have an AEoI of the Braunton Burrows SAC from disturbance.**

6.4.2.5 Alteration to Habitats during the Operation and Maintenance Phase

258. In the operational phase the export cable would be buried at depth in the intertidal zone, at least at a depth of 1.2m but potentially deeper. Consequently there would be no alteration to the surface habitat and communities, and therefore no change is expected.

259. Whilst over time the beach does change, in general over the last 14 years this has averaged less than a 0.25m decrease in the area of the cable corridor (see paragraph 136). Consequently, it is expected that the cable would not become exposed over time if that rate is extrapolated over the next 25 years (therefore less than 0.5m drop in level as a conservative interpolation), and certainly well beyond the operational lifetime of the project. As such there would be no change to the geomorphological processes within the intertidal zone.

260. Maintenance visits would be undertaken annually. These would entail a walkover of the route of the cable. As this would be undertaken on foot across the intertidal zone, no disturbance or alteration to the habitat would occur.

261. Whilst the potential for emergency repairs exists, it is extremely rare if not unheard of for cables to fail and require replacement. Failure points would most likely occur at the joins either at the transition bay inland or at the connection with the offshore export cable in the subtidal zone. Given the extremely low probability of such an event, no disturbance or habitat alteration would be reasonably expected throughout the lifetime of the project.

262. The intertidal sandflats (Annex 1 habitat 1140 Mudflats and sandflats not covered by seawater at low tide of the Braunton Burrows SAC) and their communities would not be disturbed or experience any form of alteration to the habitat or the geomorphological and physical processes as a result of the buried cable.

263. The construction process has the potential to result in the re-suspension into the water column of contaminated sediments or the release of chemicals used during the construction process. These could impact directly or indirectly on the habitats and result in changes to the extent, physical structure, diversity, community structure and typical species representative of these habitats for which the site is designated.

264. Site specific data collected to inform this ES indicates that for all parameters, sediment contaminant concentrations are low. Where exceedances of sediment guidelines occur, these are marginal (i.e. only just above the lower guideline level value) which indicates that there is minimal risk to the marine environment. These exceedances are located in a discreet area within the wind farm site and along the cable corridor route and as such works within this area will be short term, lasting the duration of the cable installation only, and alterations to habitats from re-suspension and deposition of contaminated sediments.

265. There is **<u>no potential for the Project alone to have an AEoI of the Braunton Burrows SAC from alteration to habitats</u>**.

6.4.3 Potential effects from the Project In-Combination with other Plans and Projects

266. Projects considered in the in-combination assessment are provided in **Table 6.3**.

267. As all other projects considered in the in-combination assessment are beyond 10km from the Project's offshore components, no in-combination effects are predicted in relation to Braunton Burrows SAC. There is therefore **<u>no potential for the Project alone or in combination with other plans and projects to have an AEoI on Braunton Burrows SAC</u>**.

Table 6.3 Projects considered in the in-combination effect assessment on benthic and intertidal ecology on Braunton Burrows SAC

Project	Status	Distance from Offshore Development Area (km)	Distance from Braunton Burrows SAC	Included in the CEA?	Rationale
XLinks	Concept / Early planning	No exact location is publicly available, cable routes do not cross		No	Non-significant: The projects are beyond the 10km Zone of Influence. Additive impacts across the region will be small scale and localised with no overlap of effects for benthic ecology.
The Llŷr projects (floating offshore wind)	Pre-consent	16km	71km	No	
South Pembrokeshire Demonstration Zone	Pre-planning application	30km	59km	No	
Valorous Floating Wind Demo	Pre-planning application	20km	93km	No	
Erebus Floating Wind Demo	Pre-planning application	33km	98km	No	

268. The Project's onshore components also entails trenchless crossing underneath the northern end of the Braunton Burrows SAC. Consequently, potential in-combination effects could occur during the construction phase. These are considered and assessed below. No disturbance is expected during the operation phase and therefore there is **no potential for the Project alone or in-combination with other plans and projects to have an AEoI of the Braunton Burrows SAC during the operation and maintenance phase**.

6.4.3.1 Loss of Habitats In-combination with Other Projects

269. Given that the Project will not result in the loss of any habitat or qualifying features within the SAC, there would be no prevention of the achievement of the site's conservation objectives by the Project in-combination with other plans or projects. **Consequently, there is no potential for the Project alone or in-combination with other projects to have an AEoI of the Braunton Burrows SAC as a result of habitat loss**.

6.4.3.2 Disturbance to Habitats In-combination with Other Projects

270. Given that the Project will not result in disturbance to habitat or qualifying features within the SAC, and that the projects listed in **Table 6.3** are beyond the 10km Zone of Influence, additive impacts across the region could not occur. As a result, there will be no prevention of the achievement of the site's conservation objectives by the Project in-combination with other plans or projects. There is therefore **no potential for the Project alone or in-combination with other projects to have an AEoI of the Braunton Burrows SAC from direct or indirect disturbance**.

7. Appropriate Assessment: Annex II Species – Marine Mammals

271. This section provides information to determine whether the potential effects of the Project will have an adverse effect on the conservation objectives and site integrity for each SAC and qualifying species screened into the Appropriate Assessment for offshore marine mammals (**Figure 7.1**).

272. A summary of the Project design envelope is provided in **Section 3.2**, outlining the worst-case scenario and embedded mitigation for the offshore marine mammal assessment.

273. For each designated site screened into the Appropriate Assessment a site description is provided. Depending on the information available, this may include information taken from the citation for the site, its conservation objectives, supplementary advice on the conservation objectives, conservation advice, site condition monitoring or other baseline offshore marine mammal information.

274. For each qualifying feature screened into the Appropriate Assessment, the following information is provided:

- The condition of the designated population, including any relevant data on population trends
- A summary of the ecology of the marine mammal species as relevant for each designated site assessment
- An assessment of the potential effects of the Project on the qualifying feature
- An assessment of effects when considering the Project in-combination with other relevant projects.

275. Additional information relevant to the marine mammal assessment is included in the Offshore ES in the following chapters, and appendices:

- **Annex A: Habitats Regulation Assessment Screening Report**
- **Chapter 5: Project Description** of the Offshore ES
- **Chapter 9: Marine Water and Sediment Quality** of the Offshore ES
- **Chapter 10: Benthic and Intertidal Ecology** of the Offshore ES:
    - **Appendix 10.A: Marine Conservation Zone Assessment Report**
- Chapter 11: Fish and Shellfish Ecology of the Offshore ES
- Chapter 12: Marine Mammal and Marine Turtle Ecology of the Offshore ES:
    - **Appendix 12.A: Marine Mammal and Marine Turtle Underwater Noise Report**

  - **Appendix 12.B: Marine Mammal and Marine Turtle Cumulative Impact Assessment Report**
  - **Appendix 12.C: Marine Mammals Mitigation Protocol**
  - **Appendix 12.D: In Principle Site Integrity Plan for the Bristol Channel Approaches Special Area of Conservation**.

7.1 Assessment Scenarios

7.1.1 Mitigation

7.1.1.1 Mitigation Embedded into the Design

276. This section outlines the embedded mitigation relevant to the marine mammal assessments, which has been incorporated into the design of the Project (**Table 7.1**). Where other mitigation measures are proposed, these are outlined in the relevant assessment sections.

277. Mitigation measures have been proposed where the assessment identifies that an aspect of the development is likely to give rise to significant environmental impacts and discussed with the relevant authorities and stakeholders in order to avoid, prevent or reduce impacts to acceptable levels.

278. For the purposes of the HRA, two types of mitigation are defined:

- Embedded mitigation: consisting of mitigation measures that are identified and adopted as part of the evolution of the project design, and form part of the Project design that is assessed in the HRA
- Additional mitigation: consisting of mitigation measures that are identified during the HRA process specifically to reduce or eliminate any predicted significant impacts. Additional mitigation is therefore subsequently adopted by the Applicant as the HRA process progresses.

7.1.1.2 Other Mitigation Measures

279. In addition to the embedded mitigation measures as outlined above, the Applicant has also committed to the following mitigation measures (**Table 7.2**).

Figure 7.1 Marine mammal designated sites

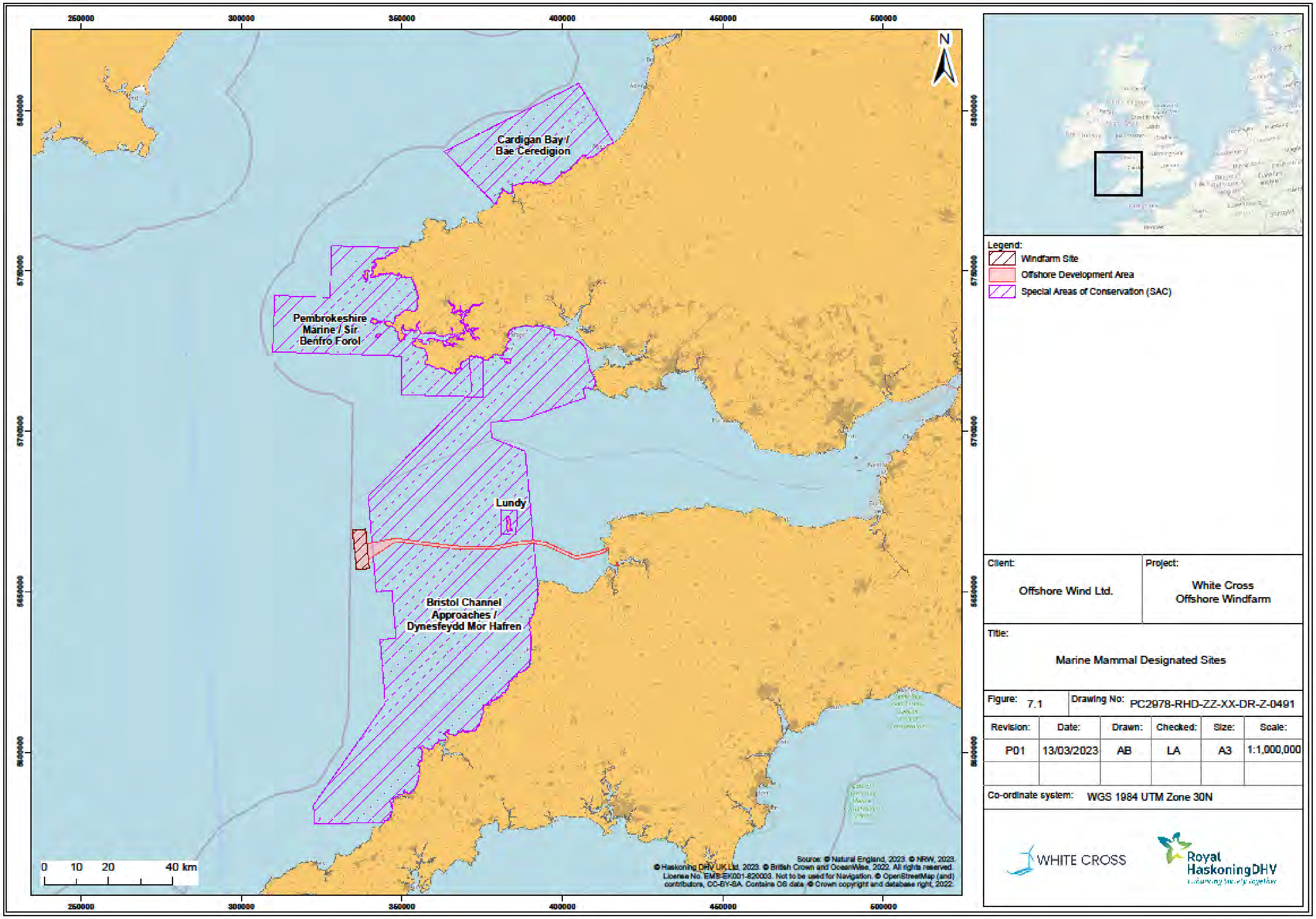


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Table 7.1 Embedded Mitigation Measures

Parameter	Mitigation Measures Embedded into the Design of the Project
MMMP for UXO Clearance	
Hierarchy of UXO clearance methods	The hierarchy of UXO clearance techniques, in order of preference, are; - Avoid (through micro-siting) - Move UXO without clearing it (if safe to do so) - Remove the UXO without clearing it (if safe to do so) - Low-order deflagration if above options not suitable / unsafe - High-order clearance, if low-order deflagration not possible, or in the unlikely event that low-order deflagration was unsuccessful.
Entanglement monitoring	
Monitoring of entanglement for asset integrity	Monitoring of all dynamic cables, mooring lines and WTGs will be undertaken throughout the operation and maintenance phase of the Project to ensure there is no risk to the infrastructure of caught debris in the mooring lines and cables. This will likely be done by use of a Remotely Operated Vehicle (ROV). In the case of any fishing gear / debris caught in the Projects infrastructure, it will be removed. See **Appendix 12.C: Draft Marine Mammal Mitigation Protocol (MMMP)** of the Offshore ES for further detail.
Electromagnetic fields	
Reduce potential effect of EMF	Cables will be buried to a target depth of 0.5-3.0m. This is a similar range to the DECC Guidelines (2011) which advise a 0.6m-1.5m depth to reduce the potential for effects relating to EMF. Cables will be specified to reduce EMF emissions as per industry standards and best practice such as the relevant IEC (International Electrotechnical Commission) specifications.

Table 7.2 Additional Mitigation Measures

Parameter	Additional Mitigation Measures
Underwater Noise	
Soft-start and ramp-up	Each piling event would commence with a soft-start at a low hammer energy followed, by a gradual ramp-up over at least 20 minutes to the maximum hammer energy required to efficiently drive the pile (the maximum hammer energy is only likely to be required at a few of the piling installation locations). The soft-start and ramp-up allows mobile species to move away from the area before the maximum hammer energy with the greatest noise impact area is reached.

Parameter	Additional Mitigation Measures
	The soft-start and ramp-up procedure, along with other mitigation measures for piling, will be detailed in the **Appendix 12.C: Draft MMMP** of the Offshore ES for piling.
UXO	**Appendix 12.C: Draft MMMP** of the Offshore ES will include measures for UXO clearance, which will ensure there are adequate mitigation measures to minimise the risk of any physical or permanent auditory injury to marine mammals and marine turtles as a result of UXO clearance. Low noise alternatives to high order detonations will be prioritised when developing protocols to clear UXOs.
Water Quality	
Pollution prevention	As outlined in **Chapter 9: Marine Sediment and Water Quality** of the Offshore ES, the Applicant is committed to the use of good practice techniques and due diligence regarding the potential for pollution throughout all construction, operation and maintenance, and decommissioning activities.
MMMP for Piling Activities	
MMMP for Piling Activities	The MMMP for piling will be developed in the pre-construction period and based upon best available information, methodologies, industry best practice, latest scientific understanding, current guidance and detailed project design. The MMMP for piling will be developed in consultation with the relevant SNCBs and the MMO, detailing the proposed mitigation measures to reduce the risk of any physical or PTS to marine mammals during all piling operations. This will include details of the embedded mitigation, for the soft-start and ramp-up, as well as details of the mitigation zone and any additional mitigation measures required in order to minimise potential effects of any physical or PTS, for example, the activation of ADD (e.g. for 10 minutes) prior to the soft-start.
MMMP for UXO Clearance	
MMMP for UXO	A detailed MMMP will be prepared for UXO clearance during the pre-construction phase. The MMMP for UXO clearance will ensure there are adequate mitigation measures to minimise the risk of any physical or permanent auditory injury to marine mammals and marine turtles as a result of UXO clearance. The MMMP for UXO clearance will be developed in the pre-construction period, when there is more detailed information on the UXO clearance which could be required and the most suitable mitigation measures, based upon best available information and methodologies at that time. The MMMP for UXO clearance will be prepared in consultation with the MMO and relevant SNCBs. The MMMP for UXO clearance will include details of all the required mitigation measures to minimise the potential risk of PTS as a result of underwater noise during UXO clearance, for example, this would consider the options, suitability and effectiveness of mitigation measures such as, but not limited to:

Parameter	Additional Mitigation Measures
	- Low-order clearance techniques, such as deflagration - The use of bubble curtains if any high-order detonation is required (taking into consideration any environmental limitations) - All UXO clearance to take place in daylight and, when possible, in favourable conditions with good visibility (sea state 3 or less) - Establishment of a monitoring area with minimum of 1km radius. The observation of the monitoring area will be by dedicated and trained marine mammal observers (MMObs) during daylight hours and suitable visibility - The activation of ADD - Other UXO clearance techniques, such as avoidance of UXO; or relocation of UXO. - The controlled explosions of the UXO will be undertaken by specialist contractors, using the minimum amount of explosive required in order to achieve safe disposal of the UXO If more than one high-order detonation is required, other measures such as the use of soft-start charges; or multiple detonations, if UXO are located in close proximity, will also be considered in consultation with the MMO and SNCBs. UXO clearance is not included in the ES application, as currently not enough detailed information is available. Therefore, UXO clearance will be assessed through a separate Marine Licence (ML) application post consent, as agreed with the MMO and Natural England during the marine mammal ETG 2 (For further information, see **Chapter 12: Marine Mammal and Marine Turtle Ecology** of the Offshore ES).
Vessel collision risk and disturbance at seal haul out sites	
Good practice to reduce vessel collision risk and disturbance at seal haul out sites	Vessel movements, where possible, will follow set vessel routes and hence areas where marine mammals and marine turtles are accustomed to vessels, in order to reduce any increased collision risk. All vessel movements will be kept to the minimum number that is required to reduce any potential collision risk. Additionally, vessel operators will follow best practice guidance to reduce any risk of collisions with marine mammals and marine turtles, such as following the Cornwall Marine and Coastal Code for Vessels[2].

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[2] https://www.cornwallwildlifetrust.org.uk/sites/default/files/2019-03/Cornwall%20Marine%20and%20Coastal%20Code%20Guidelines.pdf

Parameter	Additional Mitigation Measures
	All vessels will transit to and from the Windfarm Site at less than 10 knots to further reduce the potential for collision risk. No vessel will transit within 1km of any known seal haul out site at any time.
Site Integrity Plan (SIP)	
Site Integrity Plan (SIP) for the Bristol Channel Approaches SAC (Appendix 12.D: Site Integrity Plan)	In addition to the MMMPs for piling and UXO clearance, a SIP for the Bristol Channel Approaches SAC (solely designated for harbour porpoise) will be developed. The SIP will set out the approach to deliver any Project mitigation or management measures to reduce the potential for any significant disturbance of harbour porpoise in relation to the Bristol Channel Approaches SAC conservation objectives. The SIP is an adaptive management tool, which can be used to ensure that the most adequate, effective and appropriate measures, if required, are put in place to reduce the significant disturbance of harbour porpoise in the Bristol Channel Approaches SAC. The SIP will be developed in the pre-construction period and will be based upon best available information and methodologies at that time, in consultation with the relevant SNCBs and the MMO.

7.1.2 Worst-Case Scenario

280. The final detailed design of the Project will be confirmed through further engineering design studies that will be undertaken post-consent to enable the commencement of construction. In order to provide a precautionary but robust impact assessment at this stage of the development process, realistic worst-case scenarios have been defined in terms of the potential effects that may arise. This approach to the ES, referred to as the Rochdale Envelope, is common practice for developments of this nature, as set out in Planning Inspectorate Advice Note Nine: Rochdale Envelope (v3, 2018). The Rochdale Envelope for a project outlines the realistic worst-case scenario for each individual impact, so that it can be safely assumed that all lesser options will have less impact. Further details are provided in **Chapter 6: EIA Methodology** of the Offshore ES.

281. The realistic worst-case scenarios for the marine mammal assessment are summarised in **Table 7.3**. These are based on the project parameters described in **Chapter 5: Project Description** of the Offshore ES, which provides further details regarding specific activities and their durations.

282. In addition to the design parameters set out in **Chapter 12: Marine Mammal and Marine Turtle Ecology** of the Offshore ES, consideration is also given to:

- How the Project will be built as described in **Chapter 5: Project Description** of the Offshore ES
- A number of further development options which either depend on pre-investment or anticipatory investment, or that relate to the final design of the wind farm
- Whether one Offshore Substation Platform (OSP) or no OSPs are required.

283. In order to ensure that a robust assessment has been undertaken, all development scenarios and options have been considered to ensure the realistic worst-case scenario for each topic has been assessed. Further details are provided in **Chapter 5: Project Description** of the Offshore ES.

284. Piled foundations for the OSP (jackets with pin-piles) are considered the worst-case for marine mammal as a result of underwater noise levels. However, other options for the foundations are being considered, including Gravity Based Structure (GBS) and suction buckets (see **Chapter 5: Project Description** of the Offshore ES).

285. For underwater noise impacts from piling, two scenarios have been considered in the assessments:

- Single piling – A scenario where only one pile is installed within a 24-hour period
- Sequential piling – A scenario where one pile is installed after another pile in the same 24-hour period (e.g. four pin-piles in the same 24 hour period).

286. In relation to the different offshore design scenarios for the Project (i.e. one OSP or no OSPs), the worst-case has been included in **Table 7.3** and assessed in the impact assessment in **Chapter 12: Marine Mammal and Marine Turtle Ecology** of the Offshore ES.

287. The potential pathways for LSE are summarised in **Table 5.3**.

Table 7.3 Realistic Worst-Case Scenarios

Potential Effect Construction	Parameters	Rationale
Impact 1: Underwater noise during foundation installation (piling)	Installation of up to eight Wind Turbine Generators (WTGs) and up to one OSP.	
	Options for WTG moorings; • Drag embedment anchors (up to eight per WTG (64 total)) • Mooring pin piles (up to six per WTG (48 pin piles total)) • Suction piles (up to six per WTG (48 pin piles total).	Hammer piled foundations (mooring pin piles) represent the worst-case scenario for underwater noise. Suction piled foundations have been assessed for an OSP installation option, as a worst case.
	Options for OSP piled foundations: • Jacket with up to four piles.	Hammer piled foundations (OSP jacket piles) represent the worst-case scenario for underwater noise.
	Maximum hammer energy for mooring pin piles: up to 800kJ. Maximum hammer energy for OSP piles: up to 2,500kJ.	The maximum hammer energy will not be required for all piles and would not be required for the entire duration to install a pile.
	Maximum pile diameter for mooring pin piles: up to 2.0m. Maximum pile diameter for OSP piles: up to 4.0m.	This is the worst-case, with the greatest potential underwater noise impact ranges for installation of OSP piles.
	Duration of WTG mooring pin pile installation: two hours and 13 minutes per pin pile. Duration of OSP foundation installation: four hours and 30 minutes per OSP pile.	Total piling time includes soft-start and ramp-up, and provides allowance for issues such as low blow rate, refusal, etc.
	Total mooring piling time: Up to 13 hours and 18 minutes per WTG (with six pin piles per WTG), and up to 106 hours and 24 minutes for all eight WTGs (or a total of up to 4.5 days of active piling). Total OSP piling time: Up to 18 hours per OSP (with four piles) (or a total of up to 1 day of active piling).	
	Maximum number of piling vessels (at any one time): one. Piling rig: One (no concurrent piling).	

Potential Effect	Parameters	Rationale
	Maximum number of WTG mooring pin piles to be installed in a 24 hour period: eight. Maximum number of OSP piles to be installed in a 24 hour period: four.	
	Duration of piling period: six months	This is the maximum duration of all offshore activities to install the WTG mooring piles and OSP. However, active piling will only be a relatively small duration within this overall period.
	Activation of Acoustic Deterrent Device (ADD). For example: 31 minutes per mooring pin-piles, or 62 minutes for jacket piles.	Indicative only.
Impact 2: Underwater noise during UXO clearance	Any requirements for UXO clearance currently unknow, including locations, number, types and sizes of UXO. Risk Assessment determined worst-case is UXO with a Net Explosive Quantity (NEQ) of 309.4kg. Underwater modelling and assessments based high-order detonation of UXO with NEQ of 309.4kg (including donor charge). Low-order clearance would be the first and preferred method for UXO that require clearance. Underwater modelling and assessments include low-order deflagration with shaped charge of 3.1kg NEQ. As a worst case, assessments are based on high-order detonation without mitigation.	Indicative only. A detailed UXO survey would be completed prior to construction. The exact type, size and number of possible detonations and duration of UXO clearance operations is therefore not known at this stage.
Impact 3: Underwater noise from other activities such as seabed preparations, cable laying and rock placement	Seabed clearance methods: Pre-lay grapnel run, boulder grab, plough, sand wave levelling (pre-sweeping), dredging.	Dredging is considered to be the worst-case scenario in terms of underwater noise levels.
	Cable installation methods: Jetting / ploughing / trenching / mechanical cutting.	Assumed equal amounts of jetting and mechanical cutting.
	Windfarm Site: 50km^2.	Maximum windfarm area.
	Export cable corridor: 70 – 93.6km^2.	
	Duration of offshore construction: 16 months.	

Potential Effect	Parameters	Rationale
	Duration of offshore export cable installation: 2 to 6 months.	
Impact 4 & 6: Interactions and collision risk with vessels, and underwater noise and disturbance from vessels	Vessel movements: • Maximum number of construction vessels on site at any one time: up to five vessels. • Construction vessel movements: up to 101 movements over the construction period.	Construction port(s) will not be confirmed until nearer the start of construction.
Impact 5: Barrier effects caused by underwater noise	Maximum impact ranges from underwater noise assessments (worst-case parameters described above).	The maximum spatial area of potential impact, and duration of impacts, are considered to cause the worst-case barrier effect.
Impact 7: Disturbance at seal haul out sites	Distance to the Windfarm Site and vessel routes to seal haul out sites identified within **Section 7.2.2.1.2.1** for grey seal, respectively.	Construction port(s) will not be confirmed until nearer the start of construction.
Impact 8: Entanglement	• Max 48 mooring lines (six per WTG) • Max 10 inter-array cables • Mooring lines made up of anchor chain, mooring cables or polyester mooring line • Mooring lines extend out to between 600m (catenary system) from the WTG.	
Impact 9: Electromagnetic fields direct and indirect effects	EMF from export cable options, inter-array cables and dynamic cables from turbines to seabed in water column, based on potential direct effects of magnetic and electric fields. • Max 10 inter-array cables (max. of 8 per WTG) • Max 2 export cables.	EMF assessment for the Project (**Chapter 11: Fish and Shellfish Ecology** of the Offshore ES).
Impact 10: Barrier effects (physical presence)	Maximum impact range from underwater noise assessments (worst-case parameters described above). Windfarm Site is located 52.5km from the coast.	The maximum spatial area of potential impact, and duration of impacts, are considered to cause the worst-case barrier impact.

Potential Effect	Parameters	Rationale
Impact 11: Changes to prey availability (temporary habitat loss / disturbance; permanent habitat loss; introduction of OSP foundations, scour protection and hard substrate; increased suspended sediments and sediment re-deposition; re-mobilisation of contaminants from seabed sediment; underwater noise; and Electromagnetic Fields (EMF); entanglement)	Impacts to prey species and habitat as described in **Chapter 10: Benthic and Intertidal Ecology** and **Chapter 11: Fish and Shellfish Ecology** of the Offshore ES.	
	Total seabed disturbance within Windfarm Site, worst-case scenario total temporary disturbance of eight turbines footprint: • The area of active benthic footprint for anchoring systems for catenary turbines is 2,424m^2 per turbine (eight WTG as worst-case), total area 19,392m^2 • Max inter-array cable footprint on seabed: 480,000m^2 (assumes 8 turbines). For the offshore substation platform max footprint (4 piles) = 1256.64m^2 for the export cable corridor: • Cable burial (single cable) would disturb the subtidal = 4,680,000m^2 (plan area for two cables) • Total maximum volume of sediment disturbed = 1,684,800m^3.	The worst-case scenario for maximum area of temporary habitat loss / disturbance of seabed from offshore cable installation, seabed preparation, jack-up vessels and trenchless technology exit points.
	Export cable burial for two cables would displace a volume of 1,684km^3 assuming 3m wide, 3m deep excavation for each cable. Inter-array cable burial would displace a volume of 267,840m^3 also assuming 3m wide, 3m deep excavation (based on max length of inter-array cable = 30km). 1256.64m^2 footprint for the substation.	The worst-case for increased suspended sediments and sediment re-deposition from seabed preparation and cable trenching.
	Remobilisation of contaminated sediments: As described for increased suspended sediments and sediment re-deposition.	
	Underwater noise parameters as outlined for construction noise-related effects above and **Appendix 12.A: Marine Mammal and Marine Turtle Underwater Noise Report** of the Offshore ES.	As above for underwater noise.

Potential Effect	Parameters	Rationale
Impact 12: Indirect effects due to changes in water quality	Impacts to water quality as described in **Chapter 9: Marine Water and Sediment Quality** of the Offshore ES. See worst-case for temporary increases in Suspended Sediment Concentration (SSC) and re-mobilisation of contaminated sediments as described for Impact 1 and 2.	
Operation and Maintenance		
Impact 1: Underwater noise from operational wind turbines	Turbine parameters (e.g. size and number) as outlined above and underwater noise parameters described in **Appendix 12.A: Marine Mammal and Marine Turtle Underwater Noise Report** of the Offshore ES.	Underwater noise modelling for operational turbines.
	Operational life: Minimum 25 years	
	Turbine spacing: • Minimum in row spacing of between 1,100m and 1,310m (depending on MW of WTG) • Minimum inter row spacing of between 2,200m and 2,620m (depending on MW of WTG).	
Impact 2: Underwater noise from other activities such as cable repairs and rock placement	A maximum of 10 cable repairs (5 each) for Offshore Export Cable(s) and inter-array cables. See **Chapter 5: Project Description** of the Offshore ES for further information.	
Impact 3 and 5: Interactions and collision risk with vessels, and underwater noise and disturbance from vessels	Vessel movements: • Maximum number of vessels on site at any one time: 5 • Operation and maintenance vessel trips to port per year: approximately 40 • Maximum impact range from operation and maintenance phase underwater noise assessment (as above).	The maximum spatial area of potential effect, and duration of impacts, are considered to cause the worst-case noise effects.

Potential Effect	Parameters	Rationale
Impact 4: Barrier effects from underwater noise from operational wind turbines	Maximum impact range from underwater noise assessments (worst-case parameters described above).	The maximum spatial area of potential effect, and duration of effects, are considered to cause the worst-case barrier effect.
Impact 6: Disturbance at seal haul out sites	See construction effects for distance to seal haul out sites.	
Impact 7: Entanglement	See above in Construction, Impact 8.	
Impact 8: Barrier effects due to the physical presence of the windfarm	See turbine spacing under operation and maintenance Impact 1 above. Footprint for total WTGs: 19,200m^2 for up to eight WTGs; • Anchor length (10m) x anchor width (10m) x maximum number of anchors per WTG (six) = 600m^2 per WTG • Mooring line radius (600m) x chain width (0.5m) x maximum number of anchors (six) = 1,800m^2 per WTG. Footprint for OSP: 1,257m^2	
Impact 9: Electromagnetic fields direct and indirect effects	See above in Construction, Impact 9.	
Impact 10: Changes to prey availability (temporary habitat loss / disturbance; permanent habitat loss; OSP foundations, scour protection and hard substrate; increased suspended sediments and	Impacts to prey species and habitat as described in **Chapter 10: Benthic and Intertidal Ecology** and **Chapter 11: Fish and Shellfish Ecology** of the Offshore ES.	
	If 8 turbines with catenary mooring systems are used the maximum area of physical disturbance and temporary habitat loss of seabed habitat has been quantified based on the following: • The area of active benthic footprint for anchoring systems for catenary turbines is 2,400m^2 per turbine, total area 19,200m^2	In most places, burial of the inter array cables will be less than the 3m maximum and 0.5m minimum depth. Installation of all the moorings/anchors will take up to 53 days.

Potential Effect	Parameters	Rationale
sediment re-deposition; re-mobilisation of contaminants from sea bed sediment; underwater noise; and Electromagnetic Fields (EMF); entanglement)	- Max inter-array cable footprint on seabed: 744,000m^2 (assumes 8 turbines). For the offshore substation platform max footprint (4 piles) = 1256.6m^2 For the export cables: - Total length of cable = 93.60km per cable Maximum width of disturbance = 25m (jetting/ploughing) - Cable burial (single cable) would disturb the subtidal = 4,680,000m^2 (plan area for two cables) - Total maximum volume of sediment disturbed = 1,684,800m^3.	Assuming the maximum length of array cable is installed, the duration of installation is predicted to be up to 70 days Based on four suction caissons at 20m diameter each.
	Temporary increases in SSC and any deterioration in water quality through the resuspension of contaminated sediment due to maintenance activities could result from periodic jack-up vessel deployment, and cable repair, replacement and reburial activities – same as temporary habitat loss / disturbance.	The worst-case scenario based on maximum area of temporary habitat loss / disturbance of sea bed (as above).
	Underwater noise parameters as outlined for operation noise-related effects above and **Appendix 12.A: Marine Mammal and Marine Turtle Underwater Noise Report** of the Offshore ES.	As above for underwater noise.
Impact 11: Changes to water quality	Impacts to water quality (as described in **Chapter 9: Marine Water and Sediment Quality** of the Offshore ES). Temporary increases in SSC and any deterioration in water quality through the resuspension of contaminated sediment due to maintenance activities could result from periodic jack-up vessel deployment, and cable repair, replacement and reburial activities – same as temporary habitat loss / disturbance for prey above.	
Decommissioning		
Impact 1: Underwater noise from removing foundations and cables	No final decision has yet been made regarding the final decommissioning policy for the Project infrastructure. It is also recognised that legislation and industry best practice change over	Assumed to be no worse than during construction.

Potential Effect	Parameters	Rationale
Impact 2: Underwater noise and disturbance from vessels	time. However, the following infrastructure is likely be removed, reused or recycled where practicable: • OSP including topsides and steel jacket foundations • Offshore cables and cable protection may be removed or left in situ depending on available information at the time of decommissioning. The following infrastructure is likely to be decommissioned in situ depending on available information at the time of decommissioning: • OSP scour protection • Offshore cables may be removed or left in situ • Crossings and cable protection. The detail and scope of the decommissioning works will be determined by the relevant legislation and guidance at the time of decommissioning and will be agreed with the regulator. For the purposes of the worst-case scenario, it is anticipated that the effects will be no greater than those identified for the construction phase, as no piling will be required.	Decommissioning arrangements will be detailed in a Decommissioning Programme, which will be drawn up and agreed with Department for Energy Security and Net Zero (DESNZ) prior to construction.
Impact 3: Barrier effects caused by underwater noise		
Impact 4: Interaction and collision risk with vessels		
Impact 5: Disturbance at seal haul out sites		
Impact 6: Entanglement		
Impact 7: Electromagnetic fields direct and indirect effects		
Impact 8: changes to prey availability (temporary habitat loss / disturbance; increased suspended sediments and sediment re-deposition; re-mobilisation of contaminants from seabed sediment; underwater noise)		
Impact 9: Changes to water quality		

Potential Effect In-combination	Parameters	Rationale
Impact 1: Disturbance from underwater noise	Duration of offshore construction of up to 16 months, which could take place at any time from 2025 to 2027, and relative areas of MUs to determine long list of projects and activities. Disturbance effect ranges based on worst case, including underwater noise modelling for White Cross for similar activities (as outlined above). Precautionary approach to determine projects and all potential noise sources which could have cumulative effects. Precautionary approach to determine density estimates and reference populations for all marine mammal species.	
Impact 2: Collision risk with vessels	Potential increased collision risk to marine mammals from projects and activities identified in the CEA, compared to current number of vessel movements.	
Impact 3: Entanglement	As outlined above for entanglement during operation and maintenance, based on current information.	
Impact 4: Physical barrier effects	As outlined above for potential barrier effects from underwater noise during construction or physical presence during operation and maintenance, based on current information.	

7.2 Assessment of Potential Effects

288. The potential effects have been assessed for each of the designated sites for marine mammals during construction, operation and maintenance (operation and maintenance) and decommissioning.

289. Assessments of the potential for adverse effects, at the population level, have been based on the JNCC *et al.* (2010) draft guidance for effects on EPS, alongside the Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas (ASCOBANS) agreement.

290. The JNCC *et al.* (2010) draft guidance provides some indication on how many animals may be removed from a population without causing detrimental effects to the population at Favourable Conservation Status (FCS). The JNCC *et al.* (2010) draft guidance also provides limited consideration of temporary effects, with guidance reflecting consideration of permanent displacement.

291. JNCC *et al.* (2010) draft guidance considered 4% as the maximum potential growth rate in harbour porpoise population, and the 'default' rate for cetaceans. Therefore, beyond natural mortality, up to 4% of the population could theoretically be permanently removed before population growth could be halted. Based on this and as a precautionary approach, temporary impacts that could affect 5% or less of the population are not considered to have the potential to have long term significant impacts on the population. In assigning 5% to a temporary effect, consideration is given to uncertainty of the individual consequences of temporary disturbance.

292. Permanent effects with a greater than 1% of the reference population being affected within a single year are considered to result in a significant effect. This is based on ASCOBANS and Defra advice (Defra, 2003; ASCOBANS, 2015) relating to impacts from fisheries by-catch (i.e. a permanent effect) on harbour porpoise. A threshold of 1.7% of the relevant harbour porpoise population above which a population decline is inevitable has been agreed with Parties to ASCOBANS, with an intermediate precautionary objective of reducing the impact to less than 1% of the population (Defra, 2003; ASCOBANS, 2015).

293. As a precautionary approach, and as there is no current guidance on what determines a significant temporary or permanent effect, the above information on the potential for population level effects has been used to inform the approach to defining potential for adverse effect for harbour porpoise, bottlenose dolphin, and grey seal populations. The approach to define the potential for Adverse Effect on the Integrity (AEoI) of the site, based on the potential effect to the overall populations, is therefore as follows:

- For temporary effects, there would be potential for an AEoI of the site, if there is an effect to 5% or more of the population
- For permanent effects, there would be potential for an AEoI of the site, if there is an effect to 1% of more of the population.

294. Assessments for temporary change in hearing sensitivity (Temporary Threshold Shift (TTS)) have not been included in the assessment, as TTS does not result in permanent injury (which is considered the worst-case in terms of injury). TTS has been used as a proxy for disturbance for some species assessments, where there is limited information on that species. A full assessment of TTS has been included in **Chapter 12 Marine Mammal and Marine Turtle Ecology** of the Offshore ES.

7.2.1 Bristol Channel Approaches / Dynesfeydd Môr Hafren SAC

7.2.1.1 Baseline and Current Conservation Status

7.2.1.1.1 Description of Designation

295. The Bristol Channel Approaches SAC extends across the western approaches of the Bristol Channel, from Carmarthen Bay in South Wales to the north coast of Devon and Cornwall. The Bristol Channel Approaches covers an area of 5,850km^2, and supports a diversity of habitat types, from reefs to mudflats. Water depths range from Mean Low Water (MLW) down to 70m along the western boundary. The site area is 5,850km^2 (JNCC *et al.*, 2020).

296. The Bristol Channel Approaches SAC is an area recognised to have a seasonal variation in abundances of harbour porpoise. Harbour porpoise occur within the site year round, but are seen in persistently higher densities during winter, compared to other parts of the MU (Joint Nature Conservation Committee (JNCC), 2021a) which is from October to March (182 days) (JNCC *et al.*, 2020).

297. The closest point to the Project's Windfarm Site is approximately 1.5km from the Bristol Channel Approaches SAC, with the cable corridor running directly through the SAC (**Table 7.4**).

Table 7.4 Distances of the Project to the Bristol Channel Approaches SAC

Location	Closest point to Bristol Channel Approaches SAC
Windfarm Site	1.5km
Export cable corridor	Overlaps
Landfall location	23km

7.2.1.1.2 Qualifying Features

7.2.1.1.2.1 Harbour Porpoise

298. Within the Bristol Channel Approaches SAC site selection document, it was estimated that the Bristol Channel Approaches SAC supports 4.7% of the UK Celtic and Irish Sea (CIS) MU. However, the site selection document also states that this should not be taken as a population estimate for the site, and it is not appropriate to assign a population estimate to designated sites for harbour porpoise due to the daily and seasonal movements of the species (JNCC *et al.,* 2017). In addition, harbour porpoise should be considered as part of the relevant MU population rather than as part of a site-specific population. This site is recognised as important for harbour porpoise, specifically during the winter months, when high densities persistently occur (based on data from Heinanen & Skov, 2015).

299. Distribution and abundance maps have been developed by Waggitt *et al.* (2020) for harbour porpoise and show a consistent presence in the Bristol Channel Approaches, and the coasts off south-west England and south Wales, for both January and July (Waggitt *et al.*, 2020). Examination of this data, including all 10km grids that overlap with the Project, including export cable corridor areas, indicates an average annual density estimate of:

- 0.191 individuals per km^2 for the Windfarm Site (with a peak of 0.258 per km^2 in August)
- 0.389 per km^2 for the export cable corridor (with a peak of 0.433 per km^2 in March).

300. The Project sites are in the SCANS-III survey block D (Hammond *et al.,* 2021) where:

- Abundance estimate = 5,734 harbour porpoise (95% Confidence Interval (CI) = 1,697-12,452)
- Density estimate = 0.118 harbour porpoise/km^2 (Coefficient of Variation (CV) = 0.489).

301. Data from the Project's site-specific surveys have also been used to generate abundance and density estimates for the sites with a 4km buffer (for further details see **Chapter 12: Marine Mammal and Marine Turtle Ecology** of the Offshore ES). Harbour porpoises were recorded in July, September and October 2020, May, July and September 2021, and April to June 2022. The peak raw count of nine in May 2021 resulted in an abundance estimate of 65 (CI: 22-116; precision: 0.33) for the Survey Area, and a density estimate of 0.19/km^2.

302. The average of the winter months, summer months, and annual density has then been calculated based on the maximum calculated for each month. **Table 7.5** shows the densities for harbour porpoise, based on all individuals that have the potential to be harbour porpoise (including those that were recorded as porpoise or dolphin species).

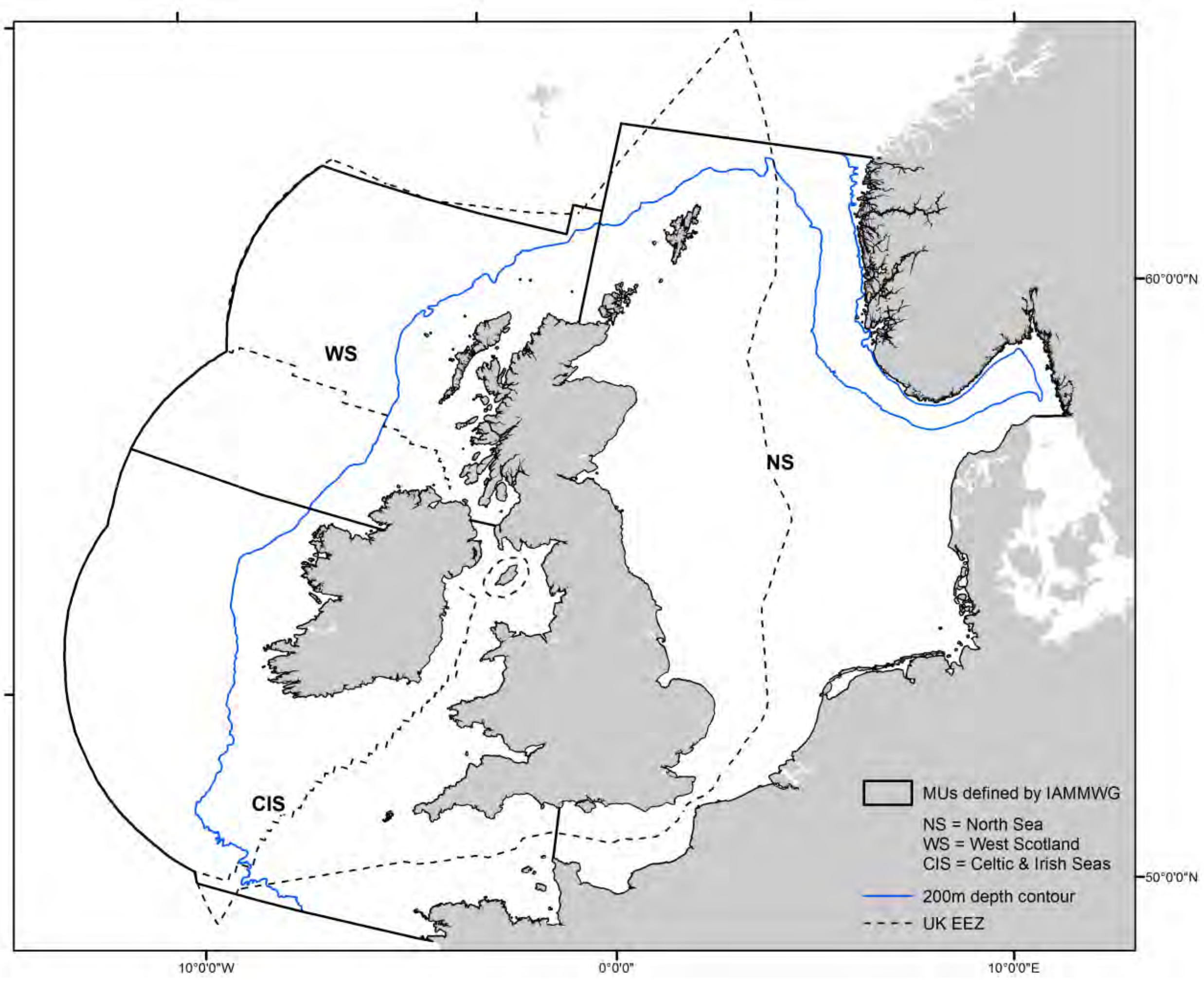
Table 7.5 Maximum Harbour Porpoise Summer, Winter and Annual Density Estimate for the Project's Survey Areas Plus 4km Buffer

Season	Maximum Density Estimate (Corrected) for Whole Survey Area (Animals/Km^2)
Average winter (October to March)	0.108
Average summer (April to September)	0.918
Average annual	0.594

303. Although the density calculations from Waggit *et al*. (2020) do not show seasonal variation, this is not the case with the site-specific surveys conducted (APEM, 2022; **Table 7.5**). The site-specific surveys indicate a seasonal pattern in the abundance of harbour porpoise, with higher numbers present in the summer months within the survey area. There is no evident pattern of harbour porpoise distribution within the survey area, with no indication of a particular area of importance (for further details see **Chapter 12: Marine Mammal and Marine Turtle Ecology** of the Offshore ES). Due to the APEM (2022), densities showing a higher estimate during the summer (0.918; **Table 7.5**), this will be used going forward in this assessment. This is contradictory to the Heinanen & Skov (2015) report that states that harbour porpoise are present in this area in higher number during the winter months, and as noted above, the Bristol Channel Approaches SAC is noted as being important for harbour porpoise in the winter months. However, the Heinanen & Skov (2015) report shows a high level of uncertainty in the data used for the study, with the data in the Bristol Channel mainly being extrapolations from a limited survey in the central part of the channel. Therefore, the worst-case density and highest density will be used in all assessments for harbour porpoise, as well as the annual density estimate.

304. The Inter-Agency Marine Mammal Working Group (IAMMWG, 2022) define three MUs for harbour porpoise. The Project's offshore sites are located in the CIS MU (**Figure 7.2**). The IAMMWG estimate of harbour porpoise abundance in the CIS MU is 62,517 (CV = 0.13; 95% CI = 48,324 – 80,877) (IAMMWG, 2022). This is the reference population for harbour porpoise used in the assessments (as supported by Natural England – see **Chapter 12: Marine Mammal and Marine Turtle Ecology** of the Offshore ES).

Figure 7.2 Harbour Porpoise MUs, Noting That This Species is Largely Confined to the Continental Shelf (i.e., Waters <200m Depth) (IAMMWG, 2022)



305. The Bristol Channel Approaches SAC Site Selection Report (JNCC, 2017a) identifies that the Bristol Channel Approaches SAC site supports approximately 2,147 individuals (95% Confidence Interval: 810 – 5,693) for at least part of the year (JNCC, 2017a). However, JNCC *et al.* (2019), states that because this estimate is from a one-month survey in a single year (the SCANS-II survey in July 2005) it cannot be considered as an estimated population for the site. It is therefore not appropriate to use site population estimates in any assessments of effects of plans or projects on the site (i.e. HRA), as they need to take into consideration population estimates at the MU level, to account for daily and seasonal movements of the animals (JNCC *et al.*, 2019).

7.2.1.1.3 Conservation Status

306. Based on the most recent 2013-2018 reporting by the JNCC, the Conservation Status for harbour porpoise within the species range in the Celtic and Irish Sea is currently '*unknown*' (JNCC, 2019).

307. More information on the ecology, distribution, abundance, diets and movements of harbour porpoise including a full summary of the site-specific aerial surveys, can be found in **Chapter 12: Marine Mammal and Marine Turtle Ecology** of the Offshore ES.

7.2.1.1.4 Conservation Objectives

308. The Conservation Objectives for the Bristol Channel Approaches SAC are designed to help ensure that the obligations of the Habitats Directive can be met. Article 6(2) of the Habitats Directive requires that there should be no deterioration or significant disturbance of the qualifying species or to the habitats upon which they rely.

309. The Conservation Objectives (JNCC *et al.*, 2019) for the Bristol Channel Approaches SAC are:

"To ensure that the integrity of the site is maintained and that it makes the best possible contribution to maintaining Favourable Conservation Status (FCS) for Harbour Porpoise in UK waters

In the context of natural change, this will be achieved by ensuring that:

- *Harbour porpoise is a viable component of the site*
- *There is no significant disturbance of the species*
- *The condition of supporting habitats and processes, and the availability of prey is maintained"*

310. These Conservation Objectives are:

311. "a set of specified objectives that must be met to ensure that the site contributes in the best possible way to achieving Favourable Conservation Status (FCS) of the designated site feature(s) at the national and biogeographic level" (JNCC et al., 2019).

7.2.1.1.4.1 Conservation Objective 1: Harbour Porpoise is a Viable Component of the Site

312. This Conservation Objective is designed to minimise the risk of injury and killing or other factors that could restrict the survivability and reproductive potential of harbour porpoise using the SAC. Specifically, this objective is primarily concerned with operations that would result in unacceptable levels of those impacts on harbour

porpoise using the SAC. Unacceptable levels can be defined as those having an impact on the FCS of the population of the species in their natural range.

313. Harbour porpoise are considered to be a viable component of the SAC if they are able to live successfully within it. The Bristol Channel Approaches SAC has been selected primarily based on the long term, relatively higher densities of porpoise in contrast to other areas of the CIS. The implication is that the SAC provides relatively good foraging habitat and may also be used for breeding and calving. However, because the number of harbour porpoise using the site naturally varies there is no exact value for the number of animals expected within the site (JNCC *et al*., 2019).

314. The Conservation Objectives (JNCC et al., 2019) state that, with regard to assessing impacts, 'the reference population for assessments against this objective is the MU population in which the SAC is situated'.

315. Harbour porpoise are listed as European Protected Species (EPS) under Annex IV of the Habitats Directive, and are therefore protected from the deliberate killing (or injury), capture and disturbance throughout their range. Under the Habitats Regulations, it is an offence if harbour porpoise are deliberately disturbed in such a way as to:

- Impair their ability to survive, to breed or reproduce, or to rear or nurture their young
- To affect significantly the local distribution or abundance of that species.

316. The term deliberate is defined as any action that is shown to be "by a person who knows, in the light of the relevant legislation that applies to the species involved, and the general information delivered to the public, that his action will most likely lead to an offence against a species, but intends this offence or, if not, consciously accepts the foreseeable results of his action".

317. In addition, Article 12(4) of the Habitats Directive is concerned with incidental capture and killing. It states that Member States "*shall establish a system to monitor the incidental capture and killing of the species listed on Annex IV (all cetaceans). In light of the information gathered, Member States shall take further research or conservation measures as required to ensure that incidental capture and killing does not have a significant negative impact on the species concerned*'.

7.2.1.1.4.2 Conservation Objective 2: There is no Significant Disturbance of the Species

318. The disturbance of harbour porpoise typically, but not exclusively, originates from operations that cause underwater noise, including activities such as seismic surveys, pile driving and sonar.

319. Disturbance is considered to be significant if it leads to the exclusion of harbour porpoise from a significant portion of the site for a significant period of time. The current Statutory Nature Conservation Bodies (SNCBs) guidance for the assessment of significant noise disturbance on harbour porpoise in the Bristol Channel Approaches SAC (JNCC *et al.,* 2020) is that "*Noise disturbance within an SAC from a plan/project individually or in-combination is considered to be significant if it excludes harbour porpoise from more than*:

- 20% of the relevant area[3] of the site in any given day[4], or
- An average of 10% of the relevant area of the site over a season[5, 6]."

320. Guidance has been developed for assessment the potential for disturbance against this Conservation Objective; *Guidance for assessing the significance of noise disturbance against Conservation Objectives of harbour porpoise SACs* (JNCC *et al.* 2020). This guidance will be used to inform the assessment for noise disturbance to the Bristol Channel Approaches SAC.

7.2.1.1.4.3 Conservation Objective 3: The Condition of Supporting Habitats and Processes, and the Availability of Prey is Maintained

321. Supporting habitats, in this context, means the characteristics of the seabed and water column. Supporting processes encompass the movements and physical properties of the habitat. The maintenance of these supporting habitats and processes contributes to ensuring prey is maintained within the site and is available to harbour porpoise using the SAC. Harbour porpoise are strongly reliant on the availability of prey species year round due to their high energy demands, and their distribution and condition may strongly reflect the availability and energy density of prey.

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[3] The relevant area is defined as that part of the SAC that was designated on the basis of higher persistent densities for that season (summer defined as April to September inclusive, winter as October to March inclusive).

[4] To be considered within the Habitats Regulation Assessment and, if needed, licence conditions should ensure that daily thresholds are not exceeded. Day to day monitoring of compliance is not practicable and therefore retrospective compliance monitoring is required to test whether the licence conditions are being adhered to.

[5] Summer defined as April to September inclusive, winter as October to March inclusive.

[6] For example, a daily footprint of 19% for 95 days would result in an average of 19x95/183 days (summer) =9.86%

322. This Conservation Objective is designed to ensure that harbour porpoise are able to access food resources year-round, and that activities occurring in the Bristol Channel Approaches SAC will not affect this.

323. For the purposes of the assessments, the potential effects considered in relation to the Bristol Channel Approaches SAC Conservation Objectives are outlined in **Table 7.6**.

Table 7.6 Potential effects of the Project in relation to the Conservation Objectives of the Bristol Channel Approaches SAC for harbour porpoise

Conservation Objective for Harbour Porpoise	Potential for Adverse Effect
Harbour porpoise is a viable component of the site	Physical and permanent auditory injury from underwater noise will be mitigated, however, this has been assessed further.
	Significant disturbance and displacement as a result of increased underwater noise levels has the potential to have an adverse effect on harbour porpoise from the Bristol Channel Approaches SAC and will be considered further.
	Any potential increased collision risk with vessels has the potential for adverse effect and will be considered further.
	Any potential entanglement of harbour porpoise with dynamic cables and mooring lines has the potential for adverse effect and will be considered further.
	The potential for a barrier effect (physical and noise barriers) to harbour porpoise has the potential for an adverse effect and will be considered further.
	The potential for effect due to EMF has the potential for adverse effect on harbour porpoise and will be considered further.
There is no significant disturbance of the species	Significant disturbance and displacement as a result of increased underwater noise levels and increased vessel activity has the potential to have an adverse effect on harbour porpoise from the Bristol Channel Approaches SAC and will be considered further.
The condition of supporting habitats and processes, and the availability of prey is maintained	Changes in water quality and prey availability have the potential to affect the harbour porpoise from the Bristol Channel Approaches SAC and will be considered further.

7.2.1.1.5 Management Measures

324. Specific management measures are yet to be developed for the Bristol Channel Approaches SAC, however JNCC *et al*., (2019) advise that "*the site should be managed in a way that ensures that its contribution to the maintenance of the harbour porpoise population at FCS is optimised, and that this may require management of human activities occurring in or around the site if they are likely to*

have an adverse impact on the site's Conservation Objectives either directly or indirectly identified through the assessment process."

325. JNCC et al. (2019), also state that "*management measures (e.g. the scale and type of mitigation) are the responsibility of the relevant regulatory or management bodies. These bodies will consider SNCB advice and hold discussions with the sector concerned, where appropriate*."

7.2.1.2 Assessment of Potential Effects During Construction

326. The potential effects during construction of the Project (in relation to harbour porpoise from the Bristol Channel Approaches SAC) were agreed through the HRA Screening process and the marine mammal related (ETG) consultation, as part of the EPP (see **Table 12.17** of **Chapter 12: Marine Mammal and Marine Turtle Ecology** of the Offshore ES). The potential effects of the Project that are assessed to determine any potential for an AEoI of the Bristol Channel Approaches SAC in relation to the Conservation Objectives for harbour porpoise are:

- Auditory injury and disturbance resulting from underwater noise during impact piling
- Auditory injury and disturbance resulting from underwater noise during UXO clearance
- Auditory injury and disturbance resulting from underwater noise during other construction activities, including seabed preparations, rock placement and cable installation
- Auditory injury and disturbance resulting from underwater noise due to construction vessels
- Barrier effects as a result of underwater noise
- Interaction and Collision Risk with Vessels
- Entanglement
- Barrier effects due to physical presence
- Electromagnetic Fields (EMFs)
- Changes to prey availability
- Changes to water quality.

327. The potential for a disturbance effect under Conservation Objective 2 should be considered in the context of the seasonal components of the SAC area (see **Section 7.2.1.1**), rather than the SAC area as a whole.

328. The assessments are based on the current recommended Effective Deterrence Ranges (EDRs) for assessing the disturbance of harbour porpoise in the SAC from different noise generating activities (JNCC *et al.*, 2020).

7.2.1.2.1 Auditory Injury and Disturbance Resulting from Underwater Noise During Impact Piling

329. There is the potential for impact piling to be used to install pin-piles for the OSP and for the WTG mooring anchors. Other methods of installation for the anchoring systems include drag embedment anchors and suction piles. It should be noted that an OSP may not be required, and that the mooring anchors would be installed using an alternative method to piling, and therefore there is the potential that impact piling would not be required for the construction of the Project However, impact piling has been fully assessed as it remains a construction option, and represents the worst-case in terms of underwater noise effects to marine mammals. Other foundation options are considered within the underwater noise modelling, and assessed where appropriate in the following sections (e.g., suction piles or drag embedment anchors, assessed in **Section 7.2.1.2.3**).

330. Impact piling is a source of high-level underwater noise. Underwater noise can cause both physiological (e.g. lethal, physical injury and auditory injury) and behavioural (e.g. disturbance and masking of communication) impacts on marine mammals.

7.2.1.2.1.1 Potential for Permanent Auditory Injury (PTS) During Impact Piling

331. Underwater noise modelling was carried out by Subacoustech Environmental Ltd. to estimate the noise levels likely to arise during piling and determine the maximum potential areas of effect (see **Chapter 12: Marine Mammal and Marine Turtle Ecology** and **Appendix 12.A Marine Mammal and Marine Turtle Underwater Noise Modelling Report** of the Offshore ES for further details).

332. The following assessments are based on the worst-case location at each site (i.e. location with greatest noise propagation) for:

- OSP jacket piles – 4.0m diameter piles, installed using a maximum blow energy of 2,500kJ, with a maximum of four piles installed in a 24-hour period
- Mooring anchor pin piles – 2.0m diameter piles, installed using a maximum blow energy of 800kJ, with a maximum of eight piles installed in a 24-hour period.

333. To determine the potential for PTS from cumulative sound exposure level (SEL_{cum}), the soft-start, ramp-up, hammer energy, total duration and strike rate are taken into account. The soft-start takes place over the first 20 minutes of piling, at a reduced hammer energy (or starting hammer energy) of no more than 400 kJ. Following the soft-start at the starting hammer energy, the hammer energy will increase (ramp-up) to the maximum hammer energy required to safely install the pile (JNCC, 2010b).

334. As a worst-case scenario it is assumed to be 100% maximum hammer energy will be required and applied for the remaining duration of the pile installation. However, in reality maximum hammer energy is only likely to be required at a few of the piling installation locations and for shorter periods of time. Therefore, the modelling and assessments are based on a highly conservative worst-case scenario which is precautionary.

335. The soft-start, ramp-up and piling duration used to assess SEL_{cum} for jacket piles and pin-piles are summarised in **Table 7.7**.

Table 7.7 Hammer energy, ramp-up and piling duration

Parameter	**Starting hammer energy**	**Ramp-up**				**Maximum hammer energy**
Jacket piles						
Jack pile hammer energy (kJ)	400	800	1,200	1,600	2,000	2,500
Number of strikes per pile	200	150	150	150	150	7,350
Strikes per minute	10	15	15	15	15	35
Duration (minutes)	20	10	10	10	10	210 (3 hours and 30 minutes)
Total Project Piling duration	8,150 strikes, 4.5 hours per pile / 32,600 strikes, 18 hours for four piles					
Mooring pin piles						
Jack pile hammer energy (kJ)	128	256	384	512	640	800
Number of strikes	98	74	74	74	74	3,607
Strikes per minute	10	15	15	15	15	35
Duration (minutes)	9.8	4.9	4.9	4.9	4.9	103.1 (1 hours and 43.1 minutes)
Total duration	4001 strikes, 2.21 hours per pile / 32,008 strikes, 17.68 hours for eight piles					

336. Further information on the pling noise source levels, environmental parameters are provided in **Chapter 12 Marine Mammal and Marine Turtle Ecology** and **Appendix 12.A Marine Mammal and Marine Turtle Underwater Noise Modelling Report** of the Offshore ES.

337. The assessments are based on the latest Southall *et al.* (2019) thresholds and criteria for marine mammals. The thresholds indicate the onset of PTS, the point at which there is an increase in risk of permanent hearing damage in an underwater receptor (although not all individuals within the maximum PTS range will have permanent hearing damage, this is assumed as a worst-case scenario).

338. The maximum impact ranges (and areas) are used to inform the assessments. The results of the underwater noise modelling for PTS in harbour porpoise are presented in **Table 7.8** for both OSP jacket piles and mooring pin piles. The PTS cumulative ranges are based on the total piling in a 24-hour period (i.e. up to four OSP jacket piles or up to eight mooring pin piles being installed sequentially in a 24 hour period).

Table 7.8 Predicted Effect Ranges (and Areas) for PTS from a Single Strike and From Cumulative Exposure for Harbour Porpoise

Species	Potential Effect	Criteria threshold (Southall *et al.*, 2019)	OSP Jacket Pile (4m Diameter) Maximum Impact Range (km) and Area (km^2)	Mooring Pin-Piles (2m Diameter) Maximum Impact Range (km) and Area (km^2)
			Maximum Hammer Energy (2,500kJ)	Maximum Hammer Energy (800kJ)
Harbour porpoise	PTS from single strike (without mitigation)	SPL_{peak} Unweighted (202 dB re 1µPa) Impulsive	570m (1km^2)	260m (0.21km^2)
	PTS from cumulative SEL (including soft-start and ramp-up)	SEL_{cum} Weighted (155 dB re 1µPa^{2}s) Impulsive	4.6km (55km^2)	2.1km (12km^2)

339. At the closest point the Windfarm Site is 1.5km from the Bristol Channel Approaches SAC winter area and the export cable corridors overlaps the winter area. Therefore, there is no direct overlap with the predicted instantaneous permanent auditory injury (PTS SPL_{peak}) Windfarm Site itself, for the maximum effect range for PTS (without mitigation) with the Bristol Channel Approaches SAC (**Table 7.4**). However, there is potential for overlap of cumulative PTS ranges with the Bristol Channel Approaches SAC.

340. The maximum number of harbour porpoise that could be at possible risk of PTS (SPL_{peak}) during piling, without any mitigation, could be up to one individual

(0.0015% of the CIS MU) (**Table 7.9**). The maximum number of harbour porpoise that could be at possible risk of PTS from SEL_{cum} during piling, without any mitigation, could be up to 51 individuals (0.08% of the CIS MU) based on the highest density rate of 0.918/km^2 over the summer, which is be the worst-case (**Table 7.9**). In all cases, less than 0.1% of the population may be at risk of the potential effect, and therefore there would not be a significant effect on the harbour porpoise population.

341. As outlined in **Section 7.1.1**, a MMMP for piling in accordance with the **Appendix 12.C: Draft MMMP** of the Offshore ES will be produced post-consent in consultation with the MMO and relevant SNCBs, and will be based on the latest scientific understanding and guidance, as well as detailed project design. The implementation of the agreed mitigation measures within the MMMP for piling will reduce the risk of PTS from the first strike of the soft-start, single strike of the maximum hammer energy and cumulative exposure. The MMMP for piling will be developed post-consent in consultation with the MMO and other relevant organisations (including Natural England) and will be based on the latest information, scientific understanding, and guidance, as well as detailed project design.

342. Mitigation to reduce the risk of PTS from cumulative exposure during installation of monopile would include mitigation for the maximum potential impact range (up to 4.6km for harbour porpoise; **Table 7.8**). Mitigation measures would include the activation of ADDs prior to the soft-start (62 minutes prior to start of OSP jacket piling, or up to 31 minutes prior to the start of mooring pin pile piling), which would ensure harbour porpoise were outside of the PTS cumulative effect ranges prior to piling.

343. Development of the MMMP (in accordance with the **Appendix 12.C: Draft MMMP** of the Offshore ES) prior to construction will also consider other mitigation methods based on the latest information and requirements.

344. The effective implementation of the MMMP for piling will reduce the risk of PTS to harbour porpoise during piling at the Windfarm Site. Therefore, there would be **no AEoI of the Bristol Channel Approaches SAC in relation to the conservation objectives for harbour porpoise, due to PTS from piling during construction**.

Table 7.9 Maximum Number of Harbour Porpoise (and % of Reference Population) That Could be at Risk of PTS for OSP Jacket Pile or Mooring Pin Pile Installation Without Mitigation, Based on Worst-Case

Species	**Criteria and Threshold (Southall *et al.*, 2019)**	**Jacket OSP Pile with Maximum Hammer Energy of 2,500kJ** **Maximum Number of Individuals (% of Reference Population)**	**Mooring Pin Pile with Maximum Hammer Energy of 800kJ** **Maximum Number of Individuals (% of Reference Population)**
Single strike at maximum energy without mitigation			
Harbour porpoise (VHF)	SPL_{peak} Unweighted (202 dB re 1μPa) Impulsive	0.92 (0.0015% of CIS MU based on the APEM summer density estimate) 0.59 (0.001% of CIS MU based on the APEM annual density estimate)	0.19 (0.0003% of CIS MU based on the APEM summer density estimate) 0.13 (0.0002% of CIS MU based on the APEM annual density estimate)
PTS from cumulative exposure without mitigation			
Harbour porpoise (VHF)	SPL_{cum} Weighted (155 dB re 1μPa^{2}s) Impulsive	50.5 (0.08% of CIS MU based on the APEM summer density estimate) 32.7 (0.05% of CIS MU based on the APEM annual density estimate)	11.0 (0.011% of CIS MU based on the APEM summer density estimate) 7.1 (0.018% of CIS MU based on the APEM annual density estimate)

7.2.1.2.1.2 Potential for Disturbance Resulting from Underwater Noise During Impact Piling

345. A review of the potential for effect to harbour porpoise due to piling activities is provided in **Section 12.7.1.3.3.1** of the **Chapter 12 Marine Mammal and Marine Turtle Ecology** of the Offshore ES.

Spatial Assessment

346. The SNCBs currently recommend that an EDR of 15km for pin-piles (with or without mitigation), which includes both the OSP jacket piles and the mooring pin piles, is used to assess harbour porpoise disturbance in all SACs designated, including the Bristol Channel Approaches SAC (JNCC *et al.*, 2020). This equates to an area of effect of 707km^2.

347. As outlined above, at the closest point the Windfarm Site is 1.5km for the Bristol Channel Approaches SAC winter area (**Table 7.4**). Therefore, for a 15km EDR based on the closest point as a worst-case, there is the potential for direct overlap with the Bristol Channel Approaches SAC.

348. Due to the distance between the closest potential point of piling (1.5km) to the Bristol Channel Approaches SAC, the potential overlap area for either OSP jacket piling, or mooring pin piling, is 305.84km^2. This accounts for one piling event. As noted in **Chapter 12: Marine Mammal and Marine Turtle Ecology** of the Offshore ES, there is the potential for either up to four jacket pin piles, or up to eight mooring pin piles, to be installed in any one day. Therefore, the potential spatial overlap of the 15km EDR within the Bristol Channel Approaches SAC must take this into account.

349. Overall, the maximum potential overlap of up to four OSP jacket pin piles is 421.98km^2, and the maximum potential overlap of up to eight mooring pin piles is 426.68km^2. These maximum overlap areas are shown on **Figure 7.3** for a single pile in one day, for up to four piles on one day and for up to eight piles in one day. Due to the distance between the piles, and to the Bristol Channel Approaches SAC, there is significant overlap in each of the potential areas for disturbance from each pile.

350. Disturbance of harbour porpoise would not exceed 20% (7.21%) of the seasonal component of the Bristol Channel Approaches SAC winter area on any given day during piling at the Windfarm Site, based on the worst-case scenario (**Table 7.10**). Therefore, under these circumstances, there would be **no AEoI of the Bristol Channel Approaches SAC in relation to the conservation objectives for harbour porpoise, due to disturbance from piling during construction**.

Table 7.10 Maximum Potential Overlap with the Bristol Channel Approaches SAC Winter Area Based on 15km EDR at Closest Point for the Windfarm Site

Piling Scenario for One Day	Maximum Area of Overlap with Bristol Channel Approaches SAC Winter Area (% of Bristol Channel Approaches SAC Winter Area)	Potential Adverse Effect on Site Integrity
One OSP jacket pile or one mooring pin-pile	305.84km^2 (5.23%)	**No** Temporary effect. Displacement of harbour porpoise would not exceed 20% of the seasonal component of the Bristol Channel Approaches SAC area on any given day during piling at the Windfarm Site, based on the worst-case scenario.
Four OSP jacket piles or four mooring pin piles	421.98km^2 (7.21%)	
Eight mooring pin piles	426.68km^2 (7.29%)	

351. Mitigation to reduce the risk of PTS could include activation of ADDs prior to the soft-start commencing. Based on the worst-case of ADD activation of 62 minutes, would disturb harbour porpoise over 5.58km. Therefore, there would be a maximum 31.37km^2 of overlap with the Bristol Channel Approaches SAC winter area (or 0.54% of the Bristol Channel Approaches SAC), based on the closest distance. This disturbance area would be within the disturbance due to piling, and therefore would not be an additive effect to harbour porpoise.

Seasonal Average

352. The active piling duration could be up to 4.5 days hours for mooring piling time and one day for OSP piling (**Table 7.3**). If four OSP jacket piles, the OSP could be installed in one day. If eight mooring pin piles are installed in one day, all WTG moorings could be installed in six days. As a precautionary approach, assessments are also based on up to four days of OSP jacket piling, assuming one day per pile installation, and up to 48 days for mooring pin pile installation (assuming one day per mooring pin pile installation), plus two days recovery.

353. The average has been calculated by taking into account the maximum potential overlap with Bristol Channel Approaches SAC winter area (**Table 7.10**) on any one day by the estimated maximum number of days within the season on which piling could occur (**Table 7.11**). The winter season covers a period of 182 days (October-March).

Figure 7.3 Potential overlap from piling with the Bristol Channel Approaches SAC

Table 7.11 Estimated Seasonal Average for Bristol Channel Approaches SAC Winter Area Based on 15km EDR at the Closest Point for the Windfarm Site

Piling Scenario	Number of Disturbance Days Per Season	Maximum Seasonal Average for Bristol Channel Approaches SAC Area	Potential Adverse Effect on Site Integrity
One OSP jacket pile or one mooring pin-pile installed per day, plus 2 days recovery	54 days	1.55%	**No** Temporary effect. Displacement of harbour porpoise would not exceed 10% of the seasonal component of the Bristol Channel Approaches SAC over the duration of the winter season, based on the worst-case scenario.
Four OSP jacket piles per day, and eight mooring pin piles per day, plus 2 days recovery	9 days (1 day for OSP jacket piles, and 6 days of mooring pin piles, plus 2 days recovery)	0.36%	

354. The seasonal averages have been based on the precautionary approach that all piling and related disturbance could occur in a single season.

355. The assessment indicates that less than 10% (1.55%) of the seasonal component of the Bristol Channel Approaches SAC over the duration of that season could be affected during piling at the Windfarm Site, based on the worst-case scenario (**Table 7.11**). Therefore, under these circumstances, there would be **no AEoI of the Bristol Channel Approaches SAC in relation to the conservation objectives for harbour porpoise, due to disturbance from piling during construction**.

Assessment in Relation to the Celtic and Irish Sea MU

356. **Table 7.12** presents the assessments for the maximum number of harbour porpoise that could be disturbed in the CIS MU.

357. As a worst-case scenario, the number of harbour porpoise that could be disturbed from the area around the Windfarm Site, during a single piling event, has been estimated based on the disturbance area based on a 15km EDR (706.9km^2) and the APEM summer density estimate of 0.918/km^2 and APEM annual density estimate of 0.594/km^2.

358. For the assessment against the CIS MU, the potential for disturbance is against all harbour porpoise within the disturbance area, rather than just those within the Bristol Channel Approaches SAC, and therefore the potential overlap areas with the

Bristol Channel Approaches SAC do not need to be taken into account, and the full disturbance areas based in the relevant EDRs are used to inform the assessment.

359. The assessment indicates that 1.1% or less of the CIS MU reference population could be temporarily displaced during piling, based on the worst-case scenario (**Table 7.12**). The temporary disturbance of 5% or less of the CIS MU population would not result in any significant population effects or result in any changes to the FCS of harbour porpoise (JNCC *et al*., 2010).

Table 7.12 Maximum Number of Harbour Porpoise Potentially Disturbed Based on 15km EDR for Piling

Species	Piling Scenario	Maximum Number of Individuals (% of Reference Population)	Potential Adverse Effect on Site Integrity
Harbour porpoise	One OSP jacket pile or one mooring pin-pile (706.9km^2)	648.9 (1.04% of CIS MU based on the APEM summer density estimate) 419.9 (0.67% of CIS MU based on the APEM annual density estimate)	**No** Temporary effect. 1.1% or less of the reference population could be temporarily displaced during piling, based on the worst-case scenario.

360. Mitigation to reduce the risk of PTS could include activation of ADDs prior to the soft-start commencing. Based on the worst-case of ADD activation of 62 minutes, this would disturb harbour porpoise over 5.58km. Up to 89.8 (0.14% of the CIS MU) could be disturbed due to ADD activation of 62 minutes for OSP jacket piles.

361. JNCC *et al.* (2010) draft guidance considered 4% as the maximum potential growth rate in harbour porpoise, and the 'default' rate for cetaceans. Therefore, beyond natural mortality, up to 4% of the population could theoretically be permanently removed before population growth could be halted. Based on this and as a precautionary approach, temporary impacts that could affect 5% or less of the population are not considered to have the potential to have long term significant impacts on the population. In assigning 5% to a temporary impact in this assessment, consideration is given to uncertainty of the individual consequences of temporary disturbance.

362. Therefore, under these circumstances, there would be **no AEoI of the Bristol Channel Approaches SAC in relation to the conservation objectives for harbour porpoise, due to disturbance from piling during construction**.

7.2.1.2.2 Auditory Injury and Disturbance Resulting from Underwater Noise During UXO Clearance

363. Prior to construction, there is the potential for UXO clearance to be required. While any identified UXO will either be avoided or removed and disposed of onshore in a designated place, there is the potential that underwater detonation could be required where it is necessary and unsafe to remove the UXO.

364. In order to undertake any UXO clearance, a marine licence is required from the MMO under the Marine and Coastal Access Act 2009. In addition, the clearance of UXO by detonation will require an EPS Licence under the Conservation of Offshore Marine Habitats and Species Regulations 2017.

365. The following assessment has been provided for information purposes only.

366. A separate Marine Licence application will be submitted when a detailed UXO survey has been completed prior to construction and a detailed assessment based on the latest available information has been undertaken.

367. The precise details and locations of potential UXO are unknown at this time. For the purposes of the underwater noise modelling and this assessment, five UXO clearance scenarios have been considered:

- High-order detonation, unmitigated
- High-order detonation, with bubble curtain
- Low-order clearance (e.g., deflagration).

368. For further information on the three UXO clearance scenarios, see **Appendix 12.A: Marine Mammal and Marine Turtle Underwater Noise Report** of the Offshore ES.

7.2.1.2.2.1 Potential for Permanent Auditory Injury (PTS) During UXO Clearance

369. The maximum effect ranges (and areas) are used to inform the assessments. The results of the underwater noise modelling for PTS in harbour porpoise are presented in **Table 7.13** for both low-order and high order clearances. The number of individuals at risk for the worst-case scenario and low-order clearance are also shown in **Table 7.13** for PTS, based on the APEM (2022) survey summer results.

370. For high-order clearance, there is the potential for PTS at up to 11.0km from the UXO clearance location, and for low-order clearance, there is the potential for PTS to occur at up to 0.61km from the UXO clearance location. At the closest point the Windfarm Site is 1.5km from the Bristol Channel Approaches SAC winter area, and the export cable corridors overlaps the winter area. Therefore, there is a direct

overlap with both the Windfarm Site and export cable corridor for PTS effects to harbour porpoise for high-order clearance (**Table 7.4**).

371. The maximum number of harbour porpoise that could be at possible risk of PTS (SPL_{peak}) during high-order UXO clearance, without any mitigation, could be up to 349 individuals (0.56% of the CIS MU) (**Table 7.9**). The maximum number of harbour porpoise that could be at possible risk of PTS due to low-order clearance is up to 11 individuals (0.017% of the CIS MU) based on the highest density rate of 0.918/km^2 over the summer, which is the worst-case (**Table 7.9**).

372. A MMMP for UXO clearance will be produced as part of the UXO Marine Licence application process. The implementation of the agreed mitigation measures within the MMMP for UXO clearance will reduce the risk of PTS from all UXO clearance options. The MMMP will be based on the latest information, scientific understanding and guidance, as well as detailed project design.

373. Mitigation to reduce the risk of instantaneous PTS from UXO clearance would include activation of ADDs prior to a UXO clearance. For a maximum PTS effect range of 11km for a high-order clearance (**Table 7.13**), and based on the swimming speed of harbour porpoise mother calf pairs at 1.5m/s (Otani *et al.,* 2000), the ADDs would be activated for 123 minutes. This should allow enough time for harbour porpoise to move beyond the maximum predicted impact range (up to a distance of 11.07km for 123 minute ADD activation).

374. It is likely that a limit of 80 minutes for ADD activation will be in place prior to all UXO clearance, to ensure there is no significant disturbance to marine mammals from the ADD itself. Therefore, if a UXO of the maximum charge weight (of 309kg NEQ) was required to be cleared, it would require clearance either by low-order methods, or using other methods of underwater noise reduction in the case that low-order clearance is not possible[7].

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[7] An ADD activation period of 80 minutes would allow harbour porpoise to flee to 7.2km from the UXO location, which is further than the modelled PTS ranges for UXO of up to 67.8kg (NEQ), therefore, any device of or below 67.8kg could be cleared using high-order, with ADDs.

Table 7.13 Maximum Number of Harbour Porpoise Potentially at Risk of PTS During UXO Clearance

Species	Maximum Effect Range (and Area)	Maximum Number of Individuals	% of Reference Population	Potential Adverse Effect on Site Integrity
PTS during UXO clearance				
Harbour porpoise	High-order detonation (309kg (NEQ) + donor charge) 11.0km (380.13km^2)	349.0 based on the APEM summer density estimate 225.8 based on the APEM annual density estimate	0.56% of the CIS MU, based on the APEM summer density estimate 0.36% of the CIS MU, based on the APEM annual density estimate	**No** Permanent effect. 0.6% or less of the reference population could be at risk of permanent auditory injury (PTS) during UXO, based on the worst-case scenario.
	Low-order clearance (2kg (NEQ)) 1.90km (11.34km^2)	10.4 based on the APEM summer density estimate 6.7 based on the APEM annual density estimate	0.017% of the CIS MU, based on the APEM summer density estimate 0.011% of the CIS MU, based on the APEM annual density estimate	

375. At present, it is not known what size of UXO (if any) will be required to be cleared, and it is possible that a device as large as the worst-case assessed will not be present. The final decision on mitigation options and clearance methods for UXO will be determined at the point of Marine Licence application, once further information on the type, size, and location of devices is known.

376. In all cases, less than 0.6% of the population may be at risk of the potential effect, and therefore there would not be a significant effect on the harbour porpoise population. There would therefore be **no AEoI of the Bristol Channel Approaches SAC in relation to the conservation objectives for harbour porpoise, due to PTS from UXO clearance during construction**.

7.2.1.2.2.2 Potential for Disturbance Resulting from Underwater Noise During UXO Clearance

Spatial Assessment

377. The SNCBs currently recommend that an EDR of 26km for high-order UXO clearance be used to assess harbour porpoise disturbance in all SACs designated, including the Bristol Channel Approaches SAC (JNCC *et al.*, 2020). This equates to a total area of effect of 2,123.7km^2. A 5km EDR is also used to assess the potential disturbance for disturbance from low-order clearance, with an effect area of 78.5km^2.

378. As outlined above, at the closest point the Windfarm Site is 1.5km for the Bristol Channel Approaches SAC winter area, and the export cable corridor runs through the Bristol Channel Approaches SAC. Therefore, for a 26km EDR based on the closest point as a worst-case, there is the potential for direct overlap with the Bristol Channel Approaches SAC.

379. The potential disturbance areas within the Bristol Channel Approaches SAC, due to either high-order or low-order UXO clearance, within either the Windfarm Site or the export cable corridor are shown in **Table 7.14** below. If high-order clearance in the export cable corridor was to take place the maximum area it could overlap is up to 35.8%, whereas the low-order techniques this would be 1.3% or below.

380. As provided in **Table 7.14**, there is the potential for significant levels of disturbance within the Bristol Channel Approaches SAC (i.e. a breach of the spatial 20% threshold) due to a high-order UXO clearance within the export cable corridor, if it took place within the winter season (October to March). Therefore, high-order clearance will not take place within the export cable corridor, during the winter period. In order to ensure the 20% spatial threshold is not breached due to a high-order UXO clearance within the Windfarm Site, only one high-order clearance would take place in the Windfarm Site, during the winter period. While UXO clearance is

not currently being applied for, the following measures are expected to be required in order to ensure no significant disturbance to harbour porpoise within the Bristol Channel Approaches SAC:

- In the winter period (October to March), the Project will not:
- Undertake any high-order UXO clearance within the export cable corridor
- Undertake more than one high-order UXO clearance outside of the boundary of the Bristol Channel Approaches SAC, in any one day.

381. Taking into account the expected commitments as outlined above, disturbance of harbour porpoise would not exceed 20% (14.8%) of the seasonal component of the Bristol Channel Approaches SAC winter area on any given day during piling at the Windfarm Site, based on the worst-case scenario (**Table 7.14**). Therefore, under these circumstances, there would be **no AEoI of the Bristol Channel Approaches SAC in relation to the conservation objectives for harbour porpoise, due to disturbance from piling during construction**.

Table 7.14 Maximum Potential Overlap with the Bristol Channel Approaches SAC Winter Area Based on 26km (High-Order) or 5km EDR (Low-Order) at Closest Point for the Windfarm Site and Export Cable Corridor

UXO Scenario	Maximum Area of Overlap with Bristol Channel Approaches SAC Winter Area (% of Bristol Channel Approaches SAC Winter Area)	Management Measure	Potential Adverse Effect on Site Integrity
High-order UXO clearance in the export cable corridor	2,093.7m^2 (35.8%)	No high-order clearance within the export cable corridor will take place within the winter period.	**No** Temporary effect. Displacement of harbour porpoise would not exceed 20% of the seasonal component of the Bristol Channel Approaches SAC area on any given day during UXO clearance, based on the worst-case scenario.
High-order UXO clearance in the Windfarm Site	868.8km^2 (14.8%)	One high-order UXO clearance per day within the winter period.	
Low-order UXO clearance in the export cable corridor	78.5km^2 (1.3%)	None required.	
Low-order UXO clearance in the Windfarm Site	25.3km^2 (0.4%)		

382. As noted above, mitigation to reduce the risk of PTS due to UXO clearance could include activation of ADDs. Based on the worst-case of ADD activation of 123 minutes for high-order clearance, ADDs would disturb harbour porpoise over 11.07km. For ADD activation of 80 minutes, harbour porpoise could be disturbed up to 7.2km.

383. Therefore, for 123 minutes of ADD activation, there would be a maximum 384.99km^2 of overlap with the Bristol Channel Approaches SAC winter area (or 6.6% of the Bristol Channel Approaches SAC). For 80 minutes of ADD activation, there would be a maximum of 162.86km^2 of overlap with the Bristol Channel Approaches SAC winter area (or 2.8% of the Bristol Channel Approaches SAC), based on a UXO within the export cable corridor (and therefore within the Bristol Channel Approaches SAC) as a worst-case.

384. For low-order clearance, there is the potential for an ADD to be activated for up to 22 minutes prior to detonation. This would result in a potential disturbance range of 1.98km (or an area of 12.32km^2 within the Bristol Channel Approaches SAC (0.21% of the winter area)).

385. For both high-order and low-order, the disturbance area due to ADD activation would be within the disturbance due to UXO clearance, and therefore would not be an additive effect to harbour porpoise over what has been assessed for UXO clearance above.

Seasonal Average

386. It is not currently known how many UXO would need to be cleared, or therefore how long (or how many days) it would take to clear all UXO for the Project It has therefore been assumed that there could be 20 UXO to be cleared on a precautionary basis, and in order to inform this early assessment. It is also not known whether this would be done by high-order or low-order. However, it has been assumed that most (95%) would be cleared by low-order, and that some (5%) may require high-order clearance. The final assessment provided with the UXO clearance Marine Licence application will provide data on the number (and number of days) that will be cleared. The following assessment is based on the assumptions as provided above, in order to indicate an approximated worst-case assessment. An application for a Marine Licence for UXO clearance will be submitted at a later date. As for the assessment for piling, two days recovery have also been included in the number of activity days.

387. The average seasonal overlap has been calculated by taking into account the maximum potential overlap with Bristol Channel Approaches SAC winter area (**Table 7.14**) on any one day and the estimated maximum number of days within the season on which UXO clearance could occur (as a proportion of the whole season).

388. The seasonal averages have been based on the precautionary approach that all UXO clearance and related disturbance would occur in a single winter season.

389. The assessment indicates, less than 10% (0.24%) of the seasonal component of the Bristol Channel Approaches SAC over the duration of that season could be affected during UXO clearance at the Windfarm Site or within the export cable corridor, based on the worst-case scenario (**Table 7.15**). Therefore, under these circumstances, there would be **no AEoI of the Bristol Channel Approaches SAC in relation to the conservation objectives for harbour porpoise, due to disturbance from piling during construction**.

Table 7.15 Estimated Seasonal Average for Bristol Channel Approaches SAC Winter Area for UXO Clearance in the Export Cable Corridor or Windfarm Site

UXO Scenario	Number of Disturbance Days Per Season[8]	Maximum Seasonal Average for Bristol Channel Approaches SAC Area	Potential Adverse Effect on Site Integrity
Up to 2 high-order UXO clearance in the Windfarm Site[9], plus 1 day recovery	3 days	0.24%	**No** Temporary effect. Displacement of harbour porpoise would not exceed 10% of the seasonal component of the Bristol Channel Approaches SAC over the duration of the winter season, based on the worst-case scenario
Up to 18 low-order clearance in the export cable corridor, plus 1 day recovery, or **Up to 18 low-order clearance in the Windfarm Site, plus 1 day recovery**	19 days	0.14% (for low-order clearance in the export cable corridor) Or 0.04% (for low-order clearance in the Windfarm Site)	

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[8] Assuming one UXO clearance per day.

[9] As noted in **Table 7.14**, high-order will not be undertaken within the export cable corridor within the winter period, and therefore the worst-case spatial overlap would be for high-order UXO clearance in the Windfarm Site.

Assessment in Relation to the Celtic and Irish Sea MU

390. **Table 7.16** presents the assessments for the maximum number of harbour porpoise that could be disturbed within the CIS MU.

Table 7.16 Maximum Number of Harbour Porpoise Potentially Disturbed During UXO Clearance

Species	Piling Scenario	Maximum Number of Individuals (% of Reference Population)	Potential Adverse Effect on Site Integrity
Harbour porpoise	One high-order clearance (2,123.7km^2)	1,949.6 (3.1% of CIS MU based on the APEM summer density estimate) 1,243.1 (2.0% of CIS MU based on the APEM annual density estimate)	**No** Temporary effect. 3.1% or less of the reference population could be temporarily displaced during UXO clearance, based on the worst-case scenario.
	One low-order clearance (78.5km^2)	72.1 (0.12% of CIS MU based on the APEM summer density estimate) 46.6 (0.07% of CIS MU based on the APEM annual density estimate)	

391. As a worst-case scenario, the number of harbour porpoise that could be disturbed from the area around the Windfarm Site has been estimated. The number of individuals has been based on the disturbance areas from a 26km EDR for high-order clearance (2,123.7km^2), and a 5km EDR for low-order clearance (78.5km^2), and the APEM summer density estimate of 0.918/km^2 and APEM annual density estimate of 0.594/km^2. For the assessment against the CIS MU, the potential for disturbance is against all harbour porpoise within the disturbance area, rather than just those within the Bristol Channel Approaches SAC. Therefore, the potential overlap areas with the Bristol Channel Approaches SAC and the potential disturbance areas from UXO clearance do not need to be taken into account, and the full disturbance areas based in the relevant EDRs are used to inform the assessment.

392. The assessment indicates that 3.1% or less of the CIS MU reference population (**Table 7.16**) could be temporarily displaced during UXO clearance, based on the worst-case scenario of high-order clearance. The temporary disturbance of 5% or less of the CIS MU population would not result in any significant population effects or result in any changes to the FCS of harbour porpoise (JNCC *et al.*, 2010). Note that high-order clearance would only be undertaken in the event that low-order clearance is not possible, and therefore it is expected that the majority of UXO

clearances (under the low-order method) would result in up to 0.12% of the CIS MU being disturbed.

393. Therefore, under these circumstances, there would be **no AEoI of the Bristol Channel Approaches SAC in relation to the conservation objectives for harbour porpoise, due to disturbance from UXO clearance**.

7.2.1.2.3 Auditory Injury and Disturbance Resulting from Underwater Noise During Other Construction Activities

394. Potential sources of underwater noise during construction activities, other than piling, include backhoe dredging, suction dredging, drag embedment anchors, suction piling, rock placement, trenching and cable installation.

395. A review of the potential underwater noise levels associated with these activities is provided in **Section 12.7.3** of **Chapter 12: Marine Mammal and Marine Turtle Ecology** of the Offshore ES.

396. Underwater noise modelling was undertaken to assess the potential effect ranges of construction activities, other than piling, on harbour porpoise. This has been used to determine the potential area of effect for permanent auditory injury (PTS) (for further information see **Chapter 12: Marine Mammal and Marine Turtle Ecology** and **Appendix 12.A: Marine Mammal and Marine Turtle Underwater Noise Report** of the Offshore ES).

397. For SEL_{cum} calculations, the duration of noise is also considered, with all sources operating for a worst-case of 12 hours in any given 24-hour period for non-impulsive noise.

7.2.1.2.3.1 Potential for Permanent Auditory Injury (PTS) During Other Construction Activities

398. To account for the weightings required for modelling using the Southall *et al.* (2019) criteria, reductions in source level have been applied to the various noise sources (see **Appendix 12.A: Marine Mammal and Marine Turtle Underwater Noise Report** of the Offshore ES for further information).

399. The cumulative PTS (SEL_{cum}) impact ranges are to the nearest 10m. The results of the underwater noise modelling indicate that harbour porpoise would have to be less than 10m (precautionary maximum range, likely to be less than 10m) from the continuous noise source for 12 hours, to be exposed to noise levels that could induce PTS based on the Southall *et al.* (2019) non-impulsive thresholds and criteria for SEL_{cum}.

400. While there is the potential that more than one of these activities could be underway at either site or the export cable corridor area at the same time, given the very localised effect area and that harbour porpoise would have to be within 10m of the source for 12 hours, it is considered highly unlikely that harbour porpoise would be at risk of PTS, and there would be **no AEoI of the Bristol Channel Approaches SAC in relation to the conservation objectives for harbour porpoise, due to PTS from construction activities (other than piling)**.

7.2.1.2.3.2 Potential for Disturbance Resulting from Underwater Noise During Other Construction Activities

401. The maximum duration for the offshore construction period is up to 16 months. However, construction activities would not be underway constantly throughout this period. The duration of offshore export cable installation and trenching activities is expected to take place over a two to six month period and take a total of 91 days per construction year.

402. The potential effects that could result from underwater noise during other construction activities, including cable laying and protection would be temporary in nature, not consistent throughout the offshore construction periods and would be limited to only part of the overall construction period and area at any one time.

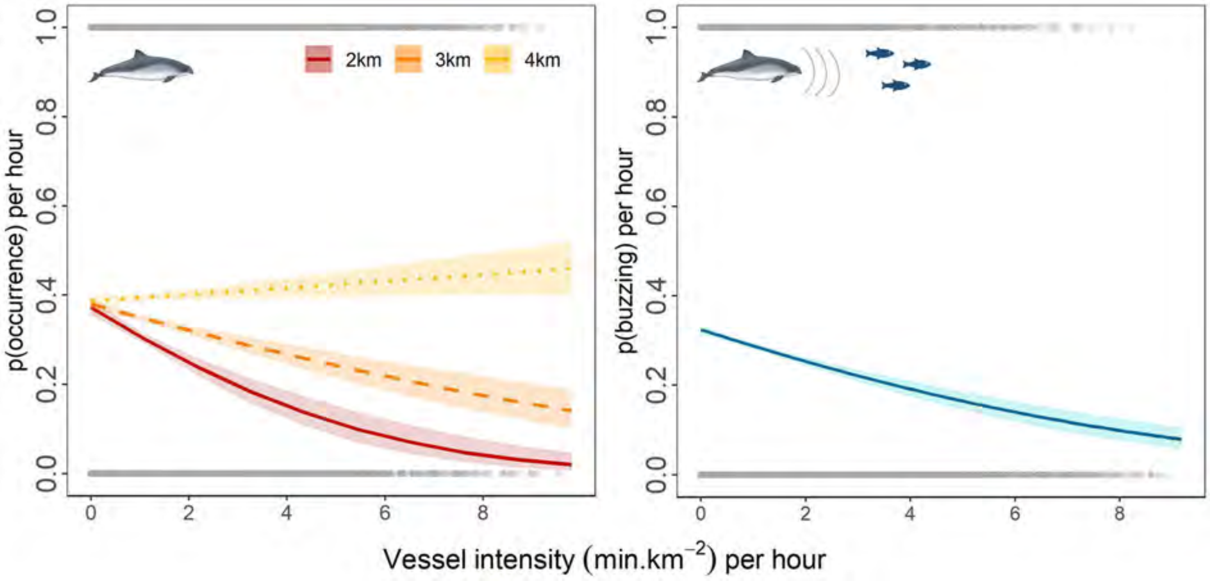
403. If the behavioural response is displacement from the area, it is predicted that harbour porpoise will return once the activity has been completed and any impacts from underwater noise as a result of construction activities other than piling noise will be both localised and temporary. Therefore, there is unlikely to be the potential for any significant impact on harbour porpoise.

404. There is limited data on the potential for a behavioural response or disturbance from other construction activities (or other continuous noise sources).

405. Studies undertaken during the construction of two Scottish windfarms (Beatrice OWF and Moray East OWF) (Benhemma-Le Gall *et al.,* 2021), found that the probability of harbour porpoise being present increased with distance from the vessels and construction activities, and decreased with increasing vessel presence and background noise. During the period of turbine installation at Beatrice OWF, a significant reduction in harbour porpoise presence was detected even while no piling was taking place. Various construction activities were undertaken during this turbine installation phase, including jacket installation, turbine and cable installations, with some activities occurring simultaneously, which led to comparatively high levels of vessel traffic within the OWF site.

406. A reduction in porpoise presence was detected at up to 12km from pile driving, and up to 4km from construction related vessels (**Figure 7.4**; Benhemma-Le Gall *et al.,* 2021). With construction vessels at 2km from C-POD locations, harbour porpoise activity decreased by up to 35.2%, with construction vessels at 3km from the C-PODs, there was a decrease of up to 24%, and at 4km from construction vessels, there was an increase of 7.2%. Outside of the piling period, the study found that the presence of harbour porpoise decreased by 17% with SPLs of 57dB (above ambient noise). It was not possible to determine what activities were being undertaken by the construction vessels in order to determine what activity was causing this effect (Benhemma-Le Gall *et al.,* 2021).

Figure 7.4 [Left] The Probability of Harbour Porpoise Presence in Relation to Vessel Activity (Red = Mean Vessel Distance of 2km, Orange = Mean Vessel Distance of 3km, Yellow = Mean Vessel Distance of 4km, and [Right] the Probability of Buzzing Activity Per Hour in Relation to Vessel Activity (Benhemma-Le Gall et al., 2021)



407. While the study did not define which activities were taking place to cause the disturbance, it was while a number of construction vessels were on site (Benhemma-Le Gall *et al.,* 2021). Therefore, this reported 4km reduction in harbour porpoise presence has been used as a potential disturbance range for other construction activities in this assessment (with a potential disturbance area of 50.3km^2).

408. All related construction activities are considered to be a moving source, and therefore once the activity / vessel moves past a certain area, the marine mammals would return to baseline numbers.

409. As previously outlined, at the closest point, the Windfarm Site is 1.5km from the Bristol Channel Approaches SAC winter area, and the cable corridor overlaps (**Table 7.4**). Therefore, there is potential for direct overlap with the Bristol Channel Approaches SAC for underwater noise from other construction activities.

Spatial Assessment

410. The potential disturbance areas within the Bristol Channel Approaches SAC, due to construction activities other than piling, within either the Windfarm Site or the export cable corridor, are shown in **Table 7.17**. There is the potential that more than one of these activities could be underway at either the Windfarm Site or the export cable corridor area at the same time, and therefore an assessment for all activities (up to seven[10]) taking place at the same time has been undertaken as a worst-case. This assessment assumes that all activities would take place within the Bristol Channel Approaches SAC, with no overlap in disturbance areas, as a worst-case. This is considered to be highly precautionary as it is unlikely that all seven activities would be taking place at the same time.

Table 7.17 Maximum Potential Overlap with the Bristol Channel Approaches SAC Winter Area Based on 4km Disturbance Range for the Windfarm Site and Export Cable Corridor

Offshore Activity	Maximum Area of Overlap with Bristol Channel Approaches SAC Winter Area (% of Bristol Channel Approaches SAC Winter Area)	Potential Adverse Effect on Site Integrity
Offshore construction activity	50.3m^2 (0.86%)	**No** Temporary effect. Displacement of harbour porpoise would not exceed 20% of the seasonal component of the Bristol Channel Approaches SAC area on any given day during construction activities other than piling, based on the worst-case scenario.
Up to seven offshore construction activities on the same day	351.9km^2 (6.0%)	

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[10] Including backhoe dredging, suction dredging, drag embedment anchors, suction piling, rock placement, trenching and cable installation.

411. The potential disturbance of harbour porpoise due to other construction activities would not exceed 20% (6.0%) of the seasonal component of the Bristol Channel Approaches SAC winter area on any given day, based on the worst-case scenario of up to seven activities within the export cable corridor (**Table 7.17**). Therefore, under these circumstances, there would be **no AEoI of the Bristol Channel Approaches SAC in relation to the conservation objectives for harbour porpoise, due to disturbance from construction activities other than piling**.

Seasonal Average

412. As noted above, the offshore construction period is 16 months, although the exact timings and programmes of construction activity is not currently known. It is currently expected that the total number of offshore construction days would be 91 days per year (plus two recovery days). However, it is assumed that all these days would take place during the winter season (October to March) as a worst case. To allow for adverse weather in the winter season, it has been assumed that 15% of the season would be lost to bad weather, and therefore the total number of days where offshore construction could take place within the winter season is 107 (91 days of expected construction activity, plus 15% (n=14) additional days to account for adverse weather, and two recovery days) (BEIS, 2020).

413. The average seasonal overlap has been calculated by taking into account the maximum potential overlap with Bristol Channel Approaches SAC winter area (**Table 7.17**) on any one day and the estimated maximum number of days within the season on which offshore construction activity could take place.

414. The assessment indicates, less than 10% (3.5%) of the seasonal component of the Bristol Channel Approaches SAC over the duration of that season could be affected during UXO clearance at the Windfarm Site or within the export cable corridor, based on the worst-case scenario (**Table 7.18**). Therefore, under these circumstances, there would be **no AEoI of the Bristol Channel Approaches SAC in relation to the conservation objectives for harbour porpoise, due to disturbance from construction activities other than piling**.

Table 7.18 Estimated Seasonal Average for Bristol Channel Approaches SAC Winter Area for Offshore Construction at the Windfarm Site and Export Cable Corridor

Offshore Activity	Number of Disturbance Days Per Season	Maximum Seasonal Average for Bristol Channel Approaches SAC Area	Potential Adverse Effect on Site Integrity
Offshore construction activity on the same day	107 days	0.51%	**No** Temporary effect. Displacement of harbour porpoise would not exceed 10% of the seasonal component of the Bristol Channel Approaches SAC over the duration of the winter season, based on the worst-case scenario
Up to seven offshore construction activities on the same day	107 days	3.5%	

Assessment in Relation to the Celtic and Irish Sea MU

415. **Table 7.19** presents the assessments for the maximum number of harbour porpoise that could be disturbed in the CIS MU due to construction activities other than piling.

416. As a worst-case scenario, the number of harbour porpoise that could be disturbed from the area around the Windfarm Site has been estimated based on the disturbance areas as presented in **Table 7.19.** For either one activity at a time, or up to seven at the same time, and the APEM summer density estimate of 0.918/km^2 and APEM annual density estimate of 0.594/km^2. A maximum of 42 individuals for one construction activity and 323 individuals for up to seven activities could potentially be disturbed.

417. The assessment indicates that 0.52% or less of the CIS MU reference population (**Table 7.19**) could be temporarily displaced during other offshore construction activities, based on the worst-case scenario of up to seven activities taking place at the same time. The temporary disturbance of 5% or less of the CIS MU population would not result in any significant population effects or result in any changes to the FCS of harbour porpoise (JNCC *et al.*, 2010).

Table 7.19 Maximum Number of Harbour Porpoise Potentially Disturbed During Construction Activities Other Than Piling

Species	Construction Activity	Maximum Number of Individuals (% of Reference Population)	Potential Adverse Effect on Site Integrity
Harbour porpoise	One offshore construction activity (50.3km²)	46.1 (0.07% of CIS MU based on the APEM summer density estimate) 29.9 (0.05% of CIS MU based on the APEM annual density estimate)	**No** Temporary effect. 0.52% or less of the reference population could be temporarily displaced during construction activities other than piling, based on the worst-case scenario.
	Up to seven offshore construction activities (351.86km²)	323.0 (0.52% of CIS MU based on the APEM summer density estimate) 209.0 (0.33% of CIS MU based on the APEM annual density estimate)	

418. Therefore, under these circumstances, there would be **<u>no AEoI of the Bristol Channel Approaches SAC in relation to the conservation objectives for harbour porpoise, due to disturbance from construction activities other than piling</u>**.

7.2.1.2.4 Auditory Injury and Disturbance Resulting from Underwater Noise Due to Construction Vessels

419. During the construction phase there will be an increase in the number of vessels; this is estimated to be up to a total of five vessels at the Project including the export cable corridor area, at any one time (**Table 7.3**). The number, type and size of vessels will vary depending on the activities taking place.

420. As previously outlined, at the closest point, the Windfarm Site is 1.5km from the Bristol Channel Approaches SAC winter area and the offshore cable corridor overlaps (**Table 7.4**). Vessel movements to and from any port will be incorporated within existing vessel routes and therefore any increase in disturbance as a result of underwater noise from vessels during construction will be within the Windfarm Site and offshore cable corridors. Therefore, there is potential for direct overlap with the Bristol Channel Approaches SAC for underwater noise and the presence of vessels when cable laying.

421. A review of the potential underwater noise levels associated with vessels is provided in **Section 12.7.4.2** of **Chapter 12: Marine Mammal and Marine Turtle Ecology** of the Offshore ES.

422. Underwater noise modelling was undertaken to assess the potential effect ranges of vessels on harbour porpoise, and this has been used to determine the potential area of effect for permanent auditory injury (PTS) (for further information see **Chapter 12: Marine Mammal and Marine Turtle Ecology** and **Appendix 12.A: Marine Mammal and Marine Turtle Underwater Noise Report** of the Offshore ES).

423. For SEL_{cum} calculations, the duration of noise is also considered, with all sources operating for a worst-case of 24 hours in any given 24-hour period.

7.2.1.2.4.1 Potential for Permanent Auditory Injury (PTS) Due to Construction Vessels

424. To account for the weightings required for modelling using the Southall *et al.* (2019) criteria, reductions in source level have been applied to the various noise sources (see **Appendix 12.A: Marine Mammal and Marine Turtle Underwater Noise Report** of the Offshore ES for further information).

425. The cumulative PTS (SEL_{cum}) impact ranges are to the nearest 10m. The results of the underwater noise modelling indicate that harbour porpoise would have to be less than 10m (precautionary maximum range) from the vessel for 24 hours, to be exposed to noise levels that could induce PTS based on the Southall *et al.* (2019) thresholds and criteria.

426. While there is the potential that up to five vessels could be present at the Project at the same time, given the very localised effect area and that harbour porpoise would have to be within 10m of the source for 24 hours. It is considered highly unlikely that harbour porpoise would be at risk of PTS. As a result, there would be **no AEoI of the Bristol Channel Approaches SAC in relation to the conservation objectives for harbour porpoise, due to PTS from construction vessels**.

7.2.1.2.4.2 Potential for Disturbance Resulting from Underwater Noise from Construction Vessels

427. Disturbance from vessel noise could occur where increased noise from construction vessels associated the Project construction is greater than the background ambient noise.

428. Brandt *et al.* (2018) found that at seven German OWFs in the vicinity (up to 2km) of the construction site, harbour porpoise detections declined several hours before the start of piling as a result of increased construction related activities and vessels. Similarly, studies in the Moray Firth during piling of the Beatrice OWF, indicate higher vessel activity within 1km was associated with an increased probability of a behavioural response (such as changes in swimming speeds, depths of dive, echoloation activity, foraging activity) in harbour porpoise (Graham *et al.*, 2019).

429. Studies in the Moray Firth indicate that at a mean distance 2km from construction vessels, harbour porpoise occurrence decreased by up to 35.2% as vessel intensity increased. Wisniewska *et al*. (2018) recorded harbour porpoises responding to vessel noise by making deeper dives, increasing swimming effort and ceasing echolocation and foraging for several minutes. However, these responses decreased with increasing distance to vessels, out to 4km where no response was observed (Benhemma-Le Gall *et al*., 2021).

430. During the periods when piling is underway, vessel noise is unlikely to add an additional impact to those assessed for piling, as the vessels and vessel noise would be within the maximum impact areas assessed. The same would be true for any UXO clearance or other construction activity, with the potential for disturbance from those activities being the worst-case when compared to the potential for disturbance from construction vessels themselves. The distance at which animals may react to vessels is difficult to predict and behavioural responses can vary a great deal depending on species, location, type and size of vessel, vessel speed, noise levels and frequency, ambient noise levels and environmental conditions.

431. Modelling by Heinänen and Skov (2015), indicates that the number of ships represents a relatively important factor determining the density of harbour porpoise in the CIS MU during both seasons, with markedly lower densities with increasing levels of traffic. A threshold level in terms of impact seems to be approximately 20,000 ships per year (approximately 80 vessels per day within a 5km^2 area).

432. Taking into account the maximum number of vessels that could be onsite during construction, the site area and the displacement of other vessels from the area, the number of vessels would not exceed the Heinänen and Skov (2015) threshold level of 80 vessels per day in a 5km^2 area for harbour porpoise.

433. For example, five vessels at the Windfarm Site (49.3km^2) would equate to less than 0.11 vessels per km^2 (approximately one vessel per 9km^2). In addition, due to safety and logistical considerations during piling, it is likely that the number of vessels in a small area, for example, around a pile location during pile installation, would be limited to a very low number of essential vessels only.

434. The maximum duration for the offshore construction period, including piling and export cable installation, is up to 16 months. Therefore, it is assumed that construction vessels could be at the offshore site for up to 16 months.

435. If the behavioural response is displacement from the area, it is predicted that harbour porpoise will return once the activity has been completed and any impacts from underwater noise as a result of construction vessels will be both localised and

temporary. Therefore, there is unlikely to be the potential for any significant disturbance of harbour porpoise, and there would be **<u>no AEoI of the Bristol Channel Approaches SAC in relation to the conservation objectives for harbour porpoise due to disturbance from construction vessels</u>**.

7.2.1.2.5 Barrier Effects as a Result of Underwater Noise

436. Underwater noise during construction could have the potential to create a barrier effect, preventing movement of harbour porpoise between important feeding and / or breeding areas, or potentially increase swimming distances if harbour porpoise avoid the area and go around it. However, the Project, including the export cable corridor, are not located on any known migration routes for harbour porpoise.

437. The greatest potential barrier effect for harbour porpoise could be from underwater noise during piling. However, piling would not be constant during the piling phases and construction periods. There will be gaps between the installations of individual piles, and if installed in groups there could be time periods when piling is not taking place as piles are brought out to the site. There will also be potential delays for weather or other technical issues.

438. Harbour porpoise are wide ranging. Therefore, if there are any potential temporary barrier effects from underwater noise during construction, harbour porpoise would be able to compensate by travelling to other foraging areas within their range. There is unlikely to be any significant long-term impacts from any barrier effects, as any areas affected would be relatively small in comparison to the range of harbour porpoise and would not be continuous throughout the offshore construction period.

439. The worst-case scenario in relation to barrier effects as a result of underwater noise is based on the maximum spatial and temporal (i.e. largest area and longest duration) scenarios.

440. The maximum duration of any barrier effects would be for the maximum piling duration, based on worst-case scenarios, including soft-start, ramp-up and ADD activation. The maximum duration of piling, based on worst case scenarios, including soft-start, ramp-up and ADD activation would be (see **Section 12.7.1.3.3.7** of **Chapter 12: Marine Mammal and Marine Turtle Ecology** of the Offshore ES for further detail):

- Piling of up to 48 mooring pin piles (including soft-start, ramp-up and 31 minute ADD activation) = up to 131 hours (up to 5.5 days)
- Piling of up to four OSP jacket piles (including soft-start, ramp-up and 62 minute ADD activation) = up to 23 hours (0.95 days).

441. There is unlikely to be the potential for any barrier effects from underwater noise for other construction activities and vessels, as it is predicted that harbour porpoise will return once the activity has been completed, and therefore any impacts from underwater noise as a result of construction activities other than piling noise will be both localised and temporary. Therefore, there is unlikely to be the potential for any barrier effects that could significantly restrict the movements of harbour porpoise.

442. The spatial worst-case is the maximum area over which potential disturbance could occur at any one time. This would be the potential disturbance of harbour porpoise based on a 15km EDR for a single jacket pile installation. The Windfarm Site is located 52km from the coast. Therefore, with the exception of very nearshore activities, any other construction activities, including vessels, in the export cable corridor would be within the 15km EDR.

443. As outlined above, at the closest point, the Windfarm Site is 1.5km from the Bristol Channel Approaches SAC winter area (disturbance to due to piling (based on the 15km EDR) has a maximum overlap of 463.51km^2 (7.9%; **Table 7.10**)). The Windfarm Site has an area of 49.35km^2, with an Offshore Export Cable Corridor area of approximately 94.94km^2. Therefore, the 463.51km^2 area would cover the Windfarm Site plus the export cable corridor area. As a result, there would be no additional disturbance of harbour porpoise from construction noise sources in addition to the 15km EDR. This would include ADD activation which would also be within the 15km EDR.

444. There would therefore be no significant barrier effects to harbour porpoise during construction and <u>**no AEoI of the Bristol Channel Approaches SAC in relation to the conservation objectives for harbour porpoise due to barrier effects from underwater noise during construction**</u>.

445. A SIP for the Bristol Channel Approaches SAC will be developed to set out the approach to deliver any project mitigation or management measures in relation to the significant disturbance of harbour porpoise (**Section 7.1.1.2**). Any measures to reduce the potential significant disturbance of harbour porpoise would also reduce the potential for any barrier effects as a result of underwater noise.

7.2.1.2.6 Interactions and Collision Risk with Vessels

446. During the offshore construction phase there will be an increase in vessel traffic within and on transit to the offshore sites. However, it is anticipated that vessels would follow an established shipping route to the relevant ports in order to minimise vessel traffic in the wider area. The **Appendix 12.C: Draft MMMP** of the Offshore

ES will provide details on vessel good practice and code of conduct that will be implemented to avoid marine mammal collisions.

447. The approximate number of vessels on site at any one time during construction is estimated to be five vessels, with an average of approximately six trips per month. This will result in a daily average of approximately 0.2 vessel movements, based on 101 vessel movements over a 16 month offshore construction period.

448. The baseline conditions indicate an already relatively high level of shipping activity in and around the offshore sites. Shipping and navigation data indicate ten existing main routes within the study area, with three routes overlapping the Windfarm Site. The number of vessels on these main vessel routes could be up to 80 vessels per month (three per day) intersecting the Windfarm Site and up to 650 vessels per month (22 per day) intersecting the offshore cable corridor (see **Chapter 15: Shipping and Navigation** of the Offshore ES).

449. As described within the **Appendix 15.A: Navigational Risk Assessment** of the Offshore ES there is an existing relatively high level of vessel traffic within the navigational study area (offshore study area plus 10km buffer), including areas close to the coastline. Vessel traffic analysis undertaken for April 2021 to March 2022 showed a total of between 20 and 80 vessel transits through the Windfarm Site, and between 250 and 500 vessels transited through the Study Area, per month (or up to nine and up to 17 vessel transits per day, respectively). Within the ECC, there were up to 600 vessel transits per month in the summer period (or 20 vessel transits per day), which was significantly more than during the winter period, with less than 350 transits per month (or up to 12 vessel transits per day).

450. With a peak of five vessels (or up to ten vessel transits) expected to be on site at any one time during the construction period, there will be an approximately 56% increase in the daily vessel presence within the Study Area, as a worst-case, and approximately a 25% increase or 42% of the ECC vessel presence during the summer and winter periods respectively.

451. Harbour porpoise are small and highly mobile and given their responses to vessel noise (e.g. Thomsen *et al.,* 2006; Evans *et al.,* 1993; Polacheck and Thorpe, 1990), are expected to largely avoid vessel collisions. The Heinänen and Skov (2015) report indicates a negative relationship between the number of ships and the distribution of harbour porpoise in the North Sea, suggesting that the species could exhibit avoidance behaviour which reduces the risk of strikes.

452. Studies have shown that larger vessels are more likely to cause the most severe or lethal injuries, with vessels over 80m in length causing the most damage to marine

mammals (Laist et al., 2001). Vessels travelling at high speeds are considered to be more likely to collide with marine mammals, and those travelling at speeds below 10 knots would rarely cause any serious injury (Laist *et al.,* 2001). Predictability of vessel movement by marine mammals is known to be a key aspect in minimising the potential risks imposed by vessel traffic (Nowacek et al., 2001, Lusseau, 2003, 2006).

453. Approximately 4% of all harbour porpoise post-mortem examinations from the Baltic, North East Atlantic, Irish and North Seas (ASCOBANS area) are thought to have evidence of interaction with vessels (Evans et al., 2011).

454. Both the Scottish Marine Animal Stranding Scheme (SMASS), Cetacean Strandings Investigation Programme (CSIP) and Cornwall Wildlife Trust (CWT) recorded strandings of harbour porpoise and undertook investigations to determine causes of fatalities wherever possible. SMASS record and investigate all strandings reported to them in Scotland, and the CSIP record and investigate all recorded strandings in the UK. Data for the Republic of Ireland (RoI) is also available from the Marine Institute (2022). **Table 7.20** summarises the data for harbour porpoise, for the most recent available data of both schemes, and details the number of deaths caused by either vessel strike, or physical trauma with an unknown cause (which could be attributed to vessel strike).

455. For harbour porpoise, the cause of death was identified for a total of 1,615 of the reported strandings. Of these, 75 died from physical trauma of an unknown cause, and 16 died as a result of physical trauma following probable impact from a ship or boat (**Table 7.20**). This results in a collision risk rate of 0.056 (this is the proportion of the total harbour porpoise population at risk of collision due to vessels).

456. The stranding's data collated (**Table 7.20**) shows that mortality of harbour porpoise from vessel collisions can occur, although it accounts for a relatively small number of the strandings where cause of death was established. It is also important to note that the strandings data are biased to those carcasses that wash ashore for collection, and therefore may not be representative.

Table 7.20 Summary of UK Harbour Porpoise Strandings (2003-2020) and Causes of Death From Physical Trauma of Unknown Cause and Physical Trauma Following Probable Impact from a Ship or Boat (Data from CSIP[11], SMASS[12], CWT[13], MEM[14], Marine Institute[15])

Number of Post-Mortems Where Cause of Death Established	Cause of Death: Physical Trauma of Unknown Cause	Cause of Death: Physical Trauma Following Probable Impact From a Ship or Boat	Collision Risk Rate (Number Attributed to Vessels Strike / Other Physical Trauma as Proportion of Total Number Necropsied)
1,615	75	16	0.056

457. To estimate the potential collision risk of vessels associated at the Project during construction, the potential risk rate per vessel has been calculated (**Table 7.21**). It is then used to calculate the total risk to harbour porpoise due to the presence of an additional five vessels at any one time during construction (**Table 7.21**).

Table 7.21 Predicted Number of Harbour Porpoise at Risk of Vessel Collision During Construction, Based on Current UK Collision Rates and Vessel Presence

Harbour Porpoise Collision Risk Rate (Table 7.20)	Estimated Total Number in UK Waters	Estimated Number Within UK Waters (Collision Risk Rate x Total UK Population)	Annual Number of Vessel Transits in UK and RoI for 2015	Number at Risk of Collision per Vessel in UK Waters	Number Annual Vessel Transits Associated with Construction	Additional Individuals at Risk Due to Increase in Vessel Number (Number of Vessels * Number at Risk per Vessel)
0.056	200,714	11,309.6	3,852,030	0.0029	101	0.3

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[11] CSIP (2004); CSIP (2005); CSIP (2011); CSIP (2018) [available from: https://ukstrandings.org/csip-reports/]

[12] SMASS (2010); SMASS (2011); SMASS (2013); SMASS (2014); SMASS (2015); SMASS (2016); SMASS (2017); SMASS (2018); SMASS (2019); SMASS (2020); SMASS (2021) [available from: https://stranding's.org/publications/]

[13] CWT (2021), CWT (2020), CWT (2019), CWT (2018), CWT (2017), CWT (2016)

[14] MEM & CSIP (2019), MEM & CSIP (2020)

[15] Marine Institute, 2022

458. To inform this assessment, the total number of harbour porpoise in UK waters has been compared against the total vessels present in UK waters, as well as the potential collision risk rate based on the SMASS and CSIP data (as presented in **Table 7.20**). The data isn't representative of MU's. The total UK population is taken from IAMMWG (2022). The total presence of vessels in UK waters is taken from the total vessel transits within the 2015 AIS data, which is the latest publicly available.

459. The number of harbour porpoise at risk of collision, per vessel, in UK waters, has been calculated from the above-described datasets, and has been used to calculate the number of individuals at risk of collision from the approximate 101 vessel transits per year during the offshore construction.

460. The assessment of collision risk (**Table 7.21**) predicts that 0.3 harbour porpoise per year could be at risk of vessel collision due to the vessels associated with construction (equating to 0.0005% of the CIS MU at risk). Therefore, this is not predicted to result in any significant population effects or any changes to the conservation status of harbour porpoise.

461. Permanent effects (i.e. assuming all vessel interactions are fatal) with a greater than 1% of the reference population being affected within a single year are considered to have the potential to result in population effects. This is based on ASCOBANS and Defra advice (Defra, 2003; ASCOBANS, 2015) relating to impacts from fisheries by-catch (i.e. a permanent effect) on harbour porpoise. A threshold of 1.7% of the relevant harbour porpoise population, above which a population decline is inevitable, has been agreed with Parties to ASCOBANS, with an intermediate precautionary objective of reducing the impact to less than 1% of the population (Defra, 2003; ASCOBANS, 2015).

462. This is a highly precautionary approach, as it is unlikely that harbour porpoise present in the Windfarm Site and Offshore Export Cable Corridor areas would be at increased collision risk with vessels during construction, considering the minimal number of vessel movements in the area and that vessels within the Windfarm Site and Offshore Export Cable Corridor areas would be stationary or very slow moving. In addition, based on the assumption that harbour porpoise would be disturbed as a result of the vessel noise and presence, there should be no potential for increased collision risk with construction vessels.

463. Vessel movements, where possible, will be incorporated into recognised vessel routes and hence to areas where marine mammals are accustomed to vessels, in order to reduce any increased collision risk. All vessel movements will be kept to the minimum number that is required to reduce any potential collision risk. Additionally,

vessel operators will use good practice to reduce any risk of collisions with marine mammals (see **Appendix 12.C: Draft MMMP** of the Offshore ES).

464. Taking into account the limited potential for increased collision risk with vessels during construction, and that good practice measures for vessels would be in place. Therefore, there would be **no AEoI of the Bristol Channel Approaches SAC in relation to the conservation objectives for harbour porpoise due to increased collision risk with construction vessels**.

7.2.1.2.7 Entanglement

465. Entanglement is the potential risk of marine mammals getting caught within the WTG mooring lines as a primary cause, and the potential risk of marine mammals getting caught within fishing lines that have been caught themselves within the WTG mooring lines as a secondary cause. The worst-case scenario for entanglement is during the operational and maintenance phase of the project due to the length of time the structures will be in place, creating a higher probability of receptors getting caught within the WTG mooring lines. However, there is the potential for a short period of time within the construction period where the WTGs will be installed before the operational period commences, and therefore a short period of time where there may be a risk of entanglement to marine mammals. Entanglement during the construction period is therefore a temporary effect. While the effect would continue into the operational phase, this assessment focuses solely on the construction phase.

466. The mooring lines, inter-array and export cables present in the water column may represent an entanglement risk for marine mammals. Entanglement is defined as the unintentional capture/restraint of marine animals by strong, flexible, anthropogenic materials such as stationary ropes, lines, cables and other mainly linear structures including lines associated with fishing gears (Benjamins *et al.,* 2014).

467. There is nothing in the existing literature to suggest that entanglement of marine mammals in catenary or tensioned mooring lines is likely to pose a significant risk. Garavelli (2020) suggests that the relative spatial scale of devices and their associated mooring lines, the water depth, and the size of marine mammals indicates that the likelihood of encounter is low because the subsea structures (mooring lines and cables) occupy a very small cross section of the water column.

468. It is important to note that, while floating windfarms are relatively new in the offshore wind industry, the oil and gas industry have used offshore floating oil rig platforms for decades. The impact of entanglement with floating oil rigs is

considered to be negligible (Morandi *et al.*, 2018) and thus a similar level of risk can be expected from floating wind structures.

469. The option for monitoring and reporting on this impact pathway will be considered as part of the MMMP and secured via the Construction Environmental Management Plan (CEMP). The CEMP will be developed from **Appendix 5.A: Outline Construction Environmental Management Plan (CEMP)** of the Offshore ES. Should any monitoring suggest that the likelihood of this impact occurring is higher than expected, then contingency measures will be put in place. The exact measures within the contingency plan have yet to be determined, and consultation and agreement with stakeholders will be sought. Measures could, for example, involve more regular monitoring of lines and cables, in order to remove any snagged derelict gear/marine litter as quickly as possible, to minimise the chance of indirect entanglement.

470. With the existing literature suggesting that entanglement will not pose a significant risk to harbour porpoise, and that this potential effect would be for a temporary period only, it is concluded that there is **no AEoI of the Bristol Channel Approaches SAC in relation to the conservation objectives for harbour porpoise due to entanglement**.

7.2.1.2.8 Barrier Effects due to Physical Presence

471. As the Project is constructed, there is the potential for a barrier effect to occur due to the physical presence of the Project's infrastructure. As for the risk of entanglement, the worst-case scenario for effects from the physical presence of the windfarm is during the operational and maintenance phase of the Project, due to the length of time the infrastructure would be in place. However, there is the potential for a short period of time within the construction period where some Project infrastructure being in place prior to the start of the operational period, and therefore a short period of time where there may be a risk of a barrier effect due to the physical presence of the windfarm. This is therefore a temporary effect. While the effect would continue into the operational phase, this assessment focuses solely on the construction phase.

472. The worst-case maximum barrier effect due to the Projects physical presence are explained further in **Section 7.2.1.3.6**, as the operational phase will see the worst-case potential effect for the Project.

473. There would therefore be **no AEoI of the Bristol Channel Approaches SAC in relation to the conservation objectives for harbour porpoise due to barrier effects due to the physical presence of the Project during construction**.

7.2.1.2.9 Electromagnetic Fields

474. Electromagnetic fields (EMFs) occur as a result of electricity transmission through conductive objects, such as transmission cables, and comprises an electric field (E field) and a magnetic field (B field). The electromagnetic attributes of EMFs have the potential to disrupt organs used for navigation and foraging within a number of species. EMFs can have attractive and repulsive effects, that can cause barrier effects dependent on the species and the spatial scale of EMF. In the context of submarine transmission cables, it is well known that EMF strength dissipates rapidly, from 7.85μT at 0m, to 1.47μT at 4m, from the average windfarm inter-array cable buried 1m below the seabed (Normandeau *et al*., 2011). Little is known on the potential for effects to harbour porpoise from dynamic cables in the water column (Gill & Desender, 2020).

475. For perspective, the earth's magnetic field has an estimated background magnitude of 25-65μT (Hutchinson *et al*, 2020). EMF interaction with solids such as the seabed sediment introduces a localised heating effect which, potentially, introduces both positive and negative barrier and fish aggregation effects. However, this will be of small magnitude (maximum of 5.5°C), dissipated within tens of centimetres from the cable's outer insulating layer, and is therefore unlikely to present additional impact (Boehlert and Gill, 2010; National Grid and Energinet, 2017; Moray Offshore Windfarm Ltd, 2018). There is no E field present outside the insulating layer of all cables (for further information, see **Chapter 10: Benthic and Intertidal Ecology** of the Offshore ES).

476. The worst-case maximum EMF effect to harbour porpoise are explained further in **Section 7.2.1.3.7**, as the operational phase will see the worst-case potential effect for the Project.

477. EMF is not expected to affect harbour porpoise, and therefore there would be **no AEoI of the Bristol Channel Approaches SAC in relation to the conservation objectives for harbour porpoise from EMF effects during construction**.

7.2.1.2.10 Changes to Prey Availability

478. The potential effects on prey species during construction can result from physical disturbance and loss of habitat; increased suspended sediment concentrations (SSC) and sediment deposition; and underwater noise (including barrier effects from underwater noise). Any effect on fish species has the potential to indirectly affect harbour porpoise through changes to their prey availability.

479. **Chapter 11: Fish and Shellfish Ecology** of the Offshore ES provides an assessment of these impact pathways on the relevant fish and shellfish species and concludes impacts of negligible to minor adverse significance in EIA terms. Any reductions in prey availability would be small scale, localised and temporary. It is considered highly unlikely that potential reductions in prey availability as a result of construction activities would result in detectable changes to harbour porpoise populations.

480. The diet of the harbour porpoise consists of a wide variety of prey species and varies geographically and seasonally, reflecting changes in available food resources (for more information see **Chapter 12: Marine Mammal and Marine Turtle Ecology** of the Offshore ES). Harbour porpoise have relatively high daily energy demands and need to capture enough prey to meet their daily energy requirements. It has been estimated that, depending on the conditions, harbour porpoise can rely on stored energy (primarily blubber) for three to five days, depending on body condition (Kastelein *et al*., 1997).

7.2.1.2.10.1 Temporary Habitat Loss / Physical Disturbance

481. During construction, activities such as anchor and mooring line installation, cable burial, cable protection installation, and associated seabed clearance all have the potential to cause physical disturbance or temporary loss of seabed habitat.

482. As previously outlined, at the closest point, the Windfarm Site is 1.5km from the Bristol Channel Approaches SAC winter area. The Offshore Export Cable Corridors overlap the winter area and therefore, there is potential for temporary habitat loss / physical disturbance in the Bristol Channel Approaches SAC.

483. The disturbance would be temporary during the approximate 16 months of construction activity with the majority of disturbance occurring during installation of foundations and cables. Some elements of disturbance, such as that caused by mooring line installation, will be highly localised and only occur over a short period.

484. The magnitude of effect of physical disturbance to seabed habitat during construction has been assessed as low in **Chapter 10: Benthic and Intertidal Ecology** of the Offshore ES. In **Chapter 11: Fish and Shellfish Ecology** of the Offshore ES the magnitude of physical disturbance during construction activities is considered to be negligible for all species. This is based on the availability of similar suitable habitat both in the offshore sites and in the wider context of the CIS together with the intermittent and reversible nature of the effect, meaning physical disturbance during construction activities is considered to be negligible to minor adverse. Given the low potential for any effect to prey species, that harbour porpoise

are able to prey upon a wide range of species, and that the loss of habitat would affect a very small proportion of the Bristol Channel Approaches SAC (up to a maximum of 6.11km^2 across the entire Project area), there would not be a significant loss of prey to any harbour porpoise, and there would be no potential for adversely affect the harbour porpoise population.

485. Therefore, any potential changes to prey availability as a result of physical disturbance and temporary habitat loss would have **no effect on the Bristol Channel Approaches SAC in relation to the conservation objectives for harbour porpoise due to changes in prey availability during construction (from temporary habitat loss / physical disturbance)**.

7.2.1.2.10.2 Temporary Increased Suspended Sediments and Sediment Deposition

486. The construction phase of the Project is predicted to result in an increase in SSC and increased sediment deposition, as a result of installation activities related to foundations, mooring lines, foundations, cable/scour protection, and export and array cables (including pre-cable works such as pre-lay grapnel run (PLGR) or sand wave levelling).

487. Works at the Landfall site may also increase suspended sediments, through potential open-cut trenching or the construction of nearshore floatation pits. Of these, the activities most likely to cause direct physical disturbance of the seabed are the installation/burial of cables, and installation of anchors.

488. Increases in suspended sediment are expected to cause localised and short-term increases in SSC at the point of discharge. Released sediment may then be transported by tidal currents in suspension in the water column. Due to the small quantities of fine-sediment released, the fine-sediment is likely to be widely and rapidly dispersed. This would result in only low, short term increase in SSC and very small changes in seabed level when the sediments are deposited. **Chapter 11: Fish and Shellfish Ecology** of the Offshore ES concludes that this would be a negligible effect to fish species. Given that harbour porpoise are able to prey upon a wide range of species, that there would be very little effect to fish species, there would not be a significant loss of prey to any harbour porpoise, and there would be no potential to adversely affect the harbour porpoise population.

489. Therefore, any potential changes to prey availability as a result of increased SSC and sediment deposition is assessed as negligible and would have **<u>no AEoI of the Bristol Channel Approaches SAC in relation to the conservation objectives for harbour porpoise due to changes in prey availability during</u>**

construction (from increased suspended sediments and sediment deposition).

7.2.1.2.10.3 Underwater Noise and Vibration

490. Potential sources of underwater noise and vibration during construction include UXO clearance, piling, increased vessel traffic, seabed preparation, rock placement and cable installation. Of these, piling is considered to produce the highest levels of underwater noise and therefore has the greatest potential to result in adverse impacts on fish.

491. **Chapter 11: Fish and Shellfish Ecology** of the Offshore ES provides an assessment of the potential underwater noise impacts on fish and shellfish species and predicts that impacts would be of negligible magnitude and of a temporary nature. See **Chapter 11: Fish and Shellfish Ecology** of the Offshore ES for a detailed assessment of underwater noise impacts on fish species.

492. The underwater noise modelling (**Appendix 12.A: Marine Mammal and Marine Turtle Underwater Noise Report** of the Offshore ES) indicates that fish species in which the swim bladder is involved in hearing are the most sensitive to the impact of underwater noise.

493. There is the potential for underwater noise to cause both injury and mortality to fish, however, the largest potential effect ranges in fish species are due to TTS. The maximum predicted cumulative impact range for TTS of 51km for fish species based on a stationary response model (**Appendix 12.A: Marine Mammal and Marine Turtle Underwater Noise Report** of the Offshore ES), which is more than the TTS SEL_{cum} range for harbour porpoise (37km). However, it is important to note that the SEL_{cum} modelling for fish is based on a stationary model. This is considered to be a highly precautionary approach, as it is unlikely that an individual would remain within the vicinity of the high noise levels.

494. Therefore, modelling that assumes a fleeing animal response to noise, especially fish with a swim bladder involved in hearing, is more realistic and therefore has been used to assess the potential impact on marine mammals. The maximum predicted cumulative impact range for TTS of 24km for fish species based on the fleeing response model, is less than the TTS SEL_{cum} range of 37km for harbour porpoise (**Appendix 12.A: Marine Mammal and Marine Turtle Underwater Noise Report** of the Offshore ES). This is the largest potential impact range for prey (fish) species and has therefore been used to inform the below worst-case and precautionary assessment. It is highly unlikely that there would be significant changes to prey over the entire area. It is more likely that effects would be restricted

to an area around the working sites. The significance of effect to fish species as a result of piling has been assessed as minor adverse within **Chapter 11: Fish and Shellfish Ecology** of the Offshore ES.

495. There is unlikely to be any additional displacement of harbour porpoise as a result of any changes in prey availability during piling as harbour porpoise would also be disturbed from the area (and to a greater area). The reduction of prey (fish) species availability would not be for all fish within the area of effect, and harbour porpoise would be able to forage within that area still, or would be able to travel outside of that area to forage, with no reduction or impact to the overall population anticipated. It is therefore concluded that the potential for loss of prey within the Bristol Channel Approaches SAC would not effect harbour porpoise over and above what has been assessed for those same activities on harbour porpoise themselves, and therefore there would be no potential for effect on the harbour porpoise population within the CIS MU.

496. Mitigation to reduce the potential impacts of underwater noise for marine mammals would also reduce the potential impacts on prey species. No further mitigation is required or proposed in relation to any changes in prey availability.

497. Taking into account the above information, there would be **no AEoI of the Bristol Channel Approaches SAC in relation to the conservation objectives for harbour porpoise due to changes to prey availability (from underwater noise effects)**.

7.2.1.2.11 Changes to Water Quality

498. As outlined in the **Chapter 9: Marine Water and Sediment Quality** of the Offshore ES, during construction there is the potential for the deterioration of water quality through:

- Localised temporary increases in suspended sediments due to cable burial
- Remobilisation of existing contaminated sediments

499. Disturbance of seabed sediments has the potential to release any sediment-bound contaminants, such as heavy metals and hydrocarbons that may be present within them into the water column. The accidental release of contaminants (e.g. through spillage) also has the potential to affect water quality. During construction there is also the potential for increased suspended sediments.

500. Throughout the construction phase, best practice techniques and due diligence regarding the potential for pollution will be followed throughout all construction activities. Any risk of accidental release of contaminants (e.g. through spillage) will

be mitigated in line with the Project Environmental Management Plan (**PEMP)** and any changes to water quality as a result of any accidental release of contaminants (e.g. through spillage or vessel collision) would be negligible. Therefore, the potential for pollutants to be released into the environment is not considered further in this assessment.

501. Harbour porpoise often inhabit turbid environments and utilise sonar to sense the environment around them and there is little evidence that turbidity affects harbour porpoise directly (Todd *et al.,* 2014). Increased turbidity is unlikely to have a substantial direct effect on harbour porpoise that often inhabit naturally turbid or dark environments.

502. Any direct impacts to harbour porpoise as a result of any contaminated sediment during construction activities are unlikely as any exposure is more likely to be through potential indirect impacts via prey species.

503. It is highly unlikely that any changes in water quality could occur over the entirety of the offshore sites during construction. It is more likely that effects would be restricted to an area around the working sites as the potential increase in suspended sediments through construction activities will be localised and temporary.

504. The potential changes in water quality have been assessed as negligible in **Chapter 9: Marine Water and Sediment Quality** of the Offshore ES. Sediment contamination levels in the surveyed area are not considered to be of significant concern and are low risk in terms of potential impacts on the marine environment.

505. Due to the limited range and short duration of the potential effects, the effect on harbour porpoise would be limited.

506. No additional mitigation is required or proposed, other than the embedded mitigation outlined in **Table 7.1**.

507. The Windfarm site lies outside the Bristol Channel Approaches SAC and therefore there will be no direct effect on the spatial or seasonal components of the SAC from any changes in water quality. However, the cable corridor overlaps the SAC, meaning there will be direct effects on the spatial and seasonal components.

508. Even with the overlap, potential changes in water quality would not have a significant effect on harbour porpoise and therefore there would be **no effect on the Bristol Channel Approaches SAC in relation to the conservation objectives for harbour porpoise due to changes in water quality during construction**.

7.2.1.3 Assessment of Potential Effects During Operation and Maintenance

The potential effects for marine mammals during operation and maintenance with the potential for LSE:

- Underwater noise
  - Operational noise from WTGs and from movement of floating turbine moorings on the seabed
  - Maintenance activities, such as cable re-burial and any additional rock placement
  - Operation and maintenance vessel activity
- Interaction and Collision Risk with vessels Entanglement
- Physical barrier effects
- EMFs
- Changes to prey resources
- Changes to water quality.

7.2.1.3.1 Potential Effects of Underwater Noise from Operational Turbines

509. Turbines will operate nearly continuously, except for occasional shutdowns for maintenance or severe weather. The Project's design life is 25 years. Therefore, there is concern that underwater noise from operational turbines could contribute a consistent, long duration of sound to the marine environment. However, the underwater noise levels emitted during the operation of wind turbines are low and not expected to cause physiological injury to marine mammals but could cause behavioural reactions if the animals are in the immediate vicinity of the wind turbine (Tougaard *et al.*, 2009a; Sigray and Andersson, 2011).

510. The main sources of sound generated during the operation of wind turbines are aerodynamic and mechanical. The mechanical noise is from the nacelle at the top of the wind turbine tower. As the wind turbine blades rotate, vibrations are generated that travel down the turbine tower and radiate into the surrounding water column and seabed (Tougaard *et al.,* 2009a; 2020; Nedwell *et al.,* 2003). The resulting sound is described as continuous and non-impulsive and is characterized by one or more tonal components that are typically at frequencies below 1kHz. The frequency content of the tonal signals is determined by the mechanical properties of the wind turbine and does not change with wind speed (Madsen *et al.,* 2006). Noise levels generated above the water surface are low enough that no significant airborne sound will pass from the air to the water (Godin, 2008).

511. Measurements made at three different wind turbines in Denmark and Sweden at ranges between 14m and 40m from the turbine foundations found that the sound generated due to turbine operation was only detectable over underwater ambient noise at frequencies below 500Hz (Tougaard *et al.*, 2009a).

512. Tougaard *et al.* (2020) reviewed the available measurements of underwater noise from different wind turbines during operation and found that source levels were at least 10–20 dB lower than ship noise in the same frequency range. A simple multi-turbine model indicated that cumulative noise levels could be elevated up to a few kilometres from a wind farm under very low ambient noise conditions. However, the noise levels were well below ambient levels unless very close to the individual turbines in locations with high ambient noise from shipping or high wind speeds (Tougaard *et al.*, 2020).

513. However, as there are few studies into the sound levels associated with floating wind farms and whether they differ to the current standard, ongoing research is currently being conducted (e.g. Offshore Renewable Energy (ORE) Catapult and Xodus Group, 2022). For example, the FORTUNE (Floating Offshore Wind Turbine Noise) project aims to obtain systematic, long-term measurements of underwater noise generated by floating turbines; where relevant and possible. This analysis would be supported by in-situ monitoring during both construction and operation within pilot scale and early commercial floating farms (ORE Catapult and Xodus Group, 2022).

514. As outlined in **Appendix 12.A: Marine Mammal and Marine Turtle Underwater Noise Report** of the Offshore ES, noise measurements made at operational wind farms have demonstrated that the operational noise produced was at such a low level that it was difficult to measure relative to background noise at distances of a few hundred metres. For floating foundations, there is also the potential for a noise that has been associated with 'cable snaps' to be present during the operation of the WTGs. It should be noted that it is likely this cable snap noise is isolated to the particular environmental conditions of where it was recorded, and would likely not occur at the Project However, as the source of this 'cable snap' noise is as of yet not well understood as to the source or the cause, it is not possible to rule out that it will occur during the operational phase (BEIS, 2020).

7.2.1.3.1.1 Potential for Auditory Injury Due to Operational Turbine Noise

515. Underwater noise modelling was undertaken to assess the potential impact ranges for operational wind turbines (see **Appendix 12.A: Marine Mammal and Marine Turtle Underwater Noise Report** of the Offshore ES). The cumulative effect (SEL_{cum}) ranges are to the nearest 10m.

516. The results of the underwater noise modelling (**Table 7.8**) indicate that harbour porpoise would have to be less than 10m (precautionary maximum range) for 24 hours in a 24 hour period, to be exposed to noise levels that could induce PTS based on the Southall *et al.* (2019) non-impulsive thresholds and criteria for SEL_{cum}. Therefore, PTS as a result of operational wind turbine noise is highly unlikely.

517. The indicative separation distance between turbines (inter-row) and between turbines in rows (in-row) would be a minimum of 1.1km (maximum of 2.62km) therefore there would be no overlap in the potential impact range of less than 100m (<0.01km) around each turbine.

518. Given the very localised effect area and that harbour porpoise would have to be within 10m of a WTG for 24 hours, it is considered highly unlikely that harbour porpoise would be at risk of PTS. Therefore, there would be **no AEoI of the Bristol Channel Approaches SAC in relation to the conservation objectives for harbour porpoise, due to PTS from operational WTGs**.

7.2.1.3.1.2 Potential for Disturbance Due to Operational Turbine Noise

519. Currently available data indicate that there is no lasting disturbance or exclusion of harbour porpoise around wind farm sites during operation (Diederichs *et al.*, 2008; Scheidat *et al.*, 2011; Tougaard et al., 2005, 2009a; 2009b). Data collected suggests that any behavioural responses in harbour porpoise may only occur up to a few hundred metres away (Touggard *et al.*, 2009b).

520. Monitoring was carried out at the Horns Rev and Nysted wind farms in Denmark during operation between 1999 and 2006 (Diederichs *et al.*, 2008). Numbers of harbour porpoise within Horns Rev were slightly reduced compared to the wider area during the first two years of operation. However, it was not possible to conclude that the wind farm was solely responsible for this change in abundance without analysing other dynamic environmental variables (Tougaard *et al.*, 2009a). Later studies by Diederichs *et al.* (2008) recorded no noticeable effect on the abundances of harbour porpoise at varying wind velocities at both of the offshore wind farms studied, following two years of operation.

521. Harbour porpoise have been shown to forage within operational wind farm sites (e.g. Lindeboom *et al.*, 2011), indicating no restriction to movements in operational OWF sites.

522. The Windfarm site lies outside the Bristol Channel Approaches SAC and therefore there will be no direct effect on the spatial or seasonal components of the SAC due to disturbance from operational WTGs.

523. As described above, studies have shown that there is no lasting disturbance or exclusion of harbour porpoise around Windfarm Sites during operation, and therefore it is not expected that there would be any disturbance of harbour porpoise. There would therefore be **no AEoI of the Bristol Channel Approaches SAC in relation to the conservation objectives for harbour porpoise due to disturbance from operational turbine noise**.

524. No additional mitigation is required or proposed.

7.2.1.3.2 Potential Effects of Underwater Noise during Maintenance Activities, such as Cable Re-Burial and Any Additional Rock Placement

525. The requirements for any potential maintenance work, such as additional rock placement or cable re-burial, are currently unknown. However, the work required and associated impacts would be less than those during construction.

526. The impacts from additional cable laying and protection are temporary in nature and will be limited to relatively short periods during the operation and maintenance phase. Disturbance responses are likely to occur at significantly shorter ranges than construction noise. Any disturbance is likely to be limited to the area in and around where the actual activity is taking place.

527. The underwater noise from maintenance activities is considered to be the same or less than those assessed for underwater noise from other construction activities (including rock placement, trenching and cable laying) (see **Section 7.2.1.2.3**).

528. Therefore, there would be **no AEoI of the Bristol Channel Approaches SAC in relation to the conservation objectives for harbour porpoise due to underwater noise and disturbance effects from operation and maintenance activities**.

529. No additional mitigation is required or proposed.

7.2.1.3.3 Potential Effects of Underwater Noise Due to Operational Vessels

530. Vessel movements during the operation and maintenance stage will be to a lesser extent than the construction stage. It is estimated that the maximum number of vessels that could be required on site at any one-time during operation and maintenance could be one, which is less than the five vessels that could be on each site during construction. However, vessel intensity will be significantly lower during operation and maintenance than construction. As noise from vessels in construction was not an issue, it is highly unlikely that vessel noise during operation and maintenance will be (see **Section 7.2.1.2.4** for further information).

531. For the operation of the Windfarm Site, there could be up to 40 vessel movements per year (approximately 0.1 vessel movements per day), representing an increase of up to 1.1% compared to average daily vessels currently within the Windfarm Site, and an increase of approximately 0.6% to the current number of vessel movements within the navigation Study Area. This is less than the number of vessel movements within the construction period, and therefore the assessments for TTS and disturbance as presented in **Section 7.2.1.2.4** would represent a worst-case scenario.

532. The underwater noise from maintenance vessels is considered to be the less than those assessed for underwater noise from construction vessels. Therefore, there would be **no AEoI of the Bristol Channel Approaches SAC in relation to the conservation objectives for harbour porpoise due to underwater noise and disturbance effects from operation and maintenance vessels**.

533. No additional mitigation is required or proposed.

7.2.1.3.4 Interaction and Collision Risk with Vessels

534. During the operation and maintenance phase there will be less vessel traffic compared to the construction stage within the Windfarm Site and the Offshore Export Cable Corridor. As stated in **Section 7.2.1.2.6**, it is anticipated that vessels would follow an established shipping route to the relevant port in order to minimise vessel traffic in the wider area. **Appendix 12.C: Draft MMMP** of the Offshore ES provides a protocol for minimising collision risk of marine mammals vessels.

535. It is estimated that there would be approximately 40 vessel movements, to and from the Project, for each year of the operation and maintenance phase (or an average of 0.1 transits per day - one vessel movement every 10 days, or one return trip every 20 days) (**Table 7.3**). An assessment of the potential increase in risk to harbour porpoise as a result of the 40 vessel movements per year has been undertaken following the same approach as undertaken for the construction phase (**Section 7.2.1.2.6**).

536. The number of harbour porpoise at risk of collision, per vessel, in UK waters has been calculated, and has been used to calculate the number of each harbour porpoise species at risk of collision from the 40 yearly vessel transits associated with the Project's operation and maintenance phase (**Table 7.22**). Up to 0.12 harbour porpoise (or 0.0002% of the CIS MU) may be at risk of vessel collision per year of operation, based on this assessment.

Table 7.22 Predicted Number of Harbour Porpoise at Risk of Vessel Collision During Operation and Maintenance, Based on Current UK Collision Rates and Vessel Presence

Collision Risk Rate (Table 7.21)	Estimated Total Number of Individuals in UK Waters	Estimated Number of Individuals at Risk Within UK Waters (Collision Risk Rate x Total UK Population)	Annual Number of Vessel Transits in UK and RoI for 2015	Number of Marine Mammals at Risk of Collision per Vessel in UK Waters	Number Annual Vessel Transits Associated with Operation and Maintenance	Additional Marine Mammals at Risk Due to Increase in Vessel Number per annum (Number of Vessels * Number at Risk per Vessel)
0.056	200,714	11,309.6	3,852,030	0.0029	40	0.12

537. This is highly precautionary considering the minimal number of vessel movements compared to the existing number of vessel movements in the area and that vessels within the Windfarm Site and Offshore Export Cable Corridor areas would be stationary or very slow moving. In addition, based on the assumption that harbour porpoise would be disturbed as a result of the vessel noise and presence, there should be no potential for increased collision risk with construction vessels.

538. Permanent effects (i.e. assuming all vessel interactions are fatal) with a greater than 1% of the reference population being affected within a single year are considered to have the potential to result in population effects.

539. Vessel movements, where possible, will be incorporated into recognised vessel routes and hence to areas where marine mammals are accustomed to vessels, in order to reduce any increased collision risk. All vessel movements will be kept to the minimum number that is required to reduce any potential collision risk. Additionally, vessel operators will use good practice to reduce any risk of collisions with marine mammals (see the **Appendix 12.C: Draft MMMP** of the Offshore ES).

540. Taking into account the limited potential for increased collision risk with vessels during the operation and maintenance phase, and that good practice measures for vessels would be in place, there would be **no AEoI of the Bristol Channel Approaches SAC in relation to the conservation objectives for harbour porpoise due to increased collision risk from operation and maintenance vessels**.

7.2.1.3.5 Entanglement

541. As previously outlined in **Section 7.2.1.2.7**, entanglement is the potential risk of marine mammals getting caught within WTG mooring lines as a primary cause, and marine mammals getting caught within fishing lines that have been caught themselves within the WTG mooring lines as a secondary cause. The worst-case scenario for entanglement is during the operation and maintenance phase of the project due to the length of time the structures will be in place, creating a higher probability of receptors to become caught within the WTG mooring lines.

542. Depending on the method used, there is also the perceived potential for entanglement in the mooring systems and dynamic cables for floating offshore wind turbines. To date, there have been no recorded instances of marine mammal entanglement from mooring systems of renewable devices (Isaacman and Daborn, 2011; Harnois *et al.*, 2015), or for anchored floating production storage offloading (FPSO) vessels in the oil and gas industry (Benjamins *et al.*, 2014), with similar mooring lines as proposed for floating turbine structures. However, entanglement in fishing gear is known to occur, and therefore there remains potential for a risk of secondary entanglement.

543. Discarded fishing gear, or 'ghost gear' can act as an attractor to fish species, and therefore attract larger marine species such as marine mammals (Filmalter *et al.,* 2013; Wilcox *et al.,* 2013).

544. For the Project, there will be a maximum of 48 mooring lines (up to eight per WTG). The mooring lines will be either catenary, taught, or semi-taught, and comprised of anchor chain, mooring cables or polyester mooring line, and extend up to 760m from the WTG. The mooring lines will be between 175mm and 300mm in diameter, depending in the type of mooring, and material used. It is expected that the full length of each mooring line will be suspended in the water column, with temporary surface buoys used during construction. See **Plate 3.5** below for an example of each of these mooring systems, and **Section 5.4.6** of **Chapter 5: Project Description** of the Offshore ES for further detail on each of these types of mooring lines.

545. There will also be up to ten dynamic inter-array cables. The dynamic section of each cable will be freely suspended in the water column in a lazy wave configuration, with buoyancy modules attached to the mid-portion of the cable, creating a mid-water arch. See **Plate 3.11** below for an example of the dynamic cable system, and **Section 5.5.1** of **Chapter 5: Project Description** of the Offshore ES for further detail.

7.2.1.3.5.1 Risk of Entanglement to Harbour Porpoise

546. Impacts to marine mammals due to entanglement include fatalities from drowning, infection and tissue damage if the animal escapes, emaciation if entanglement stops the animal from feeding effectively, and increased drag and energy use if the animal is entangled but able to move freely.

547. Harbour porpoise entanglement risk will likely be influenced by the type of mooring system employed (slack or taut-moored systems), mooring characteristics, and turbine array configuration (Farr *et al.,* 2021). Benjamins *et al.* (2014) provided an in-depth qualitative assessment of relative entanglement risk, taking into consideration both biological risk parameters (e.g. body size, flexibility, and ability to detect moorings) and physical risk parameters of mooring components (e.g., tension characteristics, swept volume, and mooring curvature).

548. Results of a risk assessment on different mooring types by Benjamins *et al.* (2014) indicated a higher risk of entanglement based on mooring stiffness for the most compliant mooring arrangements, specifically catenary with chain and nylon, catenary with accessory buoys and taut with accessory buoys. The risk was reduced for the catenary configuration with chain, and catenary configuration with chain and polyester. The risk was lowest for the stiffer taut configuration.

549. Benjamins *et al.* (2014), provides a qualitative assessment of relative entanglement risk across different marine megafauna groups. This takeinto account both biological risk factors such as animal size, sensory capabilities and foraging methods, and physical risk factors such as mooring flexibility, pre-tension and footprint. Small-toothed cetaceans (such as harbour porpoise) incur the least risk, with an assessment of low for both catenary and chain, and taut and accessory buoy mooring types, primarily due to their small size and manoeuvrability.

550. Given the size and physical characteristics of the mooring systems required for floating OWF, it is unlikely that upon encountering them, a marine mammal of any size would become directly entangled in the moorings themselves (note that the mooring system will remain under tension at all times and no loops, as seen in fishing gear, will ever be formed to allow entanglement with the mooring system).

Mooring systems in the offshore renewables industry typically have greater diameter (Benjamins *et al.,* 2014), compared to fishing gear, which has been identified as a major entanglement risk for whales (Lynch *et al*., 2018).

551. The CWT reports on marine strandings in Cornwall and the Isles of Scilly annually. As part of this scheme, from 2017 to 2021, a total number of strandings of cetaceans came to 1,081 and the scheme conducted examination on 702 (65%) of these via post-mortem or using the Bycatch Evidence Evaluation Protocol (BEEP) technique. Of the examined cetaceans, entanglement with fishing gear can be attributed to 165 (24%) of individuals. When estimated as 24% of the entire stranding population this can be seen as 254 individuals, with the majority of these cetaceans being common dolphin or harbour porpoise (CWT, 2017; 2018; 2019; 2020; 2021; **Table 7.23**).

Table 7.23 Summary of the Cornwall Wildlife Trust's Report on Marine Strandings in Cornwall and the Isles between 2017 to 2021 for Cetaceans Species (Cornwall Wildlife Trust, 2017; 2018; 2019; 2020; 2021)

Year	Total Strandings	Post-mortem and BEEP	Entangled from Post-mortem and BEEP examinations
Cetaceans			
2017	250	178	37
2018	177	113	34
2019	245	143	38
2020	202	126	26
2021	207	142	30
Total	**1081**	**702**	**165**

552. As noted above, the greatest entanglement risk is most likely to be from indirect (or secondary) entanglement in anthropogenic debris, such as 'ghost fishing' gear caught in the mooring system or cables (Benjamins *et al.,* 2014). Tertiary entanglement is also a potential risk (although is considered to be unlikely unless in areas of high fishing and high whale species presence), and refers to the potential for marine animals, who are trailing fishing gear, to swim in close proximity to mooring lines, allowing the trailing gear to become entangled.

553. The entanglement risk of harbour porpoise with floating wind systems is relatively unknown, mainly due to the lack of focused studies and monitoring (including on the potential for ghost fishing gear to become entangled in the mooring lines).

7.2.1.3.5.2 Summary of Entanglement Risk to Harbour Porpoise

554. Taking into account that there have been no recorded instances of marine mammal entanglement from mooring systems of marine renewable devices or similar

mooring lines, and neither dynamic cables or the mooring lines and cables have loose ends or sufficient slack (Copping *et al.,* 2020). There is therefore no evidence to suggest a significant risk of any entanglement to harbour porpoise. It should also be noted that the Windfarm Site itself is location 1.5km from the Bristol Channel Approaches SAC at the closest point, and therefore there would be no direct effect to harbour porpoise within the site itself (although has the potential to affect the same CIS population).

555. The Windfarm Site is not located on any known migration routes for harbour porpoise or within any known key foraging areas, and with the lack of data on entanglement of marine mammals from mooring lines in floating windfarms, the potential risk of entanglement is considered to be low.

556. Therefore, it is concluded that there is **no AEoI of the Bristol Channel Approaches SAC in relation to the conservation objectives for harbour porpoise due to the risk of entanglement**.

557. Due to current knowledge gaps on entanglement risk with floating wind farms, the Applicant will include a monitoring and reporting protocol. The exact measures within the contingency plan are yet to be determined, and consultation and agreement with stakeholders will be sought. However, it is expected that the monitoring protocol (provided within the **Draft MMMP** and developed for inclusion in the CEMP) would include:

- Monitoring for large strains on mooring lines:
- It is expected that a similar method of monitoring would be undertaken as per Kincardine Offshore Windfarm. On Kincardine Offshore Windfarm this has to date been undertaken by load cells attached to the mooring devices and subsea cables, designed to alert if there is unexpected load on the devices which can then be examined. The monitoring method is in the process of changing to using a position monitoring system, which will identify the associated drag function on the structures outside the normal operating range
- Surveys: the turbines and mooring systems would be regularly checked by ROV (during both planned and unplanned maintenance activities):
- This would ensure that there was no material such as discarded nets, ropes or other debris which could increase the risk of entanglement for marine mammals or interfere with the optimal operation of the turbines. Surveys would be caried out according to American Bureau of Shipping (ABS) rules and standards. This technique is currently being used on Kincardine Offshore Windfarm, which has not found any entanglement events to date.

558. The final monitoring design will be agreed with the MMO and Natural England, and take account results of the methods being used at Kincardine Offshore Windfarm to inform the most appropriate technique at the time of deployment of the Project.

559. In the event that any entanglement of a marine mammal or marine turtle does occur during the operation of the Project, additional mitigation and monitoring measures may be required to ensure it does not happen again.

7.2.1.3.6 Physical Barrier Effects

560. The presence of a wind farm could be perceived as having the potential to create a physical barrier, preventing movement or migration of harbour porpoise between important feeding and / or breeding areas, or potentially increasing swimming distances if marine mammals avoid the site and go round it. As stated above, the Windfarm Site is not located on any known migration routes for harbour porpoise or within any known key foraging areas.

561. As outlined in **Section 7.2.1.3.1.2**, information from operational (fixed foundation) windfarms show no evidence of exclusion of harbour porpoise or seals (for example, Diederichs *et al.*, 2008; Lindeboom *et al.*, 2011; Marine Scotland, 2012; McConnell *et al.*, 2012; Russell *et al.*, 2014; Scheidat *et al.*, 2011; Teilmann *et al.*, 2006; Tougaard *et al.*, 2005, 2009a, 2009b).

562. The minimum spacing between wind turbines will be 1,100m, and maximum spacing would be 2,620m. The mooring line radius around each turbine would be 600m. Therefore, there would be at least 1,100m between turbine locations, and between 500m and 2,020m between the mooring line configurations, depending on final turbine design and turbine spacings. This means that animals can be expected to move between devices and through the operational windfarm, irrespective of layout.

563. The maximum footprint of turbine moorings is approximately 2,400m^2 per WTG (based on total area for anchor length and width, maximum number of anchors per WTG (of six), the mooring chain width and the mooring line radius around each anchor; **Table 7.3**), and the footprint of the OSP would be 1,257m^2. This equates to a total footprint of 20,457m^2 (or 0.02km^2). Therefore, the physical footprint of structures that could present a physical barrier is a very small area (0.04%) of the total Windfarm Site area (49.35km^2).

564. There is currently no information on the potential for the physical presence of a floating OWF site to cause a barrier to movement for marine mammal species, however, it is assumed to cause a similar level of effect to that of fixed foundation wind farms. It is therefore not expected that the locations of the turbines and

infrastructure themselves will be positioned in a location to cause a barrier to movement, with room for marine mammals to transit through the Windfarm Site.

565. There would therefore be **no AEoI of the Bristol Channel Approaches SAC in relation to the conservation objectives for harbour porpoise due to barrier effects due to the physical presence of the Project during operation**.

566. No additional mitigation is required or proposed.

7.2.1.3.7 Electromagnetic Fields

567. EMFs occur as a result of electricity transmission through conductive objects, such as transmission cables, and comprises an electric field (E field) and a magnetic field (B field). Many marine organisms have evolved sensory abilities to use electric and magnetic cues in essential aspects of life history, such as prey detection, predatory behaviour, and navigation and these behaviours may be impacted by EMF emissions in the water column (Boehlert and Gill, 2010; Hutchinson *et al.,* 2020).

568. The significance of EMF effects on the surrounding environment depends on the voltage and current passing through the cables, and as voltage increases the electric field increases. For submarine transmission cables, EMF strength decreased rapidly with distance from the cable, from 7.85μT at 0m, to 1.47μT at 4m, based on the average windfarm inter-array cable buried 1m below the seabed (Normandeau *et al*., 2011).

569. The export cable (275kV AC) will be buried to an approximate depth of 1m but could be between 0.5 and 3m. EMF impacts relating to export cables and harbour porpoise are therefore not discussed in further detail in this assessment.

570. The inter-array cables are expected to be 66KV to 275Kv alternating current (AC). Where present on the seabed, the inter-array cables will be buried typically to a depth of 1m, but could be between 0.5 and 3m, significantly reducing the levels of detectable EMF, and are not expected to have any impact on harbour porpoise. However, some portion of the inter-array cables will not be buried (part of the cable being suspended within the water column), and therefore have the potential to affect harbour porpoise, both directly and indirectly through prey interaction pathways.

571. The number, length, and specification of the inter-array cables to be used in this project are as follows:

- Up to 10 inter-array cables
- 3.2km of dynamic inter-array cables (in total)
- 66KV to 275Kv rated capacity.

572. Marine mammals are not considered to be electro sensitive species (Gill *et al.*, 2005), However, Some marine mammals, such as harbour porpoise, are believed to use geomagnetic cues as a navigational tool (Ferrari & Thomas, 2016). However, this aspect of their physiology is not well understood and much of the literature dealing with EMF effects on marine mammals is inconclusive (Dhanak *et al.*, 2016).

573. The effect of EMFs are assessed in **Chapter 12: Marine Mammal and Marine Turtle Ecology** of the Offshore ES. This assessment noted that the areas potentially affected by EMF generated by the worst-case scenario for offshore cables are expected to be small and restricted to the immediate vicinity of the cables (i.e. within metres). EMFs are expected to attenuate rapidly in both horizontal and vertical plains with distance from the source.

574. It has been determined that EMF becomes undetectable at 4m from the cable in seawater, as per Normandeau *et al.* (2011), however, there is a lack of research specific to EMF in the water column.

575. Current information on the effects of EMF on marine mammals is limited, however, there is no evidence to date that their activity will change as a result of the presence of increased EMF in the environment from inter-array cables. Magnetic field intensities reduce as a function of distance from the source and are highly localised, reducing to 1uT at 4.3m from 66kV cables, well below a detectable level for magneto-receptive marine mammal species (5uT) (Normandeau *et al.,* 2011). EMF from inter-array cables is therefore unlikely to interfere with the navigation systems of these species.

576. As described above, EMF is not expected to affect harbour porpoise, and therefore there would be **no AEoI of the Bristol Channel Approaches SAC in relation to the conservation objectives for harbour porpoise from EMF effects during the operation and maintenance phase**.

7.2.1.3.8 Changes to Prey Availability

577. Any impact on prey species has the potential to affect harbour porpoise, and as outlined in **Chapter 11: Fish and Shellfish Ecology** of the Offshore ES, the potential impacts on fish species during operation and maintenance can result from:

- Permanent habitat loss
- Temporary increased suspended sediment concentrations and deposition
- Underwater noise and vibration
- EMF
- Barrier effects
- Fish aggregation effects

- Ghost fishing.

7.2.1.3.8.1 Permanent Habitat Loss

578. Habitat loss will occur during the lifetime of the Project as a result of structures, scour and external cable protection installed on the seabed. The introduction of hard substrate, such as buried export cables, catenary chains on the seabed, anchors/moorings within the seabed, and cable protection would increase habitat heterogeneity through the introduction of hard structures in an area predominantly characterised by sediment habitats. Whilst the Projects infrastructure will prevent prey species from accessing some areas, this will not account for a significant loss in water column habitat. Therefore, this potential effect only refers to the area of seabed loss due to the placement of infrastructure (such as cable protection, catenary chains on the seabed, and anchors/moorings within the seabed).

579. The estimated total permanent habitat loss would be up to 0.95km^2. In **Chapter 11: Fish and Shellfish Ecology** of the Offshore ES, this is considered not significant in the context of the amount of similar available habitat in the wider area. Overall, due to the presence of comparable habitats identified throughout the offshore sites and the wider region and the localised spatial extent of impacts, the magnitude of effect of permanent habitat loss is considered to be low to prey species.

580. Due to the presence of comparable subtidal sand and gravel habitats in and around the offshore sites, any loss of habitat is considered to have a limited effect on any changes in prey availability for harbour porpoise. Taking this into account, there would be **no AEoI of the Bristol Channel Approaches SAC in relation to the conservation objectives for harbour porpoise due to changes in prey availability (from permanent habitat loss resulting from the introduction of hard substrates) during the operation and maintenance phase**.

7.2.1.3.8.2 Temporary Increased Suspended Sediment Concentrations and Deposition

581. Increases in SSC within the water column and subsequent deposition onto the seabed may occur as a result of operation and maintenance activities. Disturbance caused by jack up vessel legs or anchors, as well as cable reburial and/or repair may result in small volumes of sediment being re-suspended. However, the volumes of sediment disturbed from such activities, as well as the overall duration of the disturbance, would be significantly less compared to construction.

582. Increased SSCs and levels of sediment re-deposition will be localised and short term. Therefore, the effect of SSC and re-deposition during the operational phase would be negligible for prey species and harbour porpoise.

583. Taking this into, there would be **<u>no AEoI of the Bristol Channel Approaches SAC in relation to the conservation objectives for harbour porpoise due to changes in prey availability (from increased SSC and sediment deposition) during the operation and maintenance phase</u>**.

7.2.1.3.8.3 Underwater Noise and Vibration

584. Sources of underwater noise during operation and maintenance include operational wind turbines, maintenance activities, such as cable repairs, replacement and protection, and vessels.

585. Underwater noise modelling (**Appendix 12.A Marine Mammal and Marine Turtle Underwater Noise Report** of the Offshore ES) has been conducted to predict the potential impacts of these noise sources and activities on different types of fish groups (based on Popper *et al.*, 2014). Based on criteria from Popper *et al.* (2014) for continuous noise, the recoverable injury threshold of 170dB (SPL_{RMS}) would require an individual to be present within 10m of an operational turbine for a period of 24 hours to be at risk due to operational turbine noise. The same potential impact range for recoverable injury (of less than 10m) has been modelled for all other potential operation and maintenance noise sources. As the noise source is near the surface, and water depths within the array are in the order of 75m, this is considered a very low risk to prey species.

586. The impact range for fish species are the same as the predicted impact range (for PTS) for harbour porpoise for operational turbines, maintenance activities such as cable laying, trenching and rock placement and vessels, and less than the potential disturbance ranges for maintenance activities. Therefore, no additional effects on harbour porpoise as a result of any impacts on fish species from underwater noise during operation and maintenance are predicted.

587. There would be **<u>no AEoI of the Bristol Channel Approaches SAC in relation to the conservation objectives for harbour porpoise as a result of any changes in prey availability from underwater noise during the operation and maintenance phase</u>**.

7.2.1.3.8.4 EMF

588. OWFs transmit the energy produced along a network of cables. As energy is transmitted, the cables emit low-energy EMF. The electrical and magnetic fields generated increase proportionally to the amount of electricity transmitted.

589. The magnitude of impact associated with EMFs is based on the worst-case scenario of a 4m radius zone around all array cables, and a 4m radius semi-circular zone around both export cables within the Maximum Footprint Area. The greatest

magnitude of impact will be in direct contact with cables, most likely the dynamic array cables within the water column, in which the maximum EMF magnitude is <50μT. As each turbine has an input and output array cable, the magnitude is compounded throughout the array, however the area of impact is very low in comparison to the total available space. The cable interacting with the seabed will be buried, either within the seabed or under rock protection, resulting in a negligible impact zone for fish and shellfish in this case.

590. The areas potentially affected by EMF generated by the worst-case scenario for offshore cables are expected to be small and restricted to the immediate vicinity of the cables (i.e. within metres). EMFs are expected to attenuate rapidly in both horizontal and vertical plains with distance from the source.

591. The effect of EMFs on prey species and any changes in prey availability would be low and there would be **no AEoI of the Bristol Channel Approaches SAC in relation to the conservation objectives for harbour porpoise from EMF effects on prey species during the operation and maintenance phase**.

7.2.1.3.8.5 Barrier Effects

592. Barrier effects to prey species occur from a number of sources, including suspended sediment plumes, noise, EMFs, and anthropogenic structures within the water column.

593. Physical barrier effects due to operation and maintenance will be similar to those occurring during construction, with the exception of any future plans to lay additional cable protection on the seabed. This activity will decrease the opportunity of some species to move between sites straddling the protection and, therefore, present a slightly elevated risk of barrier effects for demersal fish and shellfish species. The laying of additional cable protection will be assessed the same as that discussed in the construction scenario as a worst-case (**Section 7.2.1.2.8**).

594. The potential effect associated with barrier effects is based on the worst-case scenario of water volume lost within the Offshore Development Area. This represents approximately 356,139.39m³, constituting 0.0098% of the Offshore Development Area. Therefore, the magnitude of barrier effects is considered negligible to prey species (**Chapter 11: Fish and Shellfish Ecology** of the Offshore ES).

595. Therefore, the effect of barrier effects on prey species and any changes in prey availability would be low and there would be **no AEoI of the Bristol Channel Approaches SAC in relation to the conservation objectives for harbour**

porpoise from barrier effects on prey species during the operation and maintenance phase.

7.2.1.3.8.6 Fish Aggregation Effects

596. The introduction of physical substructures associated with offshore windfarms will cause fish aggregation effects over time (Wilhelmsson *et al*., 2006). Physical structures provide a foundation for settling invertebrates, which increase the organic matter surrounding the structure, and underpin artificial reef ecosystems through 'bottom-up' control of productivity. Increasing nutrient availability and biomass presents opportunities for all fish and shellfish species, from top predators to detritivores (Raoux *et al*., 2017). For further information, see **Chapter 11: Fish and Shellfish Ecology** of the Offshore ES.

597. Due to the small scale of infrastructure that traverses the entire water column (the worst-case scenario being spar buoy structures), the 'absorption' of individuals from fringe habitats, particularly demersal and bentho-pelagic species, will be of negligible significance compared to the potential effects of other offshore developments. There is greater opportunity for aggregation around the offshore substation's foundations, due to the lattice-like structure that provides shelter from larger predators. However, the use of only one OSP is unlikely to have a significant effect during the lifetime of the Project.

598. In some instances, fish aggregation effects can be detrimental to the health of offshore ecosystems. For example, the additional settlement opportunity provided by anthropogenic structures often leads to an increase in invasive and rare species, increasing nutrient load beyond natural variation, and potentially the 'absorption' of fringe populations that increases short-term 'barrenness' of surrounding habitats. It is not likely that the small spatial scale of fish aggregating devices (FADs) associated with the Project's substructures will have significant 'absorbing' effects (see **Chapter 11: Fish and Shellfish Ecology** of the Offshore ES for further information).

599. The increase in fish presence around the physical structures of the Project through the operation and maintenance phase could result in an indirect beneficial impact to marine mammal species, through the improvement of the quality of prey species in the area. **Chapter 11: Fish and Shellfish Ecology** of the Offshore ES assessed the magnitude and sensitivity of fish aggregation effects as negligible.

600. The benefit of this potential increase in prey availability to marine mammals has not yet been studied widely. However, the presence of an artificial reef does increase the abundance and biomass of species, and the increase in prey species availability

increases the attractiveness of the area to predators (Devault *et al.,* 2017; Paxton *et al.,* 2022).

601. A study of the use of marine structures in the North Sea by marine mammal species indicate that the structures are visited commonly by a range of species, including harbour porpoise (Delefosse *et al.,* 2018). Note that this study uses incidental sightings only, and therefore no firm conclusions can be drawn from the use of the structures by marine mammals in comparison to the wider area.

602. While there is potential for a benefit to marine mammals through the improvement in the quality of prey, the effect of this on marine mammal species is not well understood. In addition, as the Project is to use floating WTG structures, the potential beneficial effect is likely reduced in comparison to fixed WTG foundations (as noted above for fish species).

603. Therefore, the effect of fish aggregation effects on prey species and any changes in prey availability would be insignificant, and there would be **no AEoI of the Bristol Channel Approaches SAC in relation to the conservation objectives for harbour porpoise from fish aggregation effects on prey species during the operation and maintenance phase**.

7.2.1.3.8.7 Ghost Fishing

604. Ghost fishing refers to the trapping/entanglement of individuals within man-made debris, most commonly abandoned, lost, or discarded fishing gear (ALDFG) (Richardson *et al*., 2019). In the context of the Project, ALDFG may drift onto suspended cables and chains that form the anchor/mooring system. Ghost nets are a well-known cause of mortality in all fish and shellfish receptor groups.

605. However, the degree of impact is dependent on the size and location of ALDFG. For example, elasmobranch and pelagic species may be impacted by free-floating netting and hooks within the water column or caught on infrastructure in mid-water. Demersal and shellfish species are more likely to be impacted by ALDFG on, or near, the seabed (such as pots and traps), and nets caught on structures such as anchors/moorings, surface-laid cables and cable protection, and the base of the offshore substation. Elasmobranch species are at an elevated risk of entanglement in ALDFG due to their size, with ALDFG causing 74% of entanglement observations in published literature (Parton *et al*., 2019).

606. It is thought that lost static gear such as pots and traps have a low impact due to the relatively high retrieval rate, and the possibility of escape for most species that may reduce mortality (Brown and Macfadyen, 2007).

607. Ghost fishing, typically, has a reduced impact on fish populations in comparison to targeted fishing, particularly in the case of lost trawling nets, as nets are often tangled and have a reduced area of coverage compared to their normal use within the fishing industry. In addition, ghost fishing has a reduced degree of selectivity, and may impact all receptor groups (including mammals and birds) for an extended period of time, exceeding that of normal industry use. The passive nature of ALDFG such as trawling nets may elevate this risk due to a fish aggregating effect, particularly of predatory species that are attracted to trapped carcasses, and which may themselves be trapped/entangled.

608. A worst-case scenario for this impact is difficult to determine due to the unknown location and likelihood of lost gear entering the array at any point in time. Data can be inferred from multiple sources, including fisheries data (Piet *et al.*, 2021) and charitable citizen science, however this is not likely to be sufficiently representable within the array area. Annual monitoring of anchor/moorings will be undertaken during the lifetime of the Project. Remotely operated vehicles (ROVs) will be used to identify any entanglement hazards such as ALDFG snagged on Project substructures.

609. **Chapter 11: Fish and Shellfish Ecology** of the Offshore ES has assessed a minor adverse effect to all prey species (which would not be significant). Given that harbour porpoise are able to prey upon a wide range of species, that there would be very little effect to fish species, there would not be a significant loss of prey to any harbour porpoise, and there would be no potential to adversely affect the harbour porpoise population.

610. Therefore, there would be **no AEoI of the Bristol Channel Approaches SAC in relation to the conservation objectives for harbour porpoise from ghost fishing effects on prey species during the operation and maintenance phase**.

7.2.1.3.9 Changes to Water Quality

611. Throughout the operation and maintenance phase, due diligence and best practice techniques regarding the potential for pollution will be followed throughout the required activities. The PEMP will include the embedded mitigation measures regarding best practice techniques to avoid the accidental release of contaminants (**Table 7.1**). Any risk of accidental release of contaminants (e.g. through spillage) will be mitigated in line with the PEMP and any changes to water quality as a result of any accidental release of contaminants (e.g. through spillage or vessel collision) would be negligible.

612. During operation and maintenance, disturbance of seabed sediments will be localised to specific moorings or sections of cable and considerably less than that during the construction phase.

613. Potential changes in water quality during operation and maintenance include (see **Chapter 9: Marine Water and Sediment Quality** of the Offshore ES for more information):

- Localised temporary increases in suspended sediments
- Remobilisation of existing contaminated sediments.

614. Changes in water quality are considered to have negligible effect on marine mammals. As assessed in **Chapter 9: Marine Water and Sediment Quality** of the Offshore ES, any potential changes in water quality during operation and maintenance would be negligible.

615. Therefore, there would be **no AEoI of the Bristol Channel Approaches SAC in relation to the conservation objectives for harbour porpoise as a result of any changes to water quality during operation and maintenance**.

616. No additional mitigation is required or proposed, other than the embedded mitigation outlined in **Table 7.1**.

7.2.1.4 Assessment of Potential Effects During Decommissioning

617. Potential effects on harbour porpoise associated with decommissioning have not been assessed in detail, as further assessments will be carried out ahead of any decommissioning works to be undertaken taking account of known information at that time, including relevant guidelines and requirements. A detailed decommissioning programme will be provided to the regulator prior to construction that will give details of the techniques to be employed and any relevant mitigation measures required.

618. Decommissioning would most likely involve the removal of the accessible installed components comprising: all of the wind turbine components; part of the mooring structures (those above sea bed level); and the sections of the infield cables close to the offshore structures, as well as sections of the export cables. The process for removal of foundations is generally the reverse of the installation process. There would be no piling, and foundations may be cut to an appropriate level.

619. It is not possible to provide details of the methods that will be used during decommissioning at this time. However, it is expected that the activity levels will be

comparable to construction (with the exception of pile driving noise which would not occur).

620. Therefore, the potential effects on harbour porpoise during decommissioning would be the same or less than those assessed for construction due to the processes of decommissioning potentially being the reverse of the installation, without the need for piling. Leading to there being **no AEoI of the Bristol Channel Approaches SAC in relation to the conservation objectives for harbour porpoise due to the decommissioning effects as mentioned above**.

7.2.1.5 Potential In-Combination Effects

621. The in-combination assessment considers plans, projects and activities where the predicted effects have the potential to combine with the potential effects during construction of the Windfarm Site. The construction phase has been assessed as the worst-case for potential in-combination effects.

622. The activities, plans and projects screened into the in-combination assessment for harbour porpoise are those that are located in the CIS MU. Full information on the screening is provided in **Appendix 12.B Marine Mammals Cumulative Effects Assessment (CEA) Report** of the Offshore ES.

623. The potential in-combination effects for harbour porpoise within the Bristol Channel Approaches SAC has been identified as:

- Disturbance from underwater noise
- Increased collision risk
- Entanglement
- Changes to prey availability.

624. All other potential effects, including PTS from underwater noise, TTS from underwater noise, barrier effects, EMF, and changes to water quality have been screened out with no potential in-combination effects in relation to the Bristol Channel Approaches SAC and harbour porpoise (see **Appendix 12.B Marine Mammals CEA Screening Report** of the Offshore ES).

625. The commitment to the mitigation measures agreed through the MMMP (in accordance with the **Appendix 12.C: Draft MMMP** of the Offshore ES) for piling would reduce the risk of physical injury or permanent auditory injury (PTS) in harbour porpoise. In light of this, and taking account of the type, scale and extent of potential effects arising from the Project assessment, which concluded **no AEoI for harbour porpoise from physical injury or PTS from construction** (see **Section 7.2.1.2.1.1**).

626. Other licenced projects or activities that may result in underwater noise that could cause physical injury or PTS will have similar controls in place. Taking this into account, there is considered to be no pathway for the Project or any of the other projects screened into the in-combination assessment (see **Appendix 12.B Marine Mammals CEA Screening Report** of the Offshore ES) to contribute to in-combination effects for physical injury or PTS from piling activities. Therefore, the potential for PTS has not been assessed in the following assessment.

627. Other activities such as dredging, drilling, rock placement, vessel activity, operational wind farms, oil and gas installations or wave and tidal sites will emit broadband noise in lower frequencies and auditory injury (PTS) from these activities is very unlikely. Therefore, the potential risk of any auditory injury (PTS) is not included in the in-combination assessments. Thus, the following assessment only considers potential disturbance effects on harbour porpoise.

628. The potential sources of in-combination effects of underwater noise which could disturb harbour porpoise are:

- Piling at other OWFs (**Section 1.3.1** of **Appendix 12.B: Marine Mammals CEA Screening Report** of the Offshore ES)
- Other construction activities at OWFs (other than piling) including vessels, cable installation works, dredging, sea bed preparation and rock placement (**Section 1.3.2** of **Appendix 12.B: Marine Mammals CEA Screening Report** of the Offshore ES)
- Marine Renewable Energy (MRE) projects (wave and tidal) – construction phase only (**Section 1.3.3** of **Appendix 12.B: Marine Mammals CEA Screening Report** of the Offshore ES)
- Aggregate extraction and dredging (**Section 1.3.4** of **Appendix 12.B: Marine Mammals CEA Screening Report** of the Offshore ES)
- Oil and gas installation projects (**Section 1.3.6** of **Appendix 12.B: Marine Mammals CEA Screening Report** of the Offshore ES)
- Oil and gas seismic surveys (**Section 1.3.1** of **Appendix 12.B: Marine Mammals CEA Screening Report**) of the Offshore ES
- Subsea cable and pipelines (**Section 1.3.7** of **Appendix 12.B: Marine Mammals CEA Screening Report** of the Offshore ES)
- Other marine projects (gas storage, offshore mines and carbon capture) (**Section 1.3.8** of **Appendix 12.B: Marine Mammals CEA Screening Report** of the Offshore ES)
- Geophysical surveys at OWFs (**Section 1.5.1** of **Appendix 12.B: Marine Mammals CEA Screening Report** of the Offshore ES)

- UXO clearance (**Section 1.5.1** of **Appendix 12.B: Marine Mammals CEA Screening Report** of the Offshore ES).

629. The approach to the assessment for the in-combination effects of disturbance from underwater noise for harbour porpoise has been based on the current advice from the SNCBs (JNCC *et al*., 2020) on the assessment of effects on the Bristol Channel Approaches SAC.

630. It should be noted that a large amount of uncertainty is inherent within in-combination assessments. To take this uncertainty into account, where possible, a precautionary approach has been applied at multiple stages of the assessment process.

631. The approach to dealing with uncertainty has led to a highly precautionary assessment of the potential for in-combination effect, especially for pile driving, as the assessment is based on the worst-case scenarios for all projects included. It should therefore be noted that building precaution on top of precaution can lead to unrealistic worst-case scenarios within the assessment.

632. Therefore, the following in-combination assessment is based on the most realistic worst-case scenario of all other projects to reduce any uncertainty, and avoid presentation of highly unrealistic worst-case scenarios, while still providing a conservative assessment. Careful consideration has been given to determine the most realistic worst-case scenario for the assessment of in-combination effects.

633. Where a quantitative assessment has been possible, the potential magnitude of disturbance has been based on the number of harbour porpoise in the potential effect areas using the latest SCANS-III density estimates (Hammond *et al.,* 2021).

634. It is intended that this approach to assessing the potential in-combination effects of disturbance from underwater noise will reduce some of the uncertainties and complications in using the different assessments from EIAs, based on different noise models, thresholds and criteria, as well as different approaches to density estimates.

7.2.1.5.1 Assessment of Disturbance from Underwater Noise

7.2.1.5.1.1 Assessment of Underwater Noise from Piling at Other Offshore Wind Farms

635. Following the initial screening of UK and European OWFs (as presented in **Appendix 12.B Marine Mammals CEA Screening Report** of the Offshore ES), the next stage of the screening exercise was undertaken on those projects that have been identified as having the potential for in-combination construction effects. This stage of the screening is based on known construction periods of UK and European OWF projects, including known piling and /or construction timings and preparatory

works. In order to determine a more realistic, but still worst-case, list of UK and European OWF projects that may the potential for overlapping piling with the Project.

636. Of the UK and European OWFs screened in for having a construction period that could potentially overlap with the construction of the Project, and that are within the CIS MU, seven OWFs could be piling at the same time, which is estimated to take place in either 2026 or 2027:

- Dieppe - Le Treport
- Codling
- Dublin Array
- North Irish Sea Array
- South Irish Sea
- Awel y Môr OWF
- Morecambe.

637. Of these, none are within, or within 26km of, the Bristol Channel Approaches SAC.

638. This more realistic short list of OWF projects that could be piling at the same time as the Project could change as projects develop, but this is the best available information at the time of writing, and more accurately reflects the limitations and constraints to project delivery.

639. The assessment of in-combination effects considers the potential disturbance of harbour porpoise during piling for the Project, with the piling at other OWF projects.

Assessment of Effect

640. The potential disturbance from underwater noise during piling for harbour porpoise has been estimated for each individual OWF screened in for assessment, based on the potential disturbance area during single pile installation, based on the EDR of 26km (JNCC *et al.,* 2020).

641. As noted above, none of the screened in OWFs are within, or within 26km of, the Bristol Channel Approaches SAC, and therefore an assessment under the spatial (20%) or seasonal (10%) thresholds is not required. The assessment of in-combination effects is therefore the same as that undertaken for the Project alone (**Section 7.2.1.2.1.2**), with up to 7.29% of the Bristol Channel Approaches SAC winter area disturbed on any one day (**Table 7.10**), and up to 1.55% of the Bristol Channel Approaches SAC winter area disturbed over the winter season (**Table 7.11**), under the worst-case scenarios.

642. As assessment has however been undertaken against the CIS MU population for harbour porpoise.

643. The approach to the in-combination assessment for piling at OWFs is based on the potential for single piling at each wind farm at the same time as single piling at the Project This approach allows for some of the OWFs not to be piling at the same time, while others could be simultaneously piling. This is considered to be the most realistic worst case scenario, as it is highly unlikely that all other wind farms would be simultaneously piling at exactly the same time as piling at the Project.

644. It is important to note the actual duration for active piling time which could disturb marine mammals is only a very small proportion of the potential construction period, of up to approximately 6.5 days for the Project, based on the estimated maximum duration to install individual piles.

645. The potential for disturbance to harbour porpoise within the CIS MU, due to all other OWFs that could be piling at the same time, has been assessed in **Table 7.24**. Up to 5.6% of the CIS MU harbour porpoise population may be at risk of disturbance due to piling at the Project at the same time as piling at other OWFs. Note that all other OWFs included are assessed under the 26km EDR as they are fixed foundation sites, and therefore the EDR for monopiles relevant.

646. In practice, the potential temporary effects would be less than those predicted in this assessment as there is likely to be a great deal of variation in timing, duration, and hammer energies used throughout the various OWF project construction periods. In addition, not all individuals would be displaced over the entire potential disturbance range (26km) used within the assessments. For example, the study of harbour porpoise at Horns Rev (Brandt *et al.,* 2011), indicated that at closer distances (2.5 to 4.8km) there was 100% avoidance. However, this proportion decreased significantly moving away from the pile driving activity and at distances of 10km to 18km avoidance was 32% to 49% and at 21km the abundance was reduced by just 2%.

Table 7.24 Quantified In-Combination Assessment for the Potential Disturbance of Harbour Porpoise During Single Piling at other OWFs that Could be Piling at the Same Time as the Project Within the CIS MU

Project	Harbour Porpoise Density [SCANS-III Block] (/km^2)	Area of Effect (km^2) (Based on EDRs)	Maximum Number of Individuals Potentially Disturbed During Single Piling
White Cross	0.918 [D]	706.9	648.9
Dieppe - Le Treport	0.213 [C]	2,123.7	452.3
Codling	0.239 [E]	2,123.7	507.6
Dublin Array	0.239 [E]	2,123.7	507.6
North Irish Sea Array	0.239 [E]	2,123.7	507.6
South Irish Sea	0.239 [E]	2,123.7	507.6
Awel y Môr OWF	0.086 [F]	2,123.7	182.6
Morecambe	0.086 F]	2,123.7	182.6
Total number of harbour porpoise *(without the Project)*			**3,496.8** *2,847.9*
Percentage of CIS MU *(without the Project)*			**5.59%** *4.56%*

647. . Based on the JNCC et al. (2010) draft guidance as a precautionary approach, temporary impacts that could affect 5% or less of the population are not considered to have the potential to have long term significant impacts on the population. In assigning 5% to a temporary impact in this assessment, consideration is given to uncertainty of the individual consequences of temporary disturbance. Under this approach, there is the potential for significant effect up to 4% of the population could theoretically be permanently removed, effecting the harbour porpoise CIS MU.

648. The Project specific SIP for the Bristol Channel Approaches SAC would manage and reduce the potential for significant disturbance of harbour porpoise from in-combination underwater noise during OWF piling. The SIP shall be suitable to deliver no AEOI and will be provided and agreed with SNCBs prior to construction. Therefore, the potential for disturbance to harbour porpoise following implementation of the mitigation and management measures providing through the SIP is not expected to be significant, and the implementation of the SIP would ensure there is **no AEoI of the Bristol Channel Approaches SAC in relation to the conservation objectives for harbour porpoise due to the disturbance of OWF piling (in-combination)**.

7.2.1.5.1.2 Assessment of Underwater Noise from Construction Activities (Other than Piling) at Other OWFs

649. All OWFs with construction dates that have the potential to overlap with the construction dates for the Project have the potential for other construction activities (such as seabed preparation, dredging, trenching, cable installation, rock placement, drilling and vessels) to occur at the same time as other construction activities at the Project.

650. During piling at the Project, there is the potential to overlap with potential effects from the non-piling construction activities at other OWFs. Noise sources which could cause potential disturbance effects during OWF construction activities, other than pile driving, can include vessels, seabed preparation, ploughing / jetting / pre-trenching or cutting for installation of cables and rock placement for protection of the cable.

651. There would be no additional in-combination effects of underwater noise from other construction activities for OWFs which also have overlapping piling with the Project, as the ranges for piling would be significantly greater than those from other construction noise sources.

652. OWFs screened in for other construction activities that could have in-combination effects with other construction activities at the Project are (as presented in **Appendix 12.B Marine Mammals CEA Screening Report** of the Offshore ES):

- Arklow Bank Phase 2
- Erebus[16]
- North Channel Wind 1
- North Channel Wind 2.

Assessment of Effect

653. Erebus, the closest of these other OWFs that may be undergoing construction at the same time as the Project, is located 20.8km from the Bristol Channel Approaches SAC at closest point. Therefore there is no potential for effect within the boundary of the site, and an assessment against the spatial and seasonal thresholds (of 20% and 10% respectively) is not required.

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[16] The Erebus array area is located 26.6km from the Bristol Channel Approaches SAC, while the Erebus export cable corridor is located 20.8km from the Bristol Channel Approaches SAC.

654. The potential disturbance from OWFs during non-piling construction activities, such as vessel noise, sea bed preparation, rock placement and cable installation, has been based on the disturbance area for multiple construction activities taking place at the Project, as assessed in **Section 7.2.1.2.3.2**, based on the worst case disturbance range of 4km, for up to seven activities taking place at the same time, with an area of 351.86km^2, at each of the included OWFs, at the same time as piling at the Project (as the worst-case effect for the Project).

655. For harbour porpoise, based on the worst case scenario, for all OWFs that could be constructing at the same time as the Project, there is the potential for disturbance to 1.5% of the CIS MU (**Table 7.25**).

Table 7.25 Quantified In-Combination Assessment for the Potential Disturbance of Harbour Porpoise During the Construction at Other OWFs at the Same Time as Piling at the Project

Project	Harbour Porpoise Density (/km^2)	Area of Effect (km^2)	Maximum Number of Individuals Potentially Disturbed During Other OWF Construction
White Cross	0.918	706.9	648.9
Arklow Bank Phase II	0.2390	351.86	84.1
Erebus	0.1180	351.86	41.5
North Channel Wind 1	0.2390	351.86	84.1
North Channel Wind 2	0.2390	351.86	84.1
Total number of harbour porpoise *(without* the Project*)*			**942.7** *293.8*
Percentage of CIS MU *(without* the Project*)*			**1.51%** *0.47%*

656. For the potential temporary effects during construction, including vessels, there is likely to be a great deal of variation in timing and durations, as well as different construction methods, used throughout the various OWF construction periods. Therefore, this assessment is considered to be a precautionary worst-case. It should also be noted that while the projects included within the in-combination assessment for disturbance from other OWFs constructing at the same time were done so based on the current knowledge of their possible construction or activity windows. It is very unlikely that all activities would be taking place on the same day or in the same season, and therefore this likely represents an over-precautionary and worst-case estimate of the marine mammals that could be at risk of disturbance during the three year construction of the Project. Therefore, the likely number of marine mammals at risk of disturbance would be less than has been assessed here.

657. As assessed in **Table 7.25**, the number of harbour porpoise that could potentially be temporarily disturbed during the construction of other OWFs at the same time as piling at the Project equates to 1.5% of the CIS MU reference population. Therefore, there would be **no AEoI of the Bristol Channel Approaches SAC in relation to the conservation objectives for harbour porpoise, due to disturbance from the construction of other OWFs in-combination with piling at the Project**.

7.2.1.5.1.3 Assessment of Underwater Noise from Other Industries and Activities

658. During the construction period for the Project, the other potential noise sources that could also disturb marine mammals are:

- Geophysical surveys for OWFs
- Aggregate extraction and dredging
- Subsea cables and pipelines
- Coastal works
- Oil and gas seismic surveys
- UXO clearance.

659. Further information on the CEA screening is provided in **Appendix 12.B Marine Mammals CEA Screening Report** of the Offshore ES.

Potential for Disturbance due to Geophysical Surveys

660. As outlined in **Appendix 12.B Marine Mammals CEA Screening Report** of the Offshore ES, geophysical surveys using a Sub Bottom Profiler (SBP) and Ultra-Short Baseline (USBL) systems have the potential to disturb marine mammals and have therefore been screened into the CEA, as a precautionary approach.

661. For geophysical surveys using SBP it is realistic and appropriate to base the assessments on the potential effect area around the vessel itself, as the potential for disturbance would be around the vessel at any one time. Marine mammals would not be at risk throughout the entire area surveyed in a day, as animals would return once the vessel had passed, and the disturbance had ceased.

662. Assessments undertaken for the Review of Consents (RoC) HRA for the Southern North Sea SAC (BEIS, 2020) modelled the potential for disturbance due to the use of a SBP, and results indicated that there is the potential for a possible behavioural response in harbour porpoise at up to 3.77km (44.65km^2) from the source. The current guidance for assessing the significance of noise disturbance for harbour porpoise SACs (JNCC *et al.,* 2020) recommends the use of an EDR of 5km (78.5km^2) for geophysical surveys.

663. In the BEIS (2020) RoC HRA, it was estimated that in the unlikely event that a SBP is used continuously over a period of 24 hours with a vessel speed of 7.4km/h (4 knots) a total area of approximately 256km^2 per day could be affected (BEIS, 2020). However, as outlined in the RoC HRA (BEIS, 2020) this is a highly precautionary scenario as it is very unlikely that a SBP would be undertaken along a single transect line of 178km in a single day.

664. As a worst case, it has been assumed that harbour porpoise within 5km of the survey source, a total area of 256km^2, could be disturbed form each included geophysical survey.

665. It is currently not possible to estimate the location or number of potential high-resolution geophysical surveys that could be undertaken at the same time as construction and potential piling activity for the Project. It is therefore assumed, as a worst-case scenario, that there could potentially be up to one geophysical survey within the Bristol Channel Approaches SAC, and up to two geophysical surveys in the CEA Study Area at any one time, during construction of the Project.

666. Without knowing the actual location for geophysical surveys, the SCANS-III density estimate for the CIS MU (of 0.11/km^2) has been used to estimate the potential number of harbour porpoise that could potentially be disturbed.

Potential for Disturbance due to Aggregate Extraction and Dredging

667. As stated with **Appendix 12.B Marine Mammals CEA Screening Report** of the Offshore ES, taking into account the small potential effect ranges, distances of the aggregate extraction and dredging projects from the Project, the potential for contribution to in-combination effects is very small. Therefore, risk of PTS or TTS for all marine mammal species from aggregate extraction and dredging has been screened out from further consideration in the CEA. However, as a precautionary approach, a total of four aggregate extraction and dredging projects are included in the CEA for the potential for in-combination disturbance with the construction of the Project, within the CIS MU. None of these aggregate sites are within (or within 26km of) the Bristol Channel Approaches SAC, and therefore have been assessed against the CIS MU only.

668. As outlined in the BEIS (2020) RoC HRA for the Southern North Sea SAC, studies have indicated that harbour porpoise may be displaced by dredging operations within 600m of the activities (Diederichs *et al.,* 2010). As a worst-case assessment, a buffer of 600m has been applied to all aggregate and dredging projects screened within the CIS MU for harbour porpoise.

669. The SCANS-III density estimate for the CIS MU (of 0.11/km^2) has been used to estimate the potential number of harbour porpoise that could potentially be disturbed.

Potential for Disturbance due to Subsea Cables and Pipelines

670. Two subsea cables have been screened into the in-combination assessment; the X-Links Interconnector 1 & 2 projects. These projects are currently in the early stages of development (Tier 5) and therefore there is limited information available on potential effects and disturbance ranges for which to inform a in-combination assessment with the Project. However, similar activities are expected for the construction of the X-Links Interconnector Projects as for the other construction activities for the Project (i.e. dredging, cable laying, rock placement). Both X-Links projects are within the Bristol Channel Approaches SAC.

671. As described in **Section 7.2.1.2.3.2**, the disturbance ranges that could be generated during the cabling works would be up to 4km (with a disturbance area of 50.3km^2). These potential disturbance areas have been used to inform the assessments for the two subsea cabling projects, as activities would be similar, in the absence of any additional information for the project screened in for assessment.

672. The densities for harbour porpoise are based on the highest SCANS-III density estimate for the survey blocks that the X-Links Projects are within.

Potential for Disturbance due to Coastal Works

673. One coastal project has the potential to be undergoing construction at the same time as the Project; Hinkley Point C. As for the subsea cables projects as described above, similar activities are expected for the construction of Hinkley Point C as for the other construction activities at the Project (i.e. dredging, rock placement (**Section 7.2.1.2.3.2**)). Therefore, the same potential disturbance ranges have been applied for Hinkley Point C, as for the X-Links Interconnector Projects assessed above. Hinkley Point C is not within (or within 26km of) the Bristol Channel Approaches SAC, and therefore has been assessed against the CIS MU only.

674. The densities for each marine mammal species are based on the SCANS-III density estimate for the survey blocks of Hinkley Point C.

Potential for Disturbance due to Oil and Gas Seismic Surveys

675. It is currently not possible to estimate the number of potential oil and gas seismic surveys that could be undertaken at the same time as construction and potential piling activity at the Project. Therefore, it has been assumed that at any one time, one seismic survey could be taking place at the same time as the construction of

the Project, within the Bristol Channel Approaches SAC or within the CEA Study Area.

676. Following the current SNCB guidance for the assessment of disturbance on harbour porpoise (JNCC *et al*., 2020), during seismic surveys the EDR is 12km (452.4km^2), however, this should be assessed as a moving source, rather than a stationary one (i.e. the distance at which a survey vessel could travel in one day, with a 12km buffer area, should be assessed). It is difficult to determine what the potential area of effect would be when taking into account it is a moving source (as it is difficult to predict how far a vessel may survey in a day).

677. Based on survey vessels travelling at a speed of 4.5 to 5 knots, up to 199km could be surveyed in one day. This however does not take into account the survey downtime for line changes, weather, or other technical reason. A review of seismic surveys within the UK indicated that surveys were being undertaken for approximately 52% of the time (BEIS, 2020). Taking this into account, up to 103.5km of surveys could be undertaken in one day, resulting in a potential disturbance area of 2,936.4km^2 with the 12km EDR buffer applied. This is highly precautionary as it is unlikely that the whole seismic survey transect area would be within the Bristol Channel Approaches SAC.

678. The SCANS-III density estimate for the CIS MU (of 0.11/km^2) has been used to estimate the potential number of harbour porpoise that could potentially be disturbed.

Potential for Disturbance due to UXO Clearance

679. As for piling, the potential risk of PTS in harbour porpoise due to UXO clearance has been screened out from further consideration in the CEA; if there is the potential for any PTS, suitable mitigation would be put in place to reduce any risk to harbour porpoise. Therefore, the CEA only considers potential disturbance effects.

680. This assessment has been based on the potential for disturbance due to UXO clearance activities for other projects, taking place at the same as the construction of the Project.

681. It is currently not possible to estimate the number of potential UXO clearance events that could be undertaken at the same time as construction and potential piling activity at the Project. Therefore, on a worst-case basis, the potential for one high-order clearance and one low-order clearance has been assessed within the Bristol Channel Approaches SAC or within the CIS MU.

682. The magnitude of the potential disturbance to harbour porpoise due to UXO clearance has been estimated based the potential impact area of 2,123.7km^2 per high-order UXO clearance (based on 26km EDR for UXO high order detonation), and 78.5km^2 per low-order detonation, following the current SNCB guidance for the assessment of impact to harbour porpoise in the Southern North SAC.

683. However, as outlined in the BEIS (2020) RoC HRA, due to the nature of the sound arising from the detonation of UXO, i.e. each blast lasting for a very short duration, marine mammals, including harbour porpoise, are not predicted to be significantly displaced from an area, any changes in behaviour. If any behaviour changes occur, would be an instantaneous response and short-term. Existing guidance suggests that disturbance behaviour is not predicted to occur from UXO clearance if undertaken over a short period of time (JNCC, 2010a).

684. Mitigation measures required for UXO clearance include the preferential use of low-order clearance techniques, which could include a small donor charge, rather than full high-order detonation which is only used as a last resort. It is therefore highly unlikely that more than one UXO high-order detonation would occur at exactly the same time or on the same day as another UXO high-order detonation, even if they had overlapping UXO clearance operation durations. The CEA is therefore based on potential for disturbance from one UXO high-order detonation without mitigation (worst-case), as well as one low-order clearance event.

685. The SCANS-III density estimate for the CIS MU (of 0.11/km^2) has been used to estimate the potential number of harbour porpoise that could potentially be disturbed.

Quantitative Assessment of Disturbance from all Noisy Activities of Offshore Industries (Other than Offshore Wind)

686. Each of the above-described sound sources are quantitively assessed against the spatial and seasonal thresholds, and against the CIS MU, wherever relevant as indicated in the above sections.

687. There is no potential for disturbance from aggregate and dredging projects, or from coastal works, within (or within 26km of) the Bristol Channel Approaches SAC, and therefore disturbance from these activities is assessed against the CIS MU only. It has also been assumed that there would only be one geophysical survey within the Bristol Channel Approaches SAC itself, at the same time as the construction of the Project, while there could be up to two within the wider CIS MU.

688. Two alternative in-combination scenarios have been assessed; (1) to include those projects that are currently known (Tier 5 or below), and (2) to include all potential noise sources undertaking works at the same time as the Project (e.g. UXO clearance). The second of these scenarios is considered to be unrealistic and has been included for information purposes only. The first of these scenarios is based on the currently known projects that may be undertaking activities at the same time as the Project and is therefore the scenario that the assessment is based on.

Spatial Assessment

689. **Table 7.26** provides an in-combination assessment for all other industries and activities that may be undertaking works at the same time that the Project is undergoing construction. As noted above, two scenarios have been assessed within **Table 7.26**; (1) to include those projects that are currently known (Tier 5 or below) (shown in blue in **Table 7.26**), and (2) to include all potential noise sources undertaking works at the same time as the Project (e.g. UXO clearance) (shown in grey in **Table 7.26**). The second of these scenarios is considered to be unrealistic, and is based on the assumed number and type of activity that may be taking place at the same time as the Project construction, and is therefore not used to inform the overall in-combination assessment. The first of these scenarios is based on only those projects that are currently within (or are expected to be within) the planning application process (i.e. those projects that are currently at Tier 5 or less).

690. Under the realistic worst-case in-combination assessment (Scenario 1 as provided in **Table 7.26**), the disturbance of harbour porpoise would not exceed 20% of the seasonal component of the Bristol Channel Approaches SAC winter area on any given day. Therefore, under these circumstances, there would be **no AEoI of the Bristol Channel Approaches SAC in relation to the conservation objectives for harbour porpoise, due to disturbance from all other industries and activities in-combination with the Project**.

Table 7.26 Maximum Potential Disturbance Overlap with the Bristol Channel Approaches SAC Winter Area for All Other Industries and Activities (cells in grey present the unrealistic scenario as noted above)

Other Industries and Activities that Could Be Undertaken on Same Day as Construction of Project within the Bristol Channel Approaches SAC Winter Area	Maximum Area Of Overlap with Bristol Channel Approaches SAC Winter Area (% of Bristol Channel Approaches SAC Winter Area)	Potential Adverse Effect on Site Integrity
White Cross (worst-case area of overlap (Table 7.10))	426.67km^2 (7.29%)	**No** Temporary effect. Displacement of harbour porpoise would not exceed 20% of the seasonal component of the Bristol Channel Approaches SAC area on any given day, based on the worst-case scenario.
Up to one geophysical survey	*256km^2* (4.38%)	
Aggregate and dredging	0km^2 (0%)	
Sub-sea cables and pipelines (X-Links Interconnector 1 & 2)	100.6km^2 (1.72%)	
Coastal works (Hinkley Point C)	0km^2 (0%)	
Oil and gas seismic survey	*2,936.4km^2* (50.19%)	
UXO clearance (high-order)	*2,123.7km^2* (36.30%)	
UXO clearance (low-order)	*78.5km^2* (1.34%)	
Scenario 1 – Total for all projects that are currently (or expected to be) in the planning process (realistic worst-case scenario)	**527.27km^2 (9.01%)**	
Scenario 2 – Total for all projects and activities that may take place (unrealistic scenario)	*5,958.8km^2 (101.85%)*	

Seasonal Average

691. As noted in **Table 7.11**, the worst-case number of days of activity at the Project would be 54 days, assuming only one pile is installed per day, and including two recovery days. This results in a worst-case overall seasonal overlap of 1.55% for the Project.

692. The seasonal average has been calculated by taking into account the maximum potential overlap with Bristol Channel Approaches SAC winter area (**Table 7.26**) on any one day and the estimated maximum number of days within the season on which activities could occur as a proportion of the winter season. The winter season covers a period of 182 days (October-March), however, it has been assumed that for up to 15% of the season, activities would not be taking place due to adverse weather (and therefore there are 155 days where noisy activities could take place).

693. The seasonal averages have been based on the precautionary approach that construction of the Project and other industries and activities would take place in the same winter season.

694. As noted above, two scenarios have been assessed in **Table 7.26**; (1) to include those projects that are currently known (Tier 5 or below) (shown in blue in **Table 7.26**), and (2) to include all potential noise sources undertaking works at the same time as the Project (e.g. UXO clearance) (shown in grey in **Table 7.26**). The second of these scenarios is considered to be unrealistic, and is based on the assumed number and type of activity that may be taking place at the same time as the Project construction, and is therefore not used to inform the overall in-combination assessment. The first of these scenarios is based on only those projects that are currently within (or are expected to be within) the planning application process (i.e. those projects that are currently at Tier 5 or less).

695. The assessment indicates, less than 10% of the seasonal component of the Bristol Channel Approaches SAC over the duration of that season could be disturbed based on the realistic worst-case scenario (**Table 7.27**). Therefore, under these circumstances, there would be **no AEoI of the Bristol Channel Approaches SAC in relation to the conservation objectives for harbour porpoise, due to disturbance from all other industries and activities in-combination with the Project**.

Assessment in Relation to the Celtic and Irish Sea MU

696. **Table 7.28** provides the assessment of all other industries and activities that could be taking place within the CIS MU against the harbour porpoise population.

697. The assessment indicates that 1.1% or less of the CIS MU reference population could be temporarily displaced during noisy activities (other than OWF), based on the worst-case scenario (**Table 7.28**). The temporary disturbance of 5% or less of the CIS MU population would not result in any significant population effects or result in any changes to the FCS of harbour porpoise (JNCC *et al.*, 2010).

698. Therefore, under these circumstances, there would be **no AEoI of the Bristol Channel Approaches SAC in relation to the conservation objectives for harbour porpoise, due to disturbance from all other industries and activities in-combination with the Project**.

Table 7.27 Average Seasonal Disturbance Overlap with the Bristol Channel Approaches SAC Winter Area for All Other Industries and Activities (cells in grey present the unrealistic scenario as noted above)

Other Industries and Activities that Could Be Undertaken in Same Winter Season as Construction of Project	Number of Days of Activity	Seasonal Average Overlap with the Winter Area	Potential Adverse Effect on Site Integrity
White Cross (worst-case area of overlap (Table 7.11))	54	1.55%	**No** Temporary effect. Displacement of harbour porpoise would not exceed 10% of the seasonal component of the Bristol Channel Approaches SAC winter season, based on the worst-case scenario.
Up to one geophysical survey	*155*	*3.73%*	
Aggregate and dredging	0	0%	
Sub-sea cables and pipelines (X-Links Interconnector 1 & 2)	155	1.46%	
Coastal works (Hinkley Point C)	0	0%	
Oil and gas seismic survey	*155*	*42.74%*	
UXO clearance (high-order)	*8 (assuming 5% would be cleared by high-order)*	*1.60%*	
UXO clearance (low-order)	*147 (assuming 95% are cleared by low-order)*	*1.08%*	
Scenario 1 – Total for all projects that are currently (or expected to be) in the planning process (realistic worst-case scenario)		**3.01%**	
Scenario 2 – Total for all projects and activities that may take place (unrealistic scenario)		*52.16%*	

Table 7.28 Quantitative Assessment for Harbour Porpoise for all Noisy Activities (other than OWF) Occurring at the same time as the Construction of the Project (cells in grey present the unrealistic scenario as noted above)

Project / Industry	Harbour porpoise density (/km^2)	Area of Effect (km^2)	Maximum Number of Individuals Potentially Disturbed During All Other Offshore Industries and Activities
White Cross	0.918	706.9	648.9
Geophysical surveys	*0.11*	*512.0*	*56.3*
Aggregates and dredging	0.11	4.52	0.50
Cable and pipelines [X-Links 1 & 2]	0.118	100.6	11.9
Coastal works [Hinkley Point C]	0.118	50.3	5.9
Seismic surveys	*0.11*	*2,936.4*	*323.0*
UXO clearance [high-order]	*0.11*	*2,123.7*	*233.6*
UXO clearance [low-order]	*0.11*	*78.5*	*8.6*
Scenario 1 – Total for all projects that are currently (or expected to be) in the planning process (realistic worst-case scenario)			
Total number of harbour porpoise *(without* the Project*)*			**667.2** *18.3*
Percentage of CIS MU *(without* the Project*)*			**1.07%** *0.03%*
Scenario 2 – Total for all projects and activities that may take place (unrealistic scenario)			
Total number of harbour porpoise *(without the Project)*			*1,249.8* *600.8*
Percentage of CIS MU *(without the Project)*			*2.00%* *0.96%*

7.2.1.5.1.4 Overall In-Combination Underwater Noise Effects for all Offshore Industries and Activities

699. **Table 7.29** provides a summary of the in-combination assessment for all noisy activities, against the spatial and seasonal thresholds of the Bristol Channel Approaches SAC, and against the CIS MU, as assessed in **Sections 7.2.1.5.1.1**, **7.2.1.5.1.2** and **7.2.1.5.1.3** above. This is a highly precautionary assessment based on worst-case scenarios, at every stage precaution and conservatism has been built into the assessment process. Only those activities that are currently expected to take place at the same time as works at the Project have been included, to provide a realistic but still worst-case assessment.

Table 7.29 Quantified CEA for the Potential Disturbance of Marine Mammals from In-combination Underwater Noise Sources During Construction of the Project (Worst Case)

Project and Industry	Spatial (Daily) Overlap with the Bristol Channel Approaches SAC Winter Area (km² (% of Winter Area))	Average Seasonal Overlap with the Bristol Channel Approaches SAC Winter Area ((% of Winter Area)	Assessment Against the CIS MU (Number of Marine Mammals Potentially Disturbed (% of CIS MU))
Worst-case disturbance from the Project	463.51km^2 (7.92%)	1.55%	648.9
Piling at other OWFs	0km^2 (0%)	0%	2,847.9
Construction activities at other OWFs	0km^2 (0%)	0%	293.8
Aggregates and dredging	0km^2 (0%)	0%	0.50
Cable and pipelines	100.6km^2 (1.72%)	1.46%	11.9
Coastal works	0km^2 (0%)	0%	5.9
Total for all noisy activities	**564.11km^2 (9.64%)**	**3.01%**	**3,808.9 (6.09%)**

700. The overall in-combination assessment for disturbance due to underwater noise shows that there would be **no AEoI of the Bristol Channel Approaches SAC in relation to the conservation objectives for harbour porpoise, due to disturbance from all other industries and activities in-combination with the Project**.

7.2.1.5.2 Increased Collision Risk

7.2.1.5.2.1 Increased Collision Risk Due to Vessels

701. The in-combination effects from an increase in the number of vessels and vessel movements can pose a potential collision risk for harbour porpoise.

702. As outlined in **Sections 7.2.1.2.6** and **7.2.1.3.4**, the increased collision risk due to project vessels, even using a very precautionary approach, would result in less than one individual (0.3 harbour porpoise) being at risk of vessel collision per year (**Table 7.21**) for construction phase related vessel collision risk. Less than one (0.12) harbour porpoise per year (**Table 7.22**) would be at risk for operation and maintenance phase related vessel collision risk).

703. As outlined in the **CEMP**, vessel movements, where possible, will be incorporated into recognised vessel routes and hence to areas where harbour porpoise are

accustomed to vessels, in order to reduce any collision risk. All vessel movements will be kept to the minimum number that is required to reduce any potential for collision risk, and with a vessel speed limit of 10 knots. Additionally, vessel operators will use good practice to reduce any risk of collisions with harbour porpoise. It is expected that other offshore projects and industries would follow similar measures in order to reduce the potential for collision risk of harbour porpoise with vessels.

704. As vessel movements to and from any port will be incorporated within existing vessel routes, there would be no increased collision risk as the increase in the number OWF vessels would be relatively small compared to the baseline levels of vessel movements in these areas. Once on-site, OWF vessels and other construction related vessels would be stationary or slow moving, as they undertake the activity they are associated with.

705. Vessels associated with aggregate extraction and dredging are large and typically slow moving, using established transit routes to and from ports. Therefore, the potential increased collision risk with vessels is considered to be extremely low.

706. In addition, based on the assumption that harbour porpoise would be disturbed as a result of underwater noise from piling, other construction activities, operational and maintenance activities and vessels, there should be no potential for increased collision risk with vessels.

707. Therefore, there would be **<u>no AEoI of the Bristol Channel Approaches SAC in relation to the conservation objectives for harbour porpoise</u>**.

7.2.1.5.2.2 Increase in Collision Risk from Wave and Tidal Projects

708. **Appendix 12.B Marine Mammals CEA Screening Report** of the Offshore ES screens for the potential for wave and tidal projects to be operational at the same time as the Project is undergoing construction, or through its operational phase. Three wave or tidal projects have the potential to be operational prior to the construction of the Project, and therefore have the potential for a cumulate effect during both the construction and operation and maintenance phases of the Project. None of those projects are within the Bristol Channel Approaches SAC, however, all are within the CIS MU.

709. For those projects where sufficient information is known, an assessment for the potential for collision risk is provided below (**Table 7.30**). This is based on the assessments undertaken for each of those projects.

Table 7.30 Potential for In-Combination Collision Risk from Vessels at the Project and Wave and Tidal Projects

Project with the Potential for Collision Risk	Project Phase	Summary of Assessments for Collision Risk from the Project and Wave and Tidal Energy Projects for Harbour Porpoise
White Cross	Construction	0.3 at risk of collision
	Operation and Maintenance	0.12 at risk of collision
Morlais[17]	Operation	24.89 at risk of collision
Marine Energy Test Area (META)[18]	Operation	Minor adverse
Perpetuus Tidal Energy Centre (PTEC)[19]	Operation	Minor adverse
Total number of harbour porpoise at risk during construction of the Project (% of reference population)		**25.2 (0.04%)**
Total number of harbour porpoise at risk during operation and maintenance of the Project (% of reference population)		**25.0 (0.04%)**[20]

710. The assessment shows that up to 25.2 harbour porpoise may be at risk of collision in-combination with other projects (**Table 7.30**). It should be noted there is no specific data for META and PTEC, although these projects have been assessed as minor adverse. The majority of the collision risk is from the Morlais project (n=24.89). Morlais is located approximately 222km from the Bristol Channel Approaches SAC, and therefore the potential for collision risk to occur with harbour porpoise associated with the Bristol Channel Approaches SAC is low. With mitigation and management measures which would be applied to wave and tidal projects, the

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[17] ORML1938 MDZ_A31.15 MMC366 MOR-RHDHV-APP-0022 (02) Vol III_Chapter 12.2 Marine Mammals [https://publicregister.naturalresources.wales/Search/Download?RecordId=43392]

[18] ORML1957v2 ES Addendum [https://publicregister.naturalresources.wales/Search/Download?RecordId=90526] & Environmental Statement, Chapter 9 META Marine Mammals , Basking Shark and Otter [https://publicregister.naturalresources.wales/Search/Download?RecordId=22891]

[19] PTEC Environmental Statement, Chapter 13 Marine Mammals [https://marinelicensing.marinemanagement.org.uk/mmofox5/download/parcel/77kt1hpovnuijca2o9nud7dvr36968vtn8vagjn73b9sph5pncp6k40tjkdt5opt2m1l5rr12j0pabhj3fcke8q2n0ng833k403s/df1c3fedc48e332d16470aa88ca31626/Volume+II+ES+Chapters+1+to+16.zip?]

[20] Note that a quantitative assessment was not undertaken for META or PTEC

overall potential for effect would be further reduced. Therefore, there would be **<u>no AEoI of the Bristol Channel Approaches SAC in relation to the conservation objectives for harbour porpoise due to in-combination collision risk</u>**.

7.2.1.5.3 Entanglement

711. For the potential for entanglement, as discussed in **Section 7.2.1.3.5**, harbour porpoise are not expected to be at risk of entanglement with the dynamic cables and mooring lines associated with the Offshore Windfarm Project, due to either direct or secondary entanglement. **Section 7.2.1.3.5** discusses the baseline levels of entanglement of harbour porpoise in the UK due to entanglements in fishing gear. The operation and maintenance of the Project is not expected to increase the rates of entanglement in fishing gear, as it is likely that the presence of the wind farm infrastructure would provide individuals greater opportunity to detect (and avoid) any fishing gear that may be present in the area and caught on the cables associated with the Project.

712. While there is the potential for a number of other floating OWFs to be developed in the Celtic Sea, it is expected that these projects would also not pose a risk of entanglement to harbour porpoise, in line with the reasons outlined above for the Project. In addition, it is expected that all floating wind farms and other marine renewable projects (such as wave and tidal projects) will be required to undertake monitoring to ensure that no fishing gear is caught on the infrastructure, and all Projects would need to undertake such monitoring for infrastructure integrity purposes as well as for management of entanglements, and therefore the risk for any harbour porpoise entanglement to occur is very low.

713. Therefore, it is not expected that would be any potential for an in-combination entanglement risk, and there would be **<u>no AEoI of the Bristol Channel Approaches SAC in relation to the conservation objectives for harbour porpoise due to in-combination entanglement risk</u>**.

7.2.1.5.4 Changes to Prey Availability

714. Potential effects on prey species can result from increased SSCs and sediment re-deposition and underwater noise (leading to mortality, physical injury, auditory injury or behavioural responses); the potential effects on fish species during operation and maintenance can include physical disturbance and loss or changes to sea bed habitat, introduction of hard substrate, operational noise, and EMF. During decommissioning, potential effects on fish species can include physical disturbance, loss or changes to habitat, increased SSCs, re-mobilisation of contaminated sediments and underwater noise. Some of the effects could be adverse with fish

species moving away or being lost from an area, while some effects could have an adverse or beneficial effect, such as possible changes in species composition, and other effects could result in a beneficial effect, such as the aggregation of prey around seabed structures.

715. The potential effects on harbour porpoise as a result of any changes to prey availability can include changes in distribution, abundance and community structure, increased competition with other marine mammal species, increased susceptibility to disease and contaminants, and implications for reproductive success, which could potentially affect individuals throughout their range or at different times of the year. However, any changes to prey tend to be localised and temporary in nature. In addition, if prey species are disturbed from an area, it is highly likely that harbour porpoise will also be disturbed from the area over a potentially wider range than prey species.

716. The in-combination assessment on potential changes to prey availability has assumed that any potential effects on harbour porpoise prey species from underwater noise, including piling, would be the same or less than those for harbour porpoise. Therefore, there would be no additional effects other than those assessed for harbour porpoise, i.e. if prey are disturbed from an area as a result of underwater noise, harbour porpoise will be disturbed from the same or greater area, therefore any changes to prey availability would not affect harbour porpoise as they would already be disturbed from the same area.

717. Any effects on prey species are likely to be intermittent, temporary and highly localised, with potential for recovery following cessation of the disturbance activity. Any permanent loss or changes of prey habitat will typically represent a small percentage of the potential habitat in the surrounding area. Therefore, there would be **no AEoI of the Bristol Channel Approaches SAC in relation to the conservation objectives for harbour porpoise arising due to changes in prey availability**.

7.2.1.6 Summary of Potential Effects on Site Integrity

718. The assessment of the potential effects for the Project has been summarised in relation to the Bristol Channel Approaches SAC conservation objectives for harbour porpoise (**Table 7.31**).

719. The SIP, subject to agreement with SNCBs, will provide mitigation or management measures to reduce the potential for any significant disturbance of harbour porpoise as a result of in-combination effects from underwater noise, to ensure that:

- Displacement of harbour porpoise does not exceed 20% of the seasonal component of the SAC area in any given day or on average exceed 10% of the seasonal component of the SAC area over the duration of that season
- There would be **no AEoI of the Bristol Channel Approaches SAC in relation to the conservation objectives for harbour porpoise either alone or in-combination with other plans and projects**.

7.2.2 Lundy Island SAC

7.2.2.1 Baseline and Current Conservation Status

7.2.2.1.1 Description of Designation

720. The Lundy Island SAC is the largest island in the Bristol Channel, between England and Wales.

721. The Lundy Island SAC is recognised to have a seasonal variation in abundances of grey seal. Grey seals occur within the site year-round due to the area having ideal haul-out sites (JNCC, 2021). With higher abundances in the pupping and moulting season.

- The closest point to the Project's Windfarm Site is approximately 41km from the Lundy Island SAC (**Table 7.32**).

7.2.2.1.2 Qualifying Features

7.2.2.1.2.1 Grey Seal

722. Within the Lundy Island SAC site selection document, grey seal is a qualifying feature of the SAC, not a primary reason for the site selection. It was estimated that Lundy Island SCA supports a breeding colony of approximately 60 individuals, with an increase in this numbers during the summer months (Lundy Field Society, 2021).

723. Counts of grey seal are regularly recorded by the Lundy Field Society the latest report available for which was undertaken in 2020. The peak count of grey seal at Lundy Island SAC was in August 2020, with 218 seals counted (including 47 juveniles and one pup); this was the third highest recorded at Lundy Island SAC since annual surveys started in 2011.

724. The key haul out sites on Lundy Island SAC for grey seal include Seals Rock, Gannets Rock, Brazen Ward, Surf Point, Shutter Point and Rat Island (**Figure 7.5**; Lundy Field Society, 2022). The species in the UK spend longer hauled out during their annual moult (December – April) and during their breeding season (August – December).

Table 7.31 Summary of the Potential Effects of the Project, Including In-Combination Effects on the Bristol Channel Approaches SAC in Relation to the Conservation Objectives for Harbour Porpoise (N/A = Not assessed; - = not relevant for CO; ✗ = no potential for AEoI; ✓ = potential for AEoI)

Conservation Objectives	Physical and permanent auditory injury from underwater noise	Disturbance from Underwater Noise	Vessel Interaction	Entanglement	Barrier Effect	Changes to Water Quality	EMFs	Changes to Prey Resources
The Project Alone Effects								
Harbour porpoise is a viable component of the site	✗	✗	✗	✗	✗	-	✗	-
There is no significant disturbance of the species	-	✗	-	-	-	-	-	-
The condition of supporting habitats and processes and the availability of prey is maintained	-	-	-	-	-	✗	-	✗

Conservation Objectives	Physical and permanent auditory injury from underwater noise	Disturbance from Underwater Noise	Vessel Interaction	Entanglement	Barrier Effect	Changes to Water Quality	EMFs	Changes to Prey Resources
In-combination Effects								
Harbour porpoise is a viable component of the site	N/A	×	×	×	N/A	-	N/A	-
There is no significant disturbance of the species	-	×	-	-	-	-	-	-
The condition of supporting habitats and processes and the availability of prey is maintained	-	-	-	-	-	N/A	-	×

Table 7.32 Distances of the Project to the Lundy Island SAC

Location	Closest point to Lundy Island SAC
Windfarm Site	41km
Export cable corridor	2.2km
Landfall location	29km

Figure 7.5 Key Grey Seal Locations on Lundy Island (Lundy Field Society, 2022)

725. Taking into account the number of grey seals that would not be available to count during the August survey (25.15% of grey seal are estimated to be hauled out during August counts (SCOS, 2021)), the total Lundy Island SAC population is estimated to be 867 individuals.

726. Carter *et al*. (2022) provides habitat-based predictions of at sea distribution for seals around the British Isles. The habitat preference approach predicted distribution maps provide estimates per species, on a 5km^2 grid, of relative at sea density for

seals hauling-out in the British Isles (Figure 12.1, Volume II). It is important to note that Carter *et al.* (2022) provides relative density (i.e. percentage of the total at sea population in each grid at any one time).

727. The grey seal density estimates for Lundy Island SAC have been calculated from the seal at sea usage maps (Carter et al., 2022) based on the 5km x 5km grids that overlap with the SAC. The total grey seal population in the British Isles, at sea, is approximately 168,032 individuals, based on the corrected values and most recent haul-out counts for the UK (SCOS, 2022). This is the population estimate used with the Carter *et al.* (2022) data to calculate density estimates for Lundy Island SAC.

728. The mean at sea relative density estimates (for those grey seal associated with the Lundy Island SAC) for these areas have been calculated from Carter *et al*. (2022):

- 0.005 individuals per km^2 for the Windfarm Site
- 0.197 individuals per km^2 for the Offshore Export Cable Corridor.

729. The mean at sea relative density estimates have also been calculated for the total at-sea individuals, as noted in **Chapter 12: Marine Mammal and Marine Turtle Ecology** of the Offshore ES. The density estimates accounting for all grey seals (rather than just those associated with the Lundy SAC) are:

- 0.005 individuals per km^2 for the Windfarm Site
- 0.119 individuals per km^2 for the Offshore Export Cable Corridor.

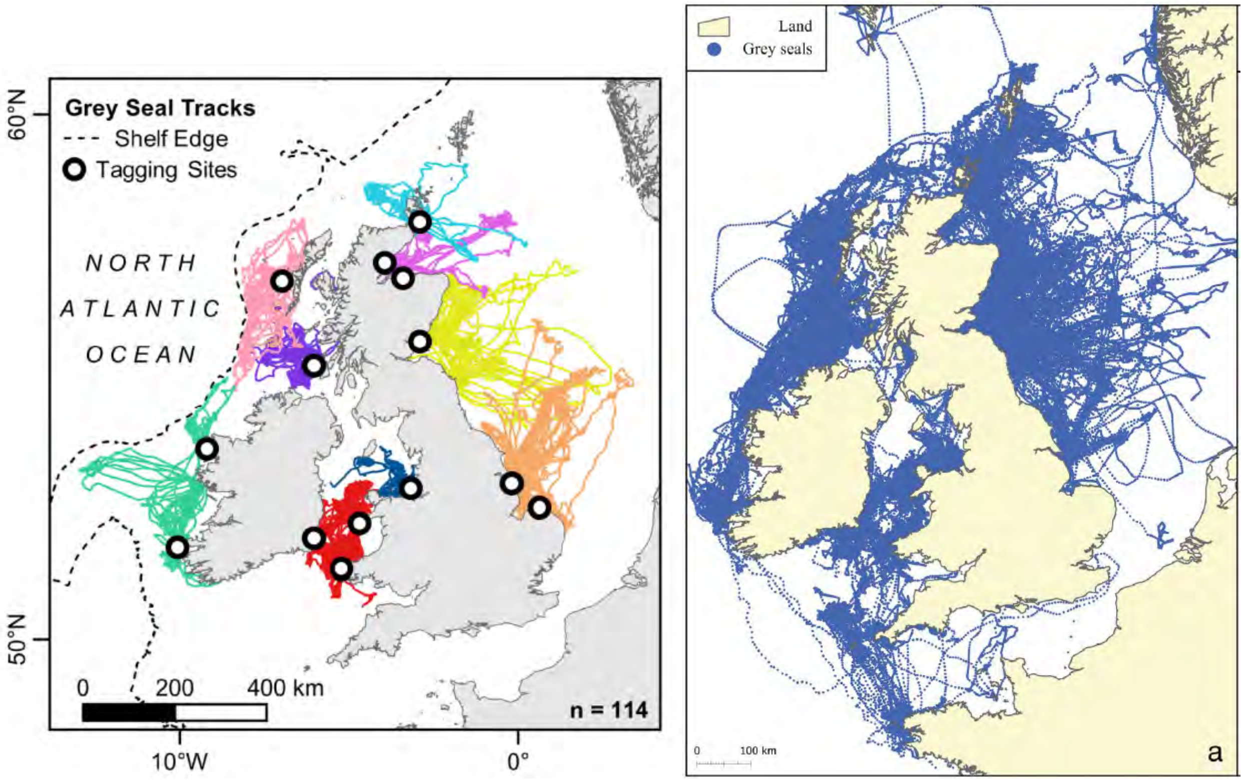
730. Data from the Project's site-specific surveys have also been used to generate abundance and density estimates for the sites with a 4km buffer (for further details see **Chapter 12: Marine Mammal and Marine Turtle Ecology** of the Offshore ES). Grey seal were recorded in March, May and September 2021. The peak raw count of three in March 2021 resulted in an abundance estimate of 23 (CI: 3-61; precision: 0.58) for the Survey Area, and a density estimate of 0.07/km^2.

731. Due to the low number of grey seal sightings, it was not possible to derive robust density and abundance estimates from the site-specific surveys to use in the assessments (for further details see **Chapter 12: Marine Mammal and Marine Turtle Ecology** of the Offshore ES).

732. There is a considerable amount of movement from grey seals among different areas and regional subunits of the British Isles. The grey seal maximum foraging range is estimated to be 448km, based on tracking data (Carter *et al*., 2022). There have been recordings of grey seals moving between haul-out sites in south-west England, Wales, the RoI and Northwest France (e.g. Carter *et al*., 2022; Jones *et al.,* 2015;

Figure 7.6) (for further details see **Chapter 12: Marine Mammal and Marine Turtle Ecology** of the Offshore ES).

Figure 7.6 Left = Grey Seal Tagging Results for 259 Grey Seal from 1991 to 2013 (Jones et al., 2015); Right = GPS Tracking Data for 114 Grey Seal (taken from Carter et al. (2022)



733. As noted above, grey seal at the Project have the potential for connectivity with Wales and RoI. In order to inform the assessments for grey seal at the Lundy Island SAC, a wider population estimate is used. Within the SW England MU, the grey seal count was estimated to be 500, and for the Wales MU, the grey seal count was estimated to be 900 (SCOS, 2020). The grey seal haul out counts for these MUs has been corrected to take account of the number of seals not available to count during the surveys. Approximately 0.2515 grey seals are available to count within the August surveys (i.e. are hauled-out) (SCOS, 2021), and therefore this has been used as a correction factor, to derive total grey seal numbers within each MU, rather than the number counted within each MU. The total population of grey seal within the SW England MU is therefore 1,988, and for Wales the total population is 3,579.

734. Within the RoI, there is identified connectivity with the east, south-east and south-west coast therefore, the wider grey seal reference population will also take into account the population of grey seal in this area. Morris & Duck (2019) undertook

haul out counts around the coast of RoI in August 2017 and 2018, and counted a total of 418, 556, and 792 grey seal within the east, south-east, and south-west survey regions respectively. This gives a total of 1,766 grey seal counted in these regions, or a total grey seal population of 7,022 within these three RoI regions.

735. The total reference population for the assessment is therefore 12,588 grey seal. Assessments will be put into context of the wider reference population (of 12,588). As a worst case it is assumed that all seals present at the Windfarm Site are from the Lundy Island SAC (with an estimated population count of 867, and the SE England MU count (of 1,988), although the more realistic assessment is based on the wider reference population which takes into account the total movement of seals.

736. Grey seals are generalist feeders, foraging mainly on the seabed at depths of up to 100m all across the UK continental shelf, with this depth being within the maximum depth of the Windfarm Site (80m). The species in the UK spend longer hauled out during their annual moult (December – April) and during their breeding season (August – December). There have been recordings of grey seals moving between haul-out sites in Wales and Northwest France to the Inner Hebrides.

7.2.2.1.3 Conservation Status

737. Based on the most recent 2013-2018 reporting by the JNCC, grey seal have a 'favourable' conservation status (JNCC, 2019).

7.2.2.1.4 Conservation Objectives

738. The Conservation Objectives for the Lundy Island SAC are designed to help ensure that the obligations of the Habitats Directive can be met. Article 6(2) of the Habitats Directive requires that there should be no deterioration or significant disturbance of the qualifying species or to the habitats upon which they rely. The Conservation Objectives (Natural England, 2022a) for the Lundy Island SAC are:

739. "To ensure that, subject to natural change, the integrity of the site is maintained or restored as appropriate, and that the site contributes to achieving the Favourable Conservation Status (FCS) for grey seal in UK waters. In the context of natural change, this will be achieved by ensuring that:

- The extent and distribution of qualifying natural habitats and habitats of the qualifying species
- The structure and function (including typical species) of qualifying natural habitats
- The structure and function of the habitats of the qualifying species

- The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely
- The populations of each of the qualifying species
- The distribution of qualifying species within the site."

7.2.2.2 Assessment of Potential Effects During Construction

740. The potential effects during construction of the Project (in relation to grey seal from the Lundy Island SAC) were agreed through the HRA Screening process and the marine mammal related (ETG) consultation, as part of the EPP (see **Table 12.17** of **Chapter 12: Marine Mammal and Marine Turtle Ecology** of the Offshore ES). The potential effects of the Project are assessed to determine any potential for an AEoI of the Lundy Island SAC in relation to the Conservation Objectives for grey seal are:

- Auditory injury and disturbance resulting from underwater noise during impact piling
- Auditory injury and disturbance resulting from underwater noise during UXO clearance
- Auditory injury and disturbance resulting from underwater noise during other construction activities, including seabed preparations, rock placement and cable installation
- Auditory injury and disturbance resulting from underwater noise due to construction vessels
- Barrier effects as a result of underwater noise
- Interaction and Collision Risk with Vessels
- Entanglement
- Disturbance at seal haul-out sites
- Barrier effects due to physical presence
- Electromagnetic Fields (EMFs)
- Changes to prey availability
- Changes to water quality.

7.2.2.2.1 Auditory Injury and Disturbance Resulting from Underwater Noise During Impact Piling

741. There is the potential for impact piling to be used to install pin-piles for the OSP and for the mooring anchors in the Project (see **Section 7.2.1.2.1**). Therefore, impact piling has been fully assessed as it remains an option to be used, and is the worst-case in terms of underwater noise effects to marine mammals.

742. Impact piling is a source of high-level underwater noise. Underwater noise can cause both physiological (e.g. lethal, physical injury and auditory injury) and behavioural (e.g. disturbance and masking of communication) impacts on marine mammals.

7.2.2.2.1.1 Potential for Permanent Auditory Injury (PTS) During Impact Piling

743. Underwater noise modelling was carried out by Subacoustech Environmental Ltd. to estimate the noise levels likely to arise during piling and determine the maximum potential areas of effect (see **Chapter 12: Marine Mammal and Marine Turtle Ecology** and **Appendix 12.A Marine Mammal and Marine Turtle Underwater Noise Modelling Report** of the Offshore ES for further details).

744. The following assessments are based on the worst-case location at each site (i.e. location with greatest noise propagation) for:

- OSP jacket piles – 4.0m diameter piles, installed using a maximum blow energy of 2,500kJ, with a maximum of four piles installed in a 24-hour period
- Mooring anchor pin piles – 2.0m diameter piles, installed using a maximum blow energy of 800kJ, with a maximum of eight piles installed in a 24-hour period (see **Section 7.2.1.2.1.1**).

745. The maximum impact ranges (and areas) are used to inform the assessments. The results of the underwater noise modelling for PTS in grey seal are presented in **Table 7.33** for both OSP jacket piles and mooring pin piles. The PTS cumulative ranges are based on the total piling in a 24-hour period (i.e. up to four OSP jacket piles or up to eight mooring pin piles being installed sequentially (one after another) in a 24 hour period).

746. At the closest point, the Windfarm Site is 41km from Lundy Island SAC and 2.2km from the Offshore Export Cable Corridors. Therefore, there is no direct overlap with the predicted instantaneous permanent auditory injury (PTS SPL_{peak}) for the Windfarm Site itself, for the maximum effect range for PTS (without mitigation) with the Lundy Island SAC (**Table 7.4**). However, there is potential for overlap of cumulative PTS ranges with the Lundy Island SAC.

Table 7.33 Predicted Effect Ranges (and Areas) for PTS from a Single Strike and From Cumulative Exposure for Grey Seals

Species	Potential Effect	Criteria threshold (Southall *et al.*, 2019)	OSP Jacket Pile (4m Diameter) Maximum Impact Range (km) and Area (km^2)	Mooring Pin-Piles (2m Diameter) Maximum Impact Range (km) and Area (km^2)
			Maximum Hammer Energy (2,500kJ)	Maximum Hammer Energy (800kJ)
Grey seal	PTS from single strike (without mitigation)	SPL_{peak} Unweighted (218 dB re 1µPa) Impulsive	<50m (0.01km^2)	<50m (0.01km^2)
	PTS from cumulative SEL (including soft-start and ramp-up)	SEL_{cum} Weighted (185 dB re 1µPa^2s) Impulsive	<100m (<0.1km^2)	<100m (<0.1km^2)

747. The maximum number of grey seal that could be at possible risk of PTS from SEL_{cum} during piling, without any mitigation, could be up to one individual; 0.00005 individuals, (0.000005% of the Lundy Island SAC population) based on the Windfarm Site density for the Lundy Island SAC (of 0.005/km^2). Therefore, less than 0.1% of the population may be at risk of the potential effect, and therefore there would not be a significant effect on the grey seal (**Table 7.34**).

Table 7.34 Maximum Number of Grey Seal (and % of Reference Population) That Could be at Risk of PTS for Jacket Pile or Pin-Pile Installation Without Mitigation, Based on Worst-Case

Species	Criteria and Threshold (Southall *et al.*, 2019)	OSP Jacket Pile with Maximum Hammer Energy of 2,500kJ Maximum Number Of Individuals (% of Reference Population)	Mooring Pin-Pile with Maximum Hammer Energy of 800kJ Maximum Number of Individuals (% of Reference Population)
Single strike at maximum energy without mitigation			
Grey seal	SPL_{peak} Unweighted (218 dB re 1µPa) Impulsive	0.00005 (0.000005% of the Lundy Island SAC population; 0.000002% of the SW MU; 0.0000004% of the combined MU) in the OWF	0.00005 (0.000005% of the Lundy Island SAC population; 0.000002% of the SW MU; 0.0000004% of the combined MU)

Species	Criteria and Threshold (Southall *et al*., 2019)	OSP Jacket Pile with Maximum Hammer Energy of 2,500kJ Maximum Number Of Individuals (% of Reference Population)	Mooring Pin-Pile with Maximum Hammer Energy of 800kJ Maximum Number of Individuals (% of Reference Population)
PTS from cumulative exposure without mitigation			
Grey seal	SEL$_{cum}$ Weighted (185 dB re $1\mu Pa^2s$) Impulsive	0.0005 (0.00006% of the Lundy Island SAC population; 0.00003% of the SW MU; 0.000004% of the combined MU)	0.0005 (0.00006% of the Lundy Island SAC population; 0.00003% of the SW MU; 0.000004% of the combined MU)

748. As outlined in **Section 7.1.1**, a MMMP for piling in accordance with the **Appendix 12.C: Draft MMMP** of the Offshore ES will be produced post-consent in consultation with the MMO and relevant SNCBs, and will be based on the latest scientific understanding and guidance, as well as detailed Project design. The implementation of the agreed mitigation measures within the MMMP for piling will reduce the risk of PTS from the first strike of the soft-start, single strike of the maximum hammer energy and cumulative exposure. The MMMP for piling will be developed post-consent in consultation with the MMO and other relevant organisations (including Natural England) and will be based on the latest information, scientific understanding and guidance, as well as detailed project design.

749. Mitigation to further reduce the risk of PTS from cumulative exposure during installation of mooring structures would include mitigation for the maximum potential impact range (which is up to 4.6km for grey seal; **Table 7.8**). Mitigation measures such as increasing the activation of ADDs prior to the soft-start to 62 minutes prior to start of OSP jacket piling, or up to 31 minutes prior to the start of mooring pin pile piling, which would ensure grey seal were outside of the PTS cumulative effect ranges prior to piling.

750. Development of the MMMP (in accordance with the **Appendix 12.C: Draft MMMP** of the Offshore ES) prior to construction will also consider other mitigation methods based on the latest information and requirements.

751. The effective implementation of the MMMP for piling will reduce the risk of PTS to grey seal during piling at the Windfarm Site. Therefore, there would be **<u>no AEoI of the Lundy Island SAC in relation to the conservation objectives for grey seals, due to PTS from piling during construction</u>**.

7.2.2.2.1.2 Potential for Disturbance Resulting from Underwater Noise During Impact Piling

752. There are currently no agreed thresholds or criteria for modelling the potential disturbance of marine mammal species from underwater noise. For marine mammals, including grey seal, a fleeing response is assumed to occur at the same noise levels as TTS.

753. A review of the potential for effect to grey seal due to piling activities is provided in **Section 12.7.1.3.3.4** of the **Chapter 12 Marine Mammal and Marine Turtle Ecology** of the Offshore ES. There is limited information on the potential disturbance range of seals from piling, however, tagged harbour seals in the Wash indicated that seals were not excluded from the vicinity of the Lincs windfarm during the overall construction phase but that there was clear evidence of avoidance during impact pile driving, with significantly reduced levels of seal activity at ranges of up to 25km from piling sites (Russell *et al*., 2016). However, within two hours of cessation of piling, seal distribution returned to pre-piling levels (Russell *et al.,* 2016). This range has been used to determine the number of grey seal that may be disturbed during piling at the Project due to a similar responsiveness between the species.

754. Up to 10 grey seal may be disturbed from piling (or 1.1% of the Lundy Island SAC population) based on the Windfarm Site density for the Lundy Island SAC or for the total at-sea population (of 0.005/km^2) (**Table 7.35**).

Table 7.35 Maximum Number of Grey Seal (and % of Reference Population) that could be Disturbed During Piling at the Project based on their Known Disturbance Range

Species	Known Disturbance Range for Piling	Maximum Number of Individuals (% of Reference Population)
Grey seal	25km (Russell *et al*., 2016)	9.8 (1.1% of the Lundy Island SAC population; 0.49% of SW MU; 0.08% of the combined MU)

755. Mitigation to reduce the risk of PTS could include activation of ADDs prior to the soft-start commencing. Based on the worst-case of ADD activation of 62 minutes, this would disturb grey seal over 5.58km. Up to 0.5 grey seal (0.06% of the Lundy Island SAC population; 0.03% of SW MU; 0.004% of the combined MU) could be disturbed due to ADD activation of 62 minutes for OSP jacket piles.

756. Temporary effects that could affect 5% or less of the population are not considered to have the potential to have long term significant impacts on the population. In assigning 5% to a temporary impact in this assessment, consideration is given to uncertainty of the individual consequences of temporary disturbance.

757. Disturbance during piling would be temporary and for a relatively short duration (i.e. during active piling). It is unlikely that all grey seal potentially affected would be from the Lundy Island SAC, which is located over 41km from the Windfarm Site (at closest point).

758. With 1.1% of the Lundy Island SAC count temporarily disturbed (or 0.5% of the SW MU; or 0.08% of the combined MU), there would be **no AEoI of the Lundy Island SAC in relation to the conservation objectives for grey seal due to disturbance from increased underwater noise during construction (piling)**.

7.2.2.2.2 Auditory Injury and Disturbance Resulting from Underwater Noise During UXO Clearance

759. The precise details and locations of potential UXO are unknown at this time. For the purposes of the underwater noise modelling and this assessment, three UXO clearance scenarios have been considered:

- High-order detonation, unmitigated
- High-order detonation, with bubble curtain
- Low-order clearance (e.g., deflagration).

760. For further information on the three UXO clearance scenarios, see **Appendix 12.A: Marine Mammal and Marine Turtle Underwater Noise Report** of the Offshore ES.

7.2.2.2.2.1 Potential for Auditory Injury and Disturbance Resulting from Underwater Noise During UXO Clearance

761. Prior to construction, there is the potential for UXO clearance to be required. While any identified UXO will either be avoided or removed and disposed of onshore in a designated place, there is the potential that underwater detonation could be required where it is necessary and unsafe to remove the UXO.

762. In order to undertake any UXO clearance, a marine licence is required from the MMO under the Marine and Coastal Access Act 2009. In addition, the clearance of UXO by detonation will require an EPS Licence under the Conservation of Offshore Marine Habitats and Species Regulations 2017.

763. The following assessment has been provided for information purposes only.

764. A separate Marine Licence application will be submitted when a detailed UXO survey has been completed prior to construction and a detailed assessment based on the latest available information has been undertaken.

765. The precise details and locations of potential UXO are unknown at this time. For the purposes of the underwater noise modelling and this assessment, three UXO clearance scenarios have been considered:

- High-order detonation, unmitigated
- High-order detonation, with bubble curtain
- Low-order clearance (e.g., deflagration).

766. For further information on the three UXO clearance scenarios, see **Appendix 12.A: Marine Mammal and Marine Turtle Underwater Noise Report** of the Offshore ES.

7.2.2.2.2.2 Potential for Permanent Auditory Injury (PTS) During UXO Clearance

767. The maximum effect ranges (and areas) are used to inform the assessments. The results of the underwater noise modelling for PTS in grey seal are presented in **Table 7.36** for both low-order and high order clearances. The number of individuals at risk for the worst-case scenario and low-order clearance are also shown in **Table 7.36** for PTS, based off the grey seal at-sea densities for individuals associated with the Lundy Island SAC (assessments are made for both the Windfarm Site and ECC densities, as UXO clearance could take place in either).

768. For high-order clearance, there is the potential for PTS at up to 2.0km from the UXO clearance location, and for low-order clearance, there is the potential for PTS to occur at up to 0.39km from the UXO clearance location. At the closest point the Windfarm Site is 2.2km from the Lundy Island SAC, therefore, there would be no direct overlap with the Windfarm Site and ECC for PTS effects to grey seal (**Table 7.36**).

769. The maximum number of grey seal that could be at possible risk of PTS (SPL_{peak}) during high-order UXO clearance, without any mitigation, could be up to three individuals (0.29% of the Lundy Island SAC, or 0.02% of the combined MU population) (**Table 7.36**). The maximum number of grey seal that could be at possible risk of PTS due to low-order clearance is up to one (0.09) individual (0.011% of the Lundy Island SAC, or up to 0.001% of the combined MU population) based on the highest density for the EEC (**Table 7.36**).

770. A MMMP for UXO clearance will be produced as part of the UXO Marine Licence application process. The implementation of the agreed mitigation measures within the MMMP for UXO clearance will reduce the risk of PTS from all UXO clearance options. The MMMP will be based on the latest information, scientific understanding and guidance, as well as detailed project design.

Table 7.36 Maximum Number of Grey Seals Potentially at Risk of PTS During UXO Clearance

Species	Maximum Effect Range (and Area)	Maximum Number of Individuals	% of Reference Population	Potential Adverse Effect on Site Integrity
PTS during UXO clearance				
Grey seal	High-order detonation (309kg (NEQ) + donor charge) 2.0km (12.57km^2)	2.5 based on the Lundy Island SAC ECC density estimate 0.06 based on the Lundy Island SAC Windfarm Site density estimate	0.29% of the Lundy Island SAC population; 0.12% of the SW MU, and 0.02% of the combined MU, based on the Lundy Island SAC ECC density estimate. 0.007% of the Lundy Island SAC population; 0.003% of the SW MU, and 0.0005% of the combined MU, based on the Lundy Island SAC Windfarm Site density estimate.	**No** Permanent effect. 0.3% or less of the reference population could be at risk of permanent auditory injury (PTS) during UXO, based on the worst-case scenario.
	Low-order clearance (2kg (NEQ)) 0.39km (0.48km^2)	0.09 based on the Lundy Island SAC ECC density estimate 0.002 based on the Lundy Island SAC Windfarm Site density estimate	0.011% of the Lundy Island SAC population; 0.005% SW MU, and 0.0008% of the combined MU, based on the Lundy Island SAC ECC density estimate. 0.0003% of the Lundy Island SAC population; 0.0001% of the SW MU, and 0.00002% of the combined MU, based on the Lundy Island SAC Windfarm Site density estimate.	

771. Mitigation to further reduce the risk of instantaneous PTS from UXO clearance would include activation of ADDs prior to a UXO clearance. The maximum PTS effect range is for harbour porpoise (11km for a high-order clearance) (**Table 7.8**), and based on a swimming speed of 1.5m/s, the ADDs would be activated for 123 minutes to ensure harbour porpoise had moved beyond the maximum predicted impact range (up to a distance of 11.07km for 123 minute ADD activation). Grey seal travelling speed is the same as that of harbour porpoise, and therefore grey seal would have ample time to flee to a distance outwith the maximum PTS onset range of 2km.

772. At present, it is not known what size of UXO (if any) will be required to be cleared, and it is possible that a device as large as the worst-case assessed will not be present. The final decision on mitigation options and clearance methods for UXO will be determined at the point of Marine Licence application, once further information on the type, size, and location of devices is known.

773. At the closest point the Windfarm Site is 41km from the Lundy Island SAC and the Offshore Export Cable Corridors is 2.2km outside of the SAC. There is therefore no direct overlap in the potential PTS ranges for UXO clearance with the Lundy Island SAC.

774. Due to the very low number of grey seal at risk of PTS onset, and that mitigation would be in place, there would be **no AEoI of the Lundy Island SAC in relation to the conservation objectives for grey seals, due to PTS from UXO clearance during construction**.

7.2.2.2.2.3 Potential for Disturbance Resulting from Underwater Noise During UXO Clearance

775. For marine mammal species, there is currently no agreed threshold for disturbance from underwater noise, however, a fleeing response is assumed to occur at the same noise levels as TTS. As outlined in Southall *et al.* (2007), the onset of behavioural disturbance is proposed to occur at the lowest level of noise exposure that has a measurable transient effect on hearing (i.e. TTS). Although, as Southall *et al.* (2007) recognise that this is not a behavioural effect *per se*, exposures to lower noise levels from a single pulse are not expected to cause disturbance. However, any compromise, even temporarily, to hearing functions could have the potential to affect behaviour.

776. The use of the TTS threshold is appropriate for UXO disturbance, because the noise from the UXO explosion is only fleetingly in the environment. Therefore, the assumption is that although noise levels lower than TTS threshold may startle the individual, this has no lasting effect. TTS results in a temporary reduction in hearing

ability, and therefore may affect the individuals' fitness temporarily (as recommended in Southall *et al.* (2007) for a single pulse).

777. As outlined in Southall *et al.* (2021), thresholds that attempt to relate single noise exposure parameters (e.g. received noise level) and behavioural response across broad taxonomic grouping and sound types can lead to severe errors in predicting effects. Differences between species, individuals, exposure situational context, the temporal and spatial scales over which they occur, and the potential interacting effects of multiple stressors can lead to inherent variability in the probability and severity of behavioural responses.

778. The assessments for TTS / fleeing response have therefore been used for assessing the potential disturbance ranges for UXO clearance.

779. The maximum effect ranges (and areas) are used to inform the assessments. The results of the underwater noise modelling for TTS / fleeing response in grey seal are presented in **Table 7.37** for both low-order and high order clearances. The number of individuals at risk for the worst-case scenario and low-order clearance are also shown in **Table 7.37**. For TTS / fleeing response, based on the grey seal at-sea densities for individuals associated with the Lundy Island SAC (assessments are made for both the Windfarm Site and ECC densities, as UXO clearance could take place in either).

780. For high-order clearance, there is the potential for TTS / fleeing response at up to 16.0km from the UXO clearance location, and for low-order clearance, there is the potential for TTS / fleeing response to occur at up to 1.5km from the UXO clearance location. At the closest point the Windfarm Site is 2.2km from the Lundy Island SAC, therefore, there would be no direct overlap with the Windfarm Site and ECC for TTS / fleeing response effects to grey seal from a low-order clearance, however there could be due to a high-order clearance (**Table 7.37**).

781. The maximum number of grey seal that could be at possible risk of TTS / fleeing response during high-order UXO clearance, without any mitigation, could be up to 159 individuals (18.3% of the Lundy Island SAC, or 1.3% of the combined MU population) (**Table 7.37**). The maximum number of grey seal that could be at possible risk of TTS / fleeing response due to low-order clearance is up to two (1.4) individuals (0.16% of the Lundy Island SAC, or up to 0.01% of the combined MU population) based on the highest density for the EEC (**Table 7.37**).

782. At present, it is not known what size of UXO (if any) will be required to be cleared, or at which location within the Projects areas, and it is possible that a device as large as the worst-case assessed will not be present, or that one will not be present

within the ECC where the highest risk to grey seal for TTS / fleeing response is. The final decision on mitigation options and clearance methods for UXO will be determined at the point of Marine Licence application, once further information on the type, size, and location of devices is known. However, it should be noted that high-order clearance would not take place unless low-order is not possible. Therefore, the assessment for the low-order clearance is likely to be the most realistic assessment.

783. While the assessments for a high-order clearance show that up to 18.3% of the Lundy Island SAC population of grey seal may be disturbed, this would only be for devices cleared in the ECC, and at the highest potential charge weight, and, as noted above, it is unlikely that high-order clearance would be required. It is also important to note that grey seal movements and foraging ranges are large, and therefore an assessment against the wider combined MU population is likely to more realistically reflect the potential for significant disturbance within the wider population. The assessments show that for the worst-case of a high-order clearance, at the maximum charge weight, and in the ECC, would cause a disturbance to up to 1.3% of the wider population. This would therefore not cause a significant level of disturbance to grey seal, and there would be **no AEoI of the Lundy Island SAC in relation to the conservation objectives for grey seals, due to disturbance from UXO clearance during construction**.

784. Note that a full assessment of the potential for UXO clearance to have a significant effect on grey seal (as well as designated sites) would be undertaken once further detail is known on the location, size, and clearance method required for any UXO at the Project, as part of the separate Marine Licence process, and therefore the assessments made prior to application would represent a realistic worst-case scenario and more accurate assessment of potential significance.

7.2.2.2.3 Auditory Injury and Disturbance Resulting from Underwater Noise during Other Construction Activities

785. Potential sources of underwater noise during construction activities, other than piling, include backhoe dredging, suction dredging, drag embedment anchors, suction piling, rock placement, trenching and cable installation.

786. Underwater noise modelling was undertaken to assess the potential effect ranges of construction activities, other than piling, on grey seals, and this has been used to determine the potential area of effect (for further information see **Chapter 12: Marine Mammal and Marine Turtle Ecology** and **Appendix 12.A: Marine Mammal and Marine Turtle Underwater Noise Report** of the Offshore ES).

Table 7.37 Maximum Number of Grey Seals Potentially at Risk of TTS During UXO Clearance

Species	Maximum Effect Range (and Area)	Maximum Number of Individuals	% of Reference Population	Potential Adverse Effect on Site Integrity
TTS during UXO clearance				
Grey seal	High-order detonation (309kg (NEQ) + donor charge) 16.0km (804.25km^2)	158.4 based on the on the Lundy Island SAC ECC density estimate 4.0 based on the on the Lundy Island SAC Windfarm Site density estimate	18.3% of the Lundy Island SAC population; 8.0% of the SW MU, and 1.3% of the combined MU, based on the ECC density estimate. 0.46% of the Lundy Island SAC population; 0.20% of the SW MU, and 0.03% of the combined MU, based on the Windfarm Site density estimate.	**No** Temporary effect. 1.3% or less of the reference population (or up to 18.3% of the Lundy Island SAC population) could be temporarily displaced during UXO, based on the worst-case scenario.
	Low-order clearance (2kg (NEQ)) 1.5km (7.07km^2)	0.04 based on the on the Lundy Island SAC ECC density estimate 1.4 based on the on the Lundy Island SAC Windfarm Site density estimate	0.16% of the Lundy Island SAC population; 0.07% of the SW MU, and 0.01% of the combined MU, based on the ECC density estimate. 0.004% of the Lundy Island SAC population; 0.002% of the SW MU, and 0.0002% of the combined MU, based on the Windfarm Site density estimate.	

787. For SEL_{cum} calculations, the duration of noise is also considered, with all sources operating for a worst-case of 12 hours in any given 24-hour period for non-impulsive noise.

7.2.2.2.3.1 Potential for Permanent Auditory Injury (PTS) During Other Construction Activities

788. To account for the weightings required for modelling using the Southall *et al.* (2019) criteria, reductions in source level have been applied to the various noise sources (see **Appendix 12.A: Marine Mammal and Marine Turtle Underwater Noise Report** of the Offshore ES for further information).

789. The cumulative PTS impact ranges are to the nearest 10m. However, they are likely to be less than 10m. The results of the underwater noise modelling (**Table 7.33**) indicate that grey seals would have to be less than 10m (precautionary maximum range) from the continuous noise source for 24 hours, to be exposed to noise levels that could induce PTS based on the Southall *et al*. (2019) non-impulsive thresholds and criteria for SEL_{cum}.

790. PTS is unlikely to occur in grey seal, as the modelling indicates that grey seal would have to remain less than 10m for 12 hours in any given 24-hour period for any potential risk of PTS. Therefore, PTS as a result of construction activity, other than piling, is highly unlikely and has not been further assessed.

791. While there is the potential that more than one of these activities could be underway at either site or the Offshore Export Cable Corridor area at the same time. Due to the very localised effect area and that grey seal would have to be within 10m of the source for 12 hours, it is considered highly unlikely that any individuals would be at risk of PTS, and there would be **no AEoI of the Lundy Island SAC in relation to the conservation objectives for grey seal, due to PTS from construction activities other than piling**.

7.2.2.2.3.2 Potential for Disturbance Resulting from Underwater Noise During Other Construction Activities

792. The maximum duration for the offshore construction period is up to 16 months. However, construction activities would not be underway constantly throughout this period. The duration of offshore export cable installation and trenching activities is expected to take place over a two to six month period, and take a total of 91 days per construction year.

793. The potential effects that could result from underwater noise during other construction activities, including cable laying and protection would be temporary in nature, not consistent throughout the offshore construction periods and would be limited to only part of the overall construction period and area at any one time.

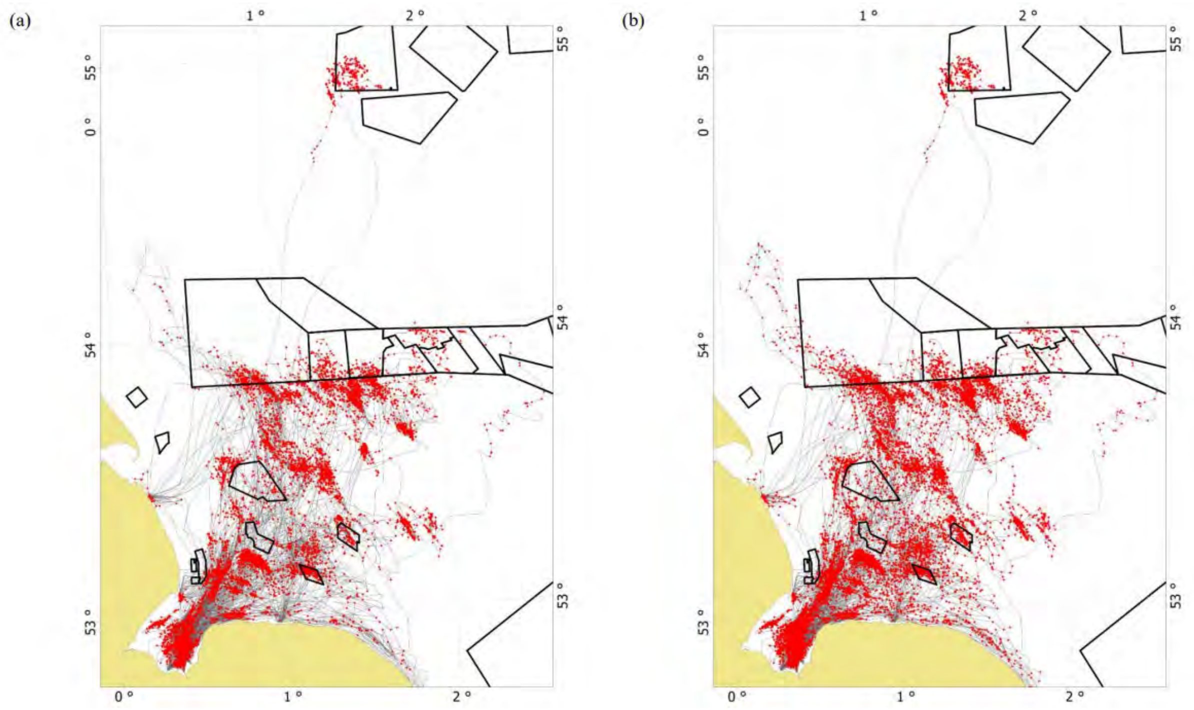
794. The noise levels generated by the majority of the other construction activities are not significantly higher than the noise levels associated with vessels (e.g. drag embedment anchor installation, cable laying, trenching, backhoe dredging, and rock placement). These construction activities have source levels of <172dB re 1 μPa @ 1m (rms), compared to a source level of 168dB re 1 μPa@ 1m (rms) for a large vessel (**Appendix 12.A: Marine Mammal and Marine Turtle Underwater Noise Report** of the Offshore ES).

795. If the behavioural response is displacement from the area, it is predicted that grey seals will return once the activity has been completed and any impacts from underwater noise as a result of construction activities other than piling noise will be both localised and temporary. Therefore, there is unlikely to be the potential for any significant impact on grey seal.

796. There is limited data on the potential for a behavioural response or disturbance from other construction activities (or other continuous noise sources). One study recorded a significant behavioural response on a single harbour seal at a received level of 100 to 110dB re 1 μPa (rms), although other studies found no response much higher received levels of up to 140dB re 1 μPa (rms) (Southall *et al.,* 2007).

797. In 2012, 25 harbour seal from The Wash were tagged, as well as a further 10 from the Thames (Russell, 2016). Of those, 24 of the tags were in place for sufficient time to determine key foraging areas of harbour seal in the southern North Sea. The results of this study show foraging activity of harbour seal off the coast off Norfolk (**Figure 7.7**; Russell, 2016). The results of this tagging study show foraging activity (in red) within Sheringham Shoal OWF which was undergoing construction, with turbine installation undertaken from 2011 to 2012, and cabling works from 2010 to 2012. This indicates that harbour seal would still undertake foraging activity during wind farm construction activities.

Figure 7.7 The Tracks (Grey) and Estimated Foraging Locations (Red) of Tagged Harbour Seals in Geo- (a) and Hydro- (b) Space (Russell, 2016)



798. As stated in **Section 7.2.1.2.3.2**, harbour seal were found to be disturbed up to a distance of 4km due to offshore construction activities (Benhemma-Le Gall *et al.,* 2021). As harbour porpoise are the most sensitive marine mammal species, this 4km potential disturbance range (with a potential effect area of 50.3km^2) has been used to also inform the assessment for grey seal, due to the absence of grey seal data to inform an assessment and the similarity in responsiveness between the species.

799. **Table 7.38** presents the assessments for the maximum number of grey seal that could be disturbed due to construction activities other than piling. As a worst-case scenario, the number of grey seal that could be disturbed from the area around the Windfarm Site has been estimated for either one activity at a time, or up to seven at the same time.

800. The assessment indicates that 0.3% or less of the combined reference population (or 3.5% of the Lundy Island SAC population) (**Table 7.38**) could be temporarily displaced during other offshore construction activities, based on the worst-case scenario of up to seven activities taking place at the same time. The temporary disturbance of 5% or less of the combined population, or of the Lundy Island SAC population, would not result in any significant population effects or result in any changes to the FCS of grey seal (JNCC *et al.*, 2010).

Table 7.38 Maximum Number of Grey Seal Potentially Disturbed During Construction Activities Other Than Piling

Species	Construction Activity	Maximum Number of Individuals (% of Reference Population)	Potential Adverse Effect on Site Integrity
Grey seal	One offshore construction activity (50.3km^2)	0.25 (0.03% of the Lundy Island SAC population; 0.01% of the SW MU; 0.002% of the combined MU) based on the on the Lundy Island SAC windfarm density estimate 9.9 (1.1% of the Lundy Island SAC population; 0.50% of the SW MU; 0.08% of the combined MU) based on the on the Lundy Island SAC ECC density estimate	**No** Temporary effect. 0.3% or less of the reference population (or up to 3.5% of the Lundy Island SAC population) could be temporarily displaced during construction activities other than piling, based on the worst-case scenario.
	Up to seven offshore construction activities (three in the ECC, plus four in the Windfarm Site) (351.86km^2)	30.7 (3.5% of the Lundy Island SAC population; 1.5% of the SW MU; 0.24% of the combined MU) based on the on the Lundy Island SAC density estimates	

801. Therefore, there would be **no AEoI of the Lundy Island SAC in relation to the conservation objectives for grey seals due to disturbance during construction activities other than piling**.

802. No additional mitigation is required or proposed for underwater noise for construction activities, other than piling.

7.2.2.2.4 Auditory Injury and Disturbance Resulting from Underwater Noise Due to Construction Vessels

7.2.2.2.4.1 Potential for Permanent Auditory Injury (PTS) Due to Construction Vessels

803. To account for the weightings required for modelling using the Southall *et al.* (2019) criteria, reductions in source level have been applied to the various noise sources (see **Appendix 12.A: Marine Mammal and Marine Turtle Underwater Noise Report** of the Offshore ES for further information).

804. The results of the underwater noise modelling indicate that grey seal would have to be less than 10m (precautionary maximum range) from the vessel for 24 hours, to be exposed to noise levels that could induce PTS based on the Southall *et al*. (2019) thresholds and criteria.

805. While there is the potential that up to five vessels could be present at the Project at the same time, given the very localised effect area and that grey seal would have to be within 10m of the source for 24 hours. It is therefore considered highly unlikely that any grey seal would be at risk of PTS, and there would be **no AEoI of the Lundy Island SAC in relation to the conservation objectives for grey seal due to PTS from construction vessels**.

7.2.2.2.4.2 Potential for Disturbance Resulting from Underwater Noise from Construction Vessels

806. Disturbance from vessel noise could occur where increased noise from construction vessels associated is greater than the background ambient noise.

807. Pinnipeds vary in their reaction to vessels depending on vessel type and proximity to haul out sites; however, disturbance (flushing behaviour) has been demonstrated at haul-out sites in the UK up to 200m away if there are pups present (Cates & Acevedo-Gutiérrez, 2017). Land-based disturbance has been shown to cause higher levels of disturbance compared to marine sources, and smaller, quiet vessels like kayaks can cause the highest levels of flushing behaviour (Bonner, 2021). In areas of high vessel traffic, there are habituation effects and disturbance behaviour is generally reduced (Strong *et al.,* 2010). A 2019 study on harbour seals in Scotland found that 30 minutes after a disturbance event, seals return to 52% pre-disturbance levels at haul-out sites and 94% four hours after disturbance (Paterson, 2019).

808. Jones *et al.* (2017) produced usage maps characterising densities of grey seals and ships around the British Isles, which were used to produce risk maps of seal co-occurrence with shipping traffic. The analysis indicates that rates of co-occurrence were highest within 50km of the coast, close to seal haul outs. When considering exposure to shipping traffic in isolation, the study found no evidence relating to declining seal population trajectories with high levels of co-occurrence between seals and vessels. For example, in areas of east England where the grey seal population is increasing there are high intensities of vessels (Duck and Morris, 2016; Jones *et al.*, 2017).

809. The maximum duration for the offshore construction period, including piling and export cable installation, is up to 16 months. Therefore, it is assumed that construction vessels for the Project will be present for up to 16 months, however, it is likely that construction activity will only take place on approximately 90 days within that period, with up to 101 vessel transits per year.

810. If the behavioural response is displacement from the area, evidence suggest that grey seal will return once the activity has been completed, and therefore any impacts from underwater noise as a result of construction vessels will be both localised and temporary. Therefore, there is unlikely to be the potential for any significant disturbance effect on grey seal. Given the limited number of vessels expected to be present during the construction of the Project, and that grey seal do not appear to be sensitive to disturbance from vessels, there would be **no AEoI of the Lundy Island SAC in relation to the conservation objectives for grey seal due to disturbance from construction vessels**.

7.2.2.2.5 Barrier Effects as a Result of Underwater Noise

811. Underwater noise during construction could have the potential to create a barrier effect, preventing movement of grey seal between feeding and / or breeding areas, or potentially increasing swimming distances if grey seal avoid the site and travel around it.

812. The greatest potential barrier effect for grey seal would be from underwater noise during piling at the Project. However, piling would not be constant during the piling phases and construction periods. There will be gaps between the installations of individual piles, and if installed in groups there could be time periods when piling is not taking place as piles are brought out to the site. There will also be potential delays for weather or other technical issues.

813. The maximum duration of any barrier effects would be for the maximum piling duration, based on worst-case scenarios, see **Table 7.3** for further details.

814. There is unlikely to be the potential for any barrier effects from underwater noise for other construction activities and vessels, as it is predicted that grey seal will return once the activity has been completed and therefore any impacts from underwater noise as a result of construction activities other than piling noise will be both localised and temporary. Therefore, there is unlikely to be the potential for any barrier effects that could significantly restrict the movements of grey seal.

815. Grey seals are wide ranging, travelling at distances of up to 448km to get to foraging sites (Carter, 2022). Therefore, if there are any potential temporary barrier effects from underwater noise during construction, grey seal would be able to compensate by travelling to other foraging areas within their range. There is unlikely to be any significant long-term impacts from any barrier effects, as any areas affected would be relatively small in comparison to the range of grey seal and would not be continuous throughout the offshore construction period.

816. Therefore, there would be no significant disturbance of grey seal and **no AEoI of the Lundy Island SAC in relation to the conservation objectives for grey seal due to potential barrier effects from increased underwater noise during construction for The Project**.

7.2.2.2.6 Interactions and Collision Risk with Vessels

817. During the offshore construction phase there will be an increase in vessel traffic within and on transit to the offshore sites. However, it is anticipated that vessels would follow an established shipping route to the relevant ports in order to minimise vessel traffic in the wider area. The **Appendix 12.C: Draft MMMP** of the Offshore ES will provide details on vessel good practice and code of conduct that will be implemented to avoid marine mammal collisions.

818. The approximate number of vessels on site at any one-time during construction is estimated to be five vessels, with an average of approximately six trips per month, resulting in a daily average of approximately 0.2 vessel movements, based on 101 vessel movements over a 16-month offshore construction period. The baseline conditions indicate an already relatively high level of shipping activity in and around the offshore sites. Shipping and navigation data indicate ten existing main routes within the study area, with three routes overlapping the Windfarm Site. The number of vessels on these main vessel routes could be up to 80 vessels per month (three per day) intersecting the Windfarm Site and up to 650 vessels per month (22 per day) intersecting the offshore cable corridor (see **Chapter 15: Shipping and Navigation** of the Offshore ES).

819. As described within the **Appendix 15.A: Navigational Risk Assessment** of the Offshore ES there is an existing relatively high level of vessel traffic within the navigational study area (offshore study area plus 10km buffer), including areas close to the coastline. Vessel traffic analysis undertaken for April 2021 to March 2022 showed a total of between 20 and 80 vessel transits through the Windfarm Site, and between 250 and 500 vessels transited through the Study Area, per month (or up to nine and up to 17 vessel transits per day, respectively). Within the ECC, there were up to 600 vessel transits per month in the summer period (or 20 vessel transits per day), which was significantly more than during the winter period, with less than 350 transits per month (or up to 12 vessel transits per day).

820. With a peak of five vessels (or up to ten vessel transits) expected to be on site at any one time during the construction period, there will be approximately a 56% increase in the daily vessel presence within the Study Area, as a worst-case, and approximately a 25% increase or 42% of the ECC vessel presence during the summer and winter periods respectively.

821. See **Section 7.2.1.2.6** for further information on the current vessel usage of the area.

822. There is lack of data looking and grey seal and vessel interactions. Grey seal are vulnerable to vessel collisions throughout their range, but the risk is much higher in coastal areas with heavy vessel traffic.

823. In 2016, SMRU conducted a study to determine the likelihood of harbour seal injury occurring due to co-presence with large vessels within the Moray Firth (Onoufriou *et al.,* 2016). This study used telemetry data of harbour seal within the Moray Firth, alongside vessel AIS data. The data indicated vessel and seal co-occurrence was high (defined as over 2,500 co-occurrence minutes per year) in very localised areas. However, there appeared to be no relationship between areas of high co-occurrence and incidences of injury (Onoufriou *et al.,* 2016). While this study is focused on harbour seal rather than grey seal, it has been included as additional background as could provide an indication as to the relationship between vessels and collision with grey seal.

824. Predictability of vessel movement by marine mammals is known to be a key aspect in minimising the potential risks imposed by vessel traffic (Nowacek *et al.,* 2001, Lusseau, 2003, 2006).

825. Strandings data was collated for grey seal as it was for harbour porpoise (described in **Section 7.2.1.2.6**), from SMASS, CSIP, and CWT. For grey seal, there were a total of 417 individuals where there was a cause of death established. Of these, none were as a result of physical trauma following probable impact from a ship or boat (**Table 7.39**). A total of 634 seals had an established cause of death, with none being as a result of physical trauma following impact from a ship or boat. There were however a total of 18 grey seal and 24 seals that had a cause of death of unknown physical trauma. This results in a collision risk rate of 0.043 for grey seal, and 0.038 for all seals.

826. The potential for collision risk for grey seal was calculated in the same method as for harbour porpoise, described in **Section 7.2.1.2.6**. The total UK populations for grey seal species are taken from SCOS (2021).

Table 7.39 Summary of UK Grey Seal Strandings (2003-2020) and Causes of Death From Physical Trauma of Unknown Cause and Physical Trauma Following Probable Impact from a Ship or Boat (Data from CSIP[21], SMASS[22], CWT[23], MEM[24], Marine Institute[25])

Species / Species Group	Number of Post-Mortems Where Cause of Death Established	Cause of Death: Physical Trauma of Unknown Cause	Cause of Death: Physical Trauma Following Probable Impact From a Ship or Boat	Collision Risk Rate (Number Attributed to Vessels Strike / Other Physical Trauma as Proportion of Total Number Necropsied)
Grey seal	417	18	0	0.043
All seal species	*634*	*24*	*0*	*0.038*

827. The assessment of collision risk (**Table 7.40**) predicts that 0.18 grey seal per year could be at risk of vessel collision due to the vessels associated with construction (equating to 0.02% of the Lundy Island SAC, or 0.009% of the SW MU, or 0.001% of the combined MU population at risk). Therefore, this is not predicted to result in any significant population effects or any changes to the conservation status of grey seal.

828. Consequently, there would be **no AEoI of the Lundy Island SAC in relation to the conservation objectives for grey seal due to potential vessel collision risk during construction**.

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[21] CSIP (2004); CSIP (2005); CSIP (2011); CSIP (2018) [available from: https://ukstrandings.org/csip-reports/]

[22] SMASS (2010); SMASS (2011); SMASS (2013); SMASS (2014); SMASS (2015); SMASS (2016); SMASS (2017); SMASS (2018); SMASS (2019); SMASS (2020); SMASS (2021) [available from: https://stranding's.org/publications/]

[23] CWT (2021), CWT (2020), CWT (2019), CWT (2018), CWT (2017), CWT (2016)

[24] MEM & CSIP (2019), MEM & CSIP (2020)

[25] Marine Institute, 2022

Table 7.40 Predicted Number of Grey Seal at Risk of Vessel Collision During Construction, Based on Current UK Collision Rates and Vessel Presence

Grey Seal Collision Risk Rate (Table 7.21)	Estimated Total Number in UK Waters	Estimated Number Within UK Waters (Collision Risk Rate x Total UK Population)	Annual Number of Vessel Transits in UK and RoI for 2015	Number at Risk of Collision per Vessel in UK Waters	Number Annual Vessel Transits Associated with Construction	Additional Individuals at Risk Due to Increase in Vessel Number per annum (Number of Vessels * Number at Risk per Vessel)
0.043	157,300	6,789.9	3,852,030	0.0018	101	0.18

7.2.2.2.7 Entanglement

829. Entanglement is the potential risk of marine mammals getting caught within the WTG mooring lines, as a primary cause and the potential risk of marine mammals becoming caught in fishing lines that have been caught themselves within the WTG mooring lines as a secondary cause. The worst-case scenario for entanglement is during the operation and maintenance phase of the project due to the length of time the structures will be in place, creating a higher probability of receptors to get caught within the WTG mooring lines. (For more information see S**ection 7.2.1.2.7**).

830. The option for monitoring and reporting on this impact pathway will be considered as part of the PEMP (within the CEMP). Should any monitoring suggest that the likelihood of this impact occurring is higher than expected, then contingency measures will be put in place. The exact measures within the contingency plan have yet to be determined, and consultation and agreement with stakeholders will be sought. Measures could, for example, involve more regular monitoring of lines and cables, in order to remove any snagged derelict gear/marine litter as quickly as possible, to minimise the chance of indirect entanglement.

831. The Windfarm Site is not located on any known migration routes for grey seal or within any known key foraging areas, and with the lack of data on entanglement of marine mammals from mooring lines in floating windfarms, the potential risk of entanglement is considered to be low.

832. Therefore with the existing literature suggesting that entanglement will not pose a significant risk to grey seal, and that this potential effect would be for a temporary period only, it is concluded that there is **no AEoI of the Lundy Island SAC in relation to the conservation objectives for grey seal due to entanglement**.

7.2.2.2.8 Potential for Disturbance at Grey Seal Haul-Out Sites

833. The Lundy Island SAC is located 41km from The Project at its closest point and 1km from the cable corridor. Known seal haul-out sites are greater than 3km from the Project. It is unknown which construction port(s) will be used, however, movements to and from any port will be incorporated within existing vessel routes.

834. Grey seal is more likely to respond to nearby vessels by moving into the water, due the speed of the vessel, rather than the distance, although movement into the water was generally observed to occur at distances of between 20 and 70m, with no detectable disturbance at 150m (Wilson, 2014; Strong and Morris, 2010). However, grey seal has been reported to move into the water when vessels are at a distance of approximately 200m to 300m (Wilson, 2014). Therefore, it is considered that, for grey seal, vessels travelling within 300m of a haul-out site may cause a n individual to flee into water, and significant disturbance would be expected at a distance of less than 150m.

835. Depending on which construction ports will be used, there may be grey seal haul-out sites in the vicinity of the vessel transit route. If existing vessel routes are within proximity of these sites, it is likely that seals hauled-out along these routes and in the area of the ports would be habituated to the noise, movements and presence of vessels. Therefore, the additional construction vessels using these existing vessel routes while transiting to port would not make a significant increase in the potential for disturbance at grey seal haul-out sites.

836. Therefore, there would be **no AEoI of the Lundy Island SAC in relation to the conservation objectives for grey seal due to disturbance at seal haul-out sites during construction for The Project**.

7.2.2.2.8.1 Potential for Disturbance of Foraging Grey Seals at Sea

837. Foraging seals have the potential to be disturbed due to underwater noise generating activities, and due to the increased presence of vessels at the Project, and in the vicinity of the vessel transit route from the construction port to the Windfarm Site.

838. The potential for grey seal to be disturbed from foraging at sea during construction relates to both the potential direct disturbance of grey seal, and the potential for an effect on fish (prey species). In total, the greatest area of effect for any disturbance

of foraging grey seal is up to 45km^2 for using UXO at The Project (based on maximum TTS impact area) and 0.12km^2 for piling at The Project (based on maximum TTS impact area).

839. If it is assumed, as an unlikely and worst-case scenario, that all grey seal within the total area would be disturbed, and that any disturbance could result in the cessation of foraging within that area, then a total of five grey seal could potentially be disturbed from foraging during UXO operations at the Project (**Table 7.36**). Piling at the Project could potentially disturb four grey seals. This effect is temporary.

840. It is unlikely however, that there would be the potential for any significant disturbance of foraging grey seal from the Lundy Island SAC, given the distance of 41km from the closest point of the Project to the SAC, and that grey seal are generalist feeders with wide foraging ranges. Any disturbance of foraging grey seals would be restricted to the area and duration of the activity, and there are other suitable habitats and prey available in the surrounding area. Therefore, there would be **no AEoI of the Lundy Island SAC in relation to the conservation objectives for grey seal due to disturbance of foraging grey seals during construction for the Project**.

7.2.2.2.9 Barrier Effects due to Physical Presence

841. As the Project is constructed, there is the potential for a barrier effect to occur due to the physical presence of the Project's infrastructure. As for the risk of entanglement, the worst-case scenario for effects from the physical presence of the windfarm is during the operational and maintenance phase of the Project, due to the length of time the infrastructure would be in place. However, there is the potential for a short period of time within the construction period where some Project infrastructure being in place prior to the start of the operational period, and therefore a short period of time where there may be a risk of a barrier effect due to the physical presence of the Project. This is therefore a temporary effect. While the effect would continue into the operational phase, this assessment focuses solely on the construction phase.

842. The worst-case maximum barrier effect due to the Project physical presence are explained further in **Section 7.2.2.3.9**, as the operational phase will see the worst-case potential effect for the Project, which concluded no AEoI.

843. There would therefore be **no AEoI of the Lundy Island SAC in relation to the conservation objectives for grey seal due to barrier effects due to the physical presence of the Project during construction**.

7.2.2.2.10 Electromagnetic Fields

844. Electromagnetic fields (EMFs) occur as a result of electricity transmission through conductive objects, such as transmission cables, and the electromagnetic attributes of EMFs have the potential to disrupt organs used for navigation and foraging within a number of species, including marine mammals. See **Section 7.2.1.2.9** for a summary of the potential effect of EMF during construction.

845. The worst-case maximum EMF effect to grey seal is explained further in **Section 7.2.2.3.10**, as the operational phase will see the worst-case potential effect for the Project which concluded no AEoI.

846. EMF is therefore not expected to effect grey seal, and there would be **no AEoI of the Lundy Island SAC in relation to the conservation objectives for grey seal from EMF effects during construction**.

7.2.2.2.11 Changes to Prey Availability

847. The potential effects on prey species during construction can result from physical disturbance and loss of habitat; increased SSC and sediment deposition; and underwater noise (including barrier effects from underwater noise).

848. **Chapter 11: Fish and Shellfish Ecology** of the Offshore ES, provides an assessment of these impact pathways on the relevant fish and shellfish species and concludes impacts of negligible to minor adverse significance in EIA terms. Any reductions in prey availability would be small scale, localised and temporary. It is considered highly unlikely that potential reductions in prey availability as a result of construction activities would result in detectable changes to grey seal populations.

849. The diet of the grey seal consists of a wide variety of prey species and they are considered to be opportunistic feeders, with relatively large foraging ranges (for more information see **Chapter 12: Marine Mammal and Marine Turtle Ecology** of the Offshore ES).

850. Grey seals tend to forage in the open sea, foraging trips taking between one and 30 days, traveling over 100km between haul out sites (SCOS, 2021). Average prey consumption of an adult grey seal is 4kg to 7kg per day (SCOS, 2020).

851. The reduction of prey (fish) species availability would not be for all fish within that area, and grey seal would be able to forage within that area still, or would be able to travel outside of that area to forage, with no reduction or impact to the overall population anticipated.

7.2.2.2.11.1 Physical Habitat Disturbance and Temporary Habitat Loss

852. It is highly unlikely that there would be significant changes to prey over the entire area. It is more likely that effects would be restricted to an area around the working sites, and the potential areas for habitat loss. The temporary impact area is up to 49.35km^2 for the Project, which represents a very small proportion of the area available for grey seal foraging from the Lundy Island SAC. As noted above, grey seal typically forages up to 100km, recorded distances up to 448km (Carter, 2022) from their haul-out sites, which equates to a significantly large total foraging area for the individuals associated with the site.

853. Mitigation measures to reduce the potential impacts of underwater noise for marine mammals would also reduce the potential impacts on prey species.

854. Therefore, the potential impacts of physical disturbance and temporary habitat loss on changes in prey availability are localised and short in duration there will therefore be **no AEoI of the Lundy Island SAC in relation to the conservation objectives for grey seal from changes to prey availability for The Project**.

7.2.2.2.11.2 Temporary Increased Suspended Sediments and Sediment Deposition

855. The construction phase of the Project is predicted to result in an increase in SSC and increased sediment deposition, as a result of installation activities related to foundation installation, mooring anchors, mooring lines, cable/scour protection, and export and array cables (including pre-cable works such as PLGR or sand wave levelling).

856. Works at the Landfall site may also increase suspended sediments, through potential open-cut trenching. The activities most likely to cause direct physical disturbance of the seabed are the installation/burial of cables, and installation of anchors.

857. As previously outlined, at the closest point, the Windfarm Site is 41km from the Lundy Island SAC and the Offshore Export Cable Corridors is 2.2km from the Lundy Island SAC. Therefore, there is no potential for increased SSC within the Lundy Island SAC.

858. Therefore, any potential changes to prey availability as a result of increased SSC and sediment deposition is assessed as negligible and would have **no AEoI of the Lundy Island SAC in relation to the conservation objectives for grey seal due to changes in prey availability during construction (from increased suspended sediments and sediment deposition)**.

7.2.2.2.11.3 Underwater Noise and Vibration

859. Potential sources of underwater noise and vibration during construction include UXO clearance, piling, increased vessel traffic, seabed preparation, rock placement and cable installation. Of these, piling is considered to produce the highest levels of underwater noise and therefore has the greatest potential to result in adverse impacts on fish.

860. **Chapter 11: Fish and Shellfish Ecology** of the Offshore ES provides an assessment of the potential underwater noise impacts on fish and shellfish species and predicts that impacts would be of negligible magnitude and of a temporary nature. See **Chapter 11: Fish and Shellfish Ecology** of the Offshore ES for a detailed assessment of underwater noise impacts on fish species.

861. The underwater noise modelling (**Appendix 12.A: Marine Mammal and Marine Turtle Underwater Noise Report** of the Offshore ES) indicates that fish species in which the swim bladder is involved in hearing are the most sensitive to the impact of underwater noise.

862. The maximum predicted cumulative impact range for TTS of 51km for fish species based on a stationary response model (**Appendix 12.A: Marine Mammal and Marine Turtle Underwater Noise Report** of the Offshore ES), which is more than the TTS SEL_{cum} range for grey seal (16km). However, it is important to note that the SEL_{cum} modelling for fish is based on a stationary model. This is considered to be a highly precautionary approach, as it is unlikely that an individual would remain within the vicinity of the high noise levels.

863. Therefore, modelling that assumes a fleeing animal response to noise, especially fish with a swim bladder involved in hearing, is more realistic and therefore has been used to assess the potential impact on marine mammals. The maximum predicted cumulative impact range for TTS of 24km for fish species based on the fleeing response model, is greater than the TTS SEL_{cum} range of 16km for grey seal (**Appendix 12.A: Marine Mammal and Marine Turtle Underwater Noise Report** of the Offshore ES). This is the largest potential impact range for prey (fish) species and has therefore been used to inform the below worst-case and precautionary assessment. It is highly unlikely that there would be significant changes to prey over the entire area. It is more likely that effects would be restricted to an area around the working sites. The significance of effect to fish species as a result of piling has been assessed as minor adverse within **Chapter 11: Fish and Shellfish Ecology** of the Offshore ES.

864. There is unlikely to be any additional displacement of grey seal as a result of any changes in prey availability during piling as grey seal would also be disturbed from the area (and to a greater area). The reduction of prey (fish) species availability would not be for all fish within the area of effect, and grey seal would be able to forage within that area still or would be able to travel outside of that area to forage, with no reduction or impact to the overall population anticipated. It is therefore concluded that the potential for loss of prey within the Lundy Island SAC would not effect grey seal over and above what has been assessed for those same activities on grey seal themselves, and therefore there would be no potential for effect on the grey seal population within the Lundy Island SAC.

865. Mitigation to reduce the potential impacts of underwater noise for marine mammals would also reduce the potential impacts on prey species. No further mitigation is required or proposed in relation to any changes in prey availability.

866. Taking into account the above information, there would be **no AEoI of the Lundy Island SAC in relation to the conservation objectives for grey seal due to changes to prey availability (from underwater noise effects)**.

7.2.2.2.12 Changes to Water Quality

867. As outlined in the **Chapter 9: Marine Water and Sediment Quality** of the Offshore ES, during construction there is the potential for the deterioration of water quality through:

- Localised temporary increases in suspended sediments due to cable burial
- Remobilisation of existing contaminated sediments.

868. Disturbance of seabed sediments has the potential to release any sediment-bound contaminants, such as heavy metals and hydrocarbons that may be present within them into the water column. The accidental release of contaminants (e.g. through spillage) also has the potential to affect water quality. During construction there is also the potential for increased suspended sediments.

869. Throughout the construction phase, best practice techniques and due diligence regarding the potential for pollution will be followed throughout all construction activities. Any risk of accidental release of contaminants (e.g. through spillage) will be mitigated in line with **Appendix 5.A: Outline CEMP** of the Offshore ES and any changes to water quality as a result of any accidental release of contaminants (e.g. through spillage or vessel collision) would be negligible. Therefore, the potential for pollutants to be released into the environment is not considered further in this assessment.

870. Grey seal often inhabits turbid environments as they have eyesight adapted for the aquatic environment and vibrissae in their whiskers in order to sense their environment. Increased turbidity is unlikely to have a substantial direct effect on grey seal that often inhabit naturally turbid or dark environments. Any direct impacts to grey seal as a result of any contaminated sediment during construction activities are unlikely as any exposure is more likely to be potential indirect impacts via prey species.

871. It is highly unlikely that any changes in water quality could occur over the entirety of the offshore sites during construction. It is more likely that effects would be restricted to an area around the working sites as the potential increase in suspended sediments through construction activities will be localised and temporary.

872. The potential changes in water quality have been assessed as negligible in **Chapter 9: Marine Water and Sediment Quality** of the Offshore ES. Sediment contamination levels in the surveyed area are not considered to be of significant concern and are low risk in terms of potential impacts on the marine environment.

873. Due to the limited range and short duration of the potential effects, the effect on grey seal would be limited.

874. No additional mitigation is required or proposed, other than the embedded mitigation outlined in **Table 7.1**.

875. The Windfarm site and the Offshore Export Cable Corridor lies outside the Lundy Island SAC and therefore there will be no direct effect on the spatial or seasonal components of the SAC from any changes in water quality.

876. The potential changes in water quality would not have a significant effect on grey seal and therefore there would be **no AEoI of the Lundy Island SAC in relation to the conservation objectives for grey seal due to changes in water quality during construction**.

7.2.2.3 Potential Effects during Operation and Maintenance

877. The potential effects for grey seal during operation and maintenance with the potential for LSE are:

- Underwater noise
    - Operational noise from WTGs and from movement of floating turbine moorings on the seabed
    - Maintenance activities, such as cable re-burial and any additional rock placement

  - Operation and maintenance vessel activity

- Interaction and Collision Risk with vessels Entanglement
- Disturbance at seal haul-out sites
- Physical barrier effects
- EMFs
- Changes to prey resources
- Changes to water quality.

7.2.2.3.1 Potential Effects of Underwater Noise from Operational Turbines

878. The operational turbines will operate nearly continuously, except for occasional shutdowns for maintenance or severe weather. The Project's design life is 25 years. Therefore, there is concern that underwater noise from operational turbines could contribute a consistent, long duration of sound to the marine environment, For more information see **Section 7.2.1.3.1**.

879. Currently available data indicates that there is no lasting disturbance or exclusion of seals around windfarm sites during operation (Russell *et al*., 2014). Data collected suggests that any behavioural responses for seals may only occur up to a few hundred metres away (McConnell *et al*., 2012).

880. Monitoring studies at Nysted and Rødsand have indicated that operational activities have had no impact on regional seal populations (Teilmann *et al*., 2006; McConnell *et al*., 2012). Tagged harbour seals have been recorded within two operational wind farm sites (Alpha Ventus in Germany and Sheringham Shoal in UK) with the movement of several of the seals suggesting foraging behaviour around wind turbine structures (Russell *et al*., 2014).

881. Furthermore, Russell *et al.,* (2014) report that seals have been shown to forage within operational windfarm sites, indicating no restriction to movements in operational OWF sites.

7.2.2.3.2 Potential for Auditory Injury Due to Operational Turbines

882. Underwater noise modelling was undertaken to assess the potential impact ranges for operational wind turbines (see **Appendix 12.A: Marine Mammal and Marine Turtle Underwater Noise Report** of the Offshore ES). The cumulative effect ranges are to the nearest 10m.

883. The maximum potential impact area for PTS for each operational turbine is less than 0.03km^2 (**Table 7.41**).

Table 7.41 Predicted impact ranges (and areas) for PTS from cumulative exposure of operational turbines

Species	Impact	Criteria and threshold (Southall *et al*., 2019)	Operational wind turbine
Grey seal (PCW)	PTS	SEL_{cum} Weighted (201 dB re 1 µPa^{2}s) Non-impulsive	<0.01km (<0.0003km^2)

884. The results of the underwater noise modelling indicate that grey seal would have to be less than 100m (precautionary maximum range) for 24 hours in a 24 hour period, to be exposed to noise levels that could induce PTS or TTS based on the Southall *et al*. (2019) non-impulsive thresholds and criteria for SEL_{cum}. Therefore, PTS as a result of operational wind turbine noise is highly unlikely.

885. Given the very localised effect area and that grey seal would have to be within 10m of a WTG for 24 hours, it is considered highly unlikely that grey seal would be at risk of PTS, and there would be **no AEoI of the Lundy Island SAC in relation to the conservation objectives for grey seal, due to PTS from operational WTGs**.

7.2.2.3.2.1 Potential for Disturbance Due to Operational Turbine Noise

886. Currently available data indicates that there is no lasting disturbance or exclusion of seals around windfarm sites during operation (Russell *et al*., 2014). Data collected suggests that any behavioural responses for seals may only occur up to a few hundred metres away (McConnell *et al*., 2012).

887. Monitoring was carried out at Nysted and Rødsand windfarms in Denmark and have indicated that operational activities have had no impact on regional seal populations (Teilmann *et al*., 2006; McConnell *et al*., 2012).

888. Tagged harbour seals have been recorded within two operational wind farm sites (Alpha Ventus in Germany and Sheringham Shoal in UK) with the movement of numerous seals in the vicinity of the windfarms suggesting that seals have been shown to forage within operational wind farm sites, indicating no restriction to movements in operational OWF sites (Russell *et al*., 2014). Therefore if operation turbine While this study is focused on harbour seal rather than grey seal, it has been included as additional background as could provide an indication as to the response of grey seal to operational wind farms.

889. The Windfarm Site lies outside the Lundy Island SAC and therefore there will be no direct effect on the spatial or seasonal components of the SAC due to disturbance from operational WTGs.

890. As described above, studies have shown that there is no lasting disturbance or exclusion of grey seal around windfarm sites during operation, and therefore it is not expected that there would be any disturbance of grey seal. Therefore, any potential effects would not result in any significant population effects or any changes to the FCS.

891. There would be **no AEoI of the Lundy Island SAC in relation to the conservation objectives for grey seal due to disturbance from operational turbine noise**.

892. No additional mitigation is required or proposed.

7.2.2.3.3 Potential effects of underwater noise during maintenance activities, such as cable re-burial and any additional rock placement

893. The requirements for any potential maintenance work, such as additional rock placement or cable re-burial, are currently unknown. However, the work required and associated impacts would be less than those during construction.

894. The impacts from additional cable laying and protection are temporary in nature and will be limited to relatively short periods during the operation and maintenance phase. Disturbance responses are likely to occur at significantly shorter ranges than construction noise. Any disturbance is likely to be limited to the area in and around where the actual activity is taking place.

895. The underwater noise from maintenance activities is considered to be the same or less than those assessed for underwater noise from other construction activities (including rock placement, trenching and cable laying) (see **Section 7.2.1.2.3**).

896. Therefore, there would be **no AEoI of the Lundy Island SAC in relation to the conservation objectives for grey seal due to underwater noise and disturbance effects from operation and maintenance activities**.

897. No additional mitigation is required or proposed.

7.2.2.3.4 Potential effects of underwater noise during operation and maintenance vessel activity

898. The vessel movement during the operation and maintenance stage will be to a lesser extent than the construction stage. It is estimated that the maximum number of vessels that could be required on site at any one-time during operation and maintenance could be one, which is less than the five vessels that could be on each site during construction. However, as a precautionary approach the assessment for construction has been used for the operation and maintenance assessment, as a worst-case scenario (see **Section 7.2.1.2.4** for further information).

899. For the operation of the Windfarm Site, there could be up to 40 vessel movements per year (approximately 0.1 vessel movements per day), representing an increase of up to 1.1% compared to average daily vessels currently within the Windfarm Site, and an increase of approximately 0.6% to the current number of vessel movements within the navigation Study Area. This is less than the number of vessel movements within the construction period, and therefore the assessments for PTS and disturbance as presented in **Section 7.2.1.2.4** would represent a worst-case scenario.

900. The underwater noise from maintenance vessels is considered to be the same or less than those assessed for underwater noise from construction vessels. As grey seal do not appear to be sensitive to disturbance from vessels, there would be no AEoI of the Lundy Island SAC in relation to the conservation objectives for grey seal due to disturbance from construction vessels. Therefore, there would be **no AEoI of the Lundy Island SAC in relation to the conservation objectives for grey seal due to underwater noise and disturbance effects from operation and maintenance vessels**.

901. No additional mitigation is required or proposed.

7.2.2.3.5 Interaction and Collision Risk with Vessels

902. During the operation and maintenance phase there will be an increase in vessel traffic within the Windfarm Site and ECC, and from vessels enroute from the chosen port. However, it is anticipated that vessels would follow an established shipping route to the relevant port in order to minimise vessel traffic in the wider area. The **Appendix 12.C: Draft MMMP** of the Offshore ES provides a protocol for minimising collision risk of marine mammals with vessels.

903. It is estimated that there would be approximately 40 vessel movements, to and from the Project, for each year of the operation and maintenance phase (or an average of 0.1 transits per day (one vessel movement every 10 days, or one return trip every 20 days) (**Table 7.3**). An assessment of the potential increase in risk to grey seal as a result of the 40 vessel movements per year has been undertaken following the same approach as undertaken for the construction phase (**Section 7.2.1.2.6**).

904. The number of grey seal at risk of collision, per vessel, in UK waters has been calculated, and has been used to calculate the number of each grey seal species at risk of collision from the 40 yearly vessel transits associated with the Project's operation and maintenance phase (**Table 7.42**). Up to 0.07 grey seal (0.008% of

the Lundy Island SAC; 0.004% of SW MU; 0.0006% of combined MU) may be at risk of vessel collision per year of operation, based on this assessment.

905. This is a highly precautionary approach, as it is unlikely that grey seal present in the Windfarm Site and Offshore Export Cable Corridor areas would be at increased collision risk with vessels during the operation and maintenance phase. A minimal number of additional vessels will be in the area due to the Windfarm Site, where these vessels would be stationary or very slow moving. In addition, based on the assumption that grey seal would be disturbed as a result of the vessel noise and presence, there should be no potential for increased collision risk with construction vessels.

906. Permanent effects (i.e. assuming all vessel interactions are fatal) with a greater than 1% of the reference population being affected within a single year are considered to have the potential to result in population effects.

907. Vessel movements, where possible, will be incorporated into recognised vessel routes and hence to areas where marine mammals are accustomed to vessels, in order to reduce any increased collision risk. All vessel movements will be kept to the minimum number that is required to reduce any potential collision risk. Additionally, vessel operators will use good practice to reduce any risk of collisions with marine mammals (see the **Appendix 12.C: Draft MMMP** of the Offshore ES).

908. Taking into account the limited potential for increased collision risk with vessels during the operation and maintenance phase, and that good practice measures for vessels would be in place, there would be **no AEoI of the Lundy Island SAC in relation to the conservation objectives for grey seal due to increased collision risk from operation and maintenance vessels**.

909. No additional mitigation is required or proposed, other than the embedded mitigation outlined in **Table 7.1**.

7.2.2.3.6 Potential for Disturbance at Grey Seal Haul-Out Sites during Operation and Maintenance

910. Any potential disturbance at grey seal haul-out sites during operation and maintenance would be less than those assessed for during construction, as there are fewer vessels.

Table 7.42 Predicted Number of grey seal at Risk of Vessel Collision During Operation and Maintenance, Based on Current UK Collision Rates and Vessel Presence

Grey Seal Collision Risk Rate	Estimated Total Number of Individuals in UK Waters	Estimated Number of Individuals at Risk Within UK Waters (Collision Risk Rate x Total UK Population)	Annual Number of Vessel Transits in UK and RoI for 2015	Number of Marine Mammals at Risk of Collision per Vessel in UK Waters	Number Annual Vessel Transits Associated with Operation and Maintenance	Additional Marine Mammals at Risk Due to Increase in Vessel Number (Number of Vessels * Number at Risk per Vessel)
0.043	157,300	6,789.9	3,852,030	0.0018	40	0.07

911. As grey seal do not appear to be sensitive to disturbance from vessels at haul-out sites, and that vessels are not expected to be within close proximity of the haul-out sites, there would be **no AEoI of the Lundy Island SAC in relation to the conservation objectives for grey seal due to disturbance at haul-out sites from construction vessels**.

912. Therefore, there would be no significant effects on grey seal and **no AEoI of the Lundy Island SAC in relation to the conservation objectives for grey seal due to potential disturbance at haul-out sites from operation and maintenance vessels for The Project**.

7.2.2.3.7 Potential for Disturbance of Foraging Grey Seals at Sea during Operation and Maintenance

913. Any potential disturbance of foraging grey seal during operation and maintenance would be less than those assessed for during construction. The assessment for the construction phase concluded that it is unlikely that there would be the potential for any significant disturbance of foraging grey seal from the Lundy Island SAC, given the distance of 41km from the closest point of the Project to the SAC. As grey seal are generalist feeders with wide foraging ranges. Any disturbance of foraging grey seals would be restricted to the area and duration of the activity, and there are other suitable habitats and prey available in the surrounding area. Therefore, there would be no AEoI during the construction phase.

914. Therefore, there would be no significant effects on grey seal and **no AEoI of the Lundy Island SAC in relation to the conservation objectives for grey seal due to potential disturbance of foraging seals during operation and maintenance for The Project**.

7.2.2.3.8 Entanglement

915. As previously outlined in **Section 7.2.1.2.7**, entanglement is the potential risk of marine mammals getting caught within the WTG mooring lines, as a primary cause and fishing lines that have been caught themselves within the WTG mooring lines as a secondary cause. The worst-case scenario for entanglement is during the operational and maintenance phase of the project due to the length of time the structures will be in place, creating a higher probability of receptors to get caught within the WTG mooring lines (see **Section 7.2.1.3.5**).

7.2.2.3.8.1 Risk of Entanglement to Grey seal

916. Impacts to grey seals from entanglement include fatalities from drowning, infection and tissue damage if the animal escapes, emaciation if entanglement stops the

animal from feeding effectively, and increased drag and energy use if the animal is entangled but able to move freely.

917. Given the size and physical characteristics of the mooring systems required for floating OWF, it is unlikely that upon encountering them, a grey seal of any size would become directly entangled in the moorings themselves (note that the mooring system will remain under tension at all times and no loops, as seen in fishing gear, will ever be formed to allow entanglement with the mooring system). Mooring systems in the offshore renewables industry typically have greater diameter (Benjamins *et al.,* 2014), compared to fishing gear, which has been identified as a major entanglement risk for whales (Lynch *et al.*, 2018).

918. The CWT reports on marine strandings in Cornwall and the Isles of Scilly annually. As part of this scheme, from 2017 to 2021, a total number of strandings of grey seals came to 1,080. Of these, 107 (10%) were examined either by post-mortem of the BEEP technique. Of the examined grey seals, entanglement with fishing gear can be attributed to seven (7%) of individuals. When estimated as 7% of the entire stranding population this can be seen as 70 individuals (Cornwall Wildlife Trust, 2017; 2018; 2019; 2020; 2021; **Table 7.43**).

Table 7.43 Summary of the Cornwall Wildlife Trust's report on marine strandings in Cornwall and the Isles between 2017 to 2021 for cetaceans and grey seals (Cornwall Wildlife Trust, 2017; 2018; 2019; 2020; 2021)

Year	Total Strandings	Post-mortem and BEEP	Entangled from Post-mortem and BEEP examinations
2017	161	15	4
2018	179	19	1
2019	246	20	0
2020	203	18	1
2021	291	35	1
Total	702	107	7

919. The greatest entanglement risk is most likely to be from indirect (or secondary) entanglement in anthropogenic debris, such as 'ghost fishing' gear caught in the mooring system or cables (Benjamins *et al.,* 2014). Tertiary entanglement is also a potential risk (although is considered to be unlikely unless in areas of high fishing and high whale species presence), and refers to the potential for marine animals, who are trailing fishing gear, to swim in close proximity to mooring lines, allowing the trailing gear to become entangled.

920. The entanglement risk of grey seal with floating wind systems is relatively unknown, mainly due to the lack of focused studies and monitoring (including on the potential for ghost fishing gear to become entangled in the mooring lines).

7.2.2.3.8.2 Summary of Entanglement Risk to Grey Seal

921. Taking into account that there have been no recorded instances of marine mammal entanglement from mooring systems of marine renewable devices or similar mooring lines, and neither dynamic cables or the mooring lines and cables have loose ends or sufficient slack (Copping *et al.,* 2020), it is not expected that there would be a significant risk of any entanglement to grey seal. It should also be noted that the Windfarm Site itself is location 41km from the Lundy Island SAC at closest point, and therefore there would be no direct effect to grey seal within the site itself (although has the potential to affect the same SW and wider MU population).

922. As stated in **Section 7.2.2.2.7** the Windfarm Site is not located on any known migration routes for grey seal or within any known key foraging areas, and with the lack of data on entanglement of marine mammals from mooring lines in floating windfarms, the potential risk of entanglement is considered to be low.

923. Therefore, it is concluded that there is **no AEoI of the Lundy Island SAC in relation to the conservation objectives for grey seal due to the risk of entanglement**.

924. In the event that any entanglement of a marine mammal does occur during the operation of the Project, additional mitigation and monitoring measures may be required to ensure it does not happen again (see **Section 7.2.1.3.5.1**).

7.2.2.3.9 Physical Barrier Effects

925. The presence of a windfarm could be perceived as having the potential to create a physical barrier, preventing movement or seasonal migration of grey seal between important feeding and / or breeding areas, or potentially increasing swimming distances if grey seal avoids the site and go round it. The Windfarm Site is not located on any known important routes for grey seal or within any known key foraging areas.

926. As outlined in **Section 7.2.1.3.1.2**, information from operational (fixed foundation) windfarms show no evidence of exclusion of seals (for example, Diederichs *et al*., 2008; Lindeboom *et al*., 2011; Marine Scotland, 2012; McConnell *et al*., 2012; Russell *et al*., 2014; Scheidat *et al*., 2011; Teilmann *et al*., 2006; Tougaard *et al*., 2005, 2009a, 2009b).

927. The minimum spacing between wind turbines will be 1,100m, and maximum spacing would be 2,620m. The mooring line radius around each turbine would be 600m. Therefore, there would be at least 1,100m between turbine locations, and between 500m and 2,020m between the mooring line configurations, depending on final turbine design and turbine spacings. This means that animals can be expected to move between devices and through the operational windfarm, irrespective of layout.

928. The maximum footprint of turbine moorings is approximately 2,400m^2 per WTG (based on total area for anchor length and width, maximum number of anchors per WTG (of six), the mooring chain width and the mooring line radius around each anchor; **Table 7.3**), and the footprint of the OSP would be 1,257m^2. This equates to a total footprint of 20,457m^2 (or 0.02km^2). Therefore, the physical footprint of structures that could present a physical barrier is a very small area (0.04%) of the total Windfarm Site area (49.35km^2).

929. There is currently no information on the potential for the physical presence of a floating OWF site to cause a barrier to movement for marine mammal species, however, it is assumed to cause a similar level of effect to that of fixed foundation wind farms. It is therefore not expected that the locations of the turbines and infrastructure themselves will be positioned in a location to cause a barrier to movement, with room for grey seals to transit through the Windfarm Site.

930. There would therefore be **no AEoI of the Lundy Island SAC in relation to the conservation objectives for grey seal due to barrier effects due to the physical presence of the Project during operation**.

7.2.2.3.10 Electromagnetic Fields

931. Information on EMF have been described in **Section 7.2.1.3.7** which will be the same for the Lundy Island SAC.

932. Marine mammals are not considered to be electro sensitive species (Gill *et al.*, 2005). Some marine mammals, are believed to use geomagnetic cues as a navigational tool (Ferrari & Thomas, 2016). However, no evidence has been found to suggest that seals are magneto receptive (Gill *et al.*, 2005).

933. The effect of EMFs are assessed in **Chapter 11: Fish and Shellfish Ecology** of the Offshore ES. This assessment noted that the areas potentially affected by EMF generated by the worst-case scenario for offshore cables are expected to be small and restricted to the immediate vicinity of the cables (i.e. within metres). EMFs are expected to attenuate rapidly in both horizontal and vertical plains with distance from the source.

934. It has been determined that EMF becomes undetectable at 4m from the cable in seawater, as per Normandeau *et al*. (2011), however, there is a lack of research specific to EMF in the water column.

935. Current information on the effects of EMF on marine mammals, especially seals is limited, however, there is no evidence to date that their activity will change as a result of the presence of increased EMF in the environment from inter-array cables. Magnetic field intensities reduce as a function of distance from the source and are highly localised, reducing to 1uT at 4.3m from 66kV cables, well below a detectable level for magneto-receptive marine mammal species (5uT) (Normandeau *et al.,* 2011).

936. As described above, EMF is not expected to affect grey seal, and therefore there would be **no AEoI of the Lundy Island SAC in relation to the conservation objectives for grey seal from EMF effects during operation**.

7.2.2.3.11 Potential for Any Changes in Prey Availability during Operation and Maintenance

937. Any impact on prey species has the potential to affect grey seal, and as outlined in **Chapter 11: Fish and Shellfish Ecology** of the Offshore ES, the potential impacts on fish species during operation and maintenance can result from:

- Permanent habitat loss
- Temporary increased SSC and deposition
- Underwater noise and vibration
- EMF
- Barrier effects
- Fish aggregation effects
- Ghost fishing.

7.2.2.3.11.1 Permanent Habitat Loss

938. Habitat loss will occur during the lifetime of the Project as a result of structures, scour and external cable protection installed on the seabed. The introduction of hard substrate, such as buried export cables, catenary chains on the seabed, anchors/moorings within the seabed, and cable protection would increase habitat heterogeneity through the introduction of hard structures in an area predominantly characterised by sediment habitats. Whilst the Project’s infrastructure will prevent prey species from accessing some areas, this will not account for a significant loss in water column habitat. Therefore, this potential effect only refers to the area of seabed loss due to the placement of infrastructure (such as buried export cables, catenary chains on the seabed, and anchors/moorings within the seabed).

939. The estimated total permanent habitat loss would be up to 0.95km^2. In **Chapter 11: Fish and Shellfish Ecology** of the Offshore ES, this is considered not significant in the context of the amount of similar available habitat in the wider area. Overall, due to the presence of comparable habitats identified throughout the offshore sites and the wider region and the localised spatial extent of impacts, the magnitude of effect of permanent habitat loss is considered to be low to prey species.

940. Due to the presence of comparable subtidal sand and gravel habitats in and around the offshore sites, any loss of habitat is considered to have a limited effect on any changes in prey availability for grey seal. Taking this into account, there would be **no AEoI of the Lundy Island SAC in relation to the conservation objectives for grey seal due to changes in prey availability (from permanent habitat loss resulting from the introduction of hard substrates) during the operation and maintenance phase**.

7.2.2.3.11.2 Temporary Increased SSC and Deposition

941. Increases in SSC within the water column and subsequent deposition onto the seabed may occur as a result of operation and maintenance activities. Disturbance caused by jack up vessel legs or anchors, as well as cable reburial and/or repair may result in small volumes of sediment being re-suspended. However, the volumes of sediment disturbed from such activities, as well as the overall duration of the disturbance, would be significantly less compared to construction.

942. Increased SSCs and levels of sediment re-deposition will be localised and short term and of low magnitude. Therefore, the effect of SSC and re-deposition during the operational phase would be negligible for prey species and grey seal.

943. Taking this into, there would be **no AEoI of the Lundy Island SAC in relation to the conservation objectives for greys seal due to changes in prey availability (from increased SSC and sediment deposition) during the operation and maintenance phase**.

7.2.2.3.11.3 Underwater Noise and Vibration

944. Sources of underwater noise during operation and maintenance include, operational wind turbines, maintenance activities, such as cable repairs, replacement and protection, and vessels.

945. Underwater noise modelling (**Appendix 12.A Marine Mammal and Marine Turtle Underwater Noise Report** of the Offshore ES) has been conducted to predict the potential impacts of these noise sources and activities on different types of fish groups (based on Popper *et al.*, 2014). Based on criteria from Popper *et al.*

(2014) for continuous noise, the recoverable injury threshold of 170dB (SPL_{RMS}) would require an individual to be present within 10m of an operational turbine for a period of 24hrs to be at risk due to operational turbine noise. The same potential impact range for recoverable injury (of less than 10m) has been modelled for all other potential operation and maintenance noise sources. As the noise source is near the surface, and water depths within the array are in the order of 75m, this is considered a very low risk to prey species.

946. The impact range for fish species are the same as the predicted impact range (for PTS) for grey seal for operational turbines, maintenance activities such as cable laying, trenching and rock placement and vessels, and less than the potential disturbance ranges for maintenance activities. Therefore, no additional effects on grey seal as a result of any impacts on fish species from underwater noise during operation and maintenance are predicted.

947. There would be **no AEoI of the Lundy Island SAC in relation to the conservation objectives for grey seal as a result of any changes in prey availability from underwater noise during the operation and maintenance phase**.

7.2.2.3.11.4 Electromagnetic Fields (EMF)

948. OWFs transmit the energy produced along a network of cables. As energy is transmitted, the cables emit low-energy EMF. The electrical and magnetic fields generated increase proportionally to the amount of electricity transmitted.

949. The magnitude of impact associated with EMFs is based on the worst-case scenario of a 4m radius zone around all array cables, and a 4m radius semi-circular zone around both export cables. The greatest magnitude of impact will be in direct contact with cables, most likely the dynamic array cables within the water column, in which the maximum EMF magnitude is <50μT. As each turbine has an input and output array cable, the magnitude is compounded throughout the array, however the area of impact is very low in comparison to the total available space. The cable interacting with the seabed will be buried, either within the seabed or under rock protection, resulting in a negligible impact zone for fish and shellfish in this case.

950. The areas potentially affected by EMF generated by the worst-case scenario for offshore cables are expected to be small and restricted to the immediate vicinity of the cables (i.e. within metres). EMFs are expected to attenuate rapidly in both horizontal and vertical plains with distance from the source.

951. The effect of EMFs on prey species and any changes in prey availability would be low and there would be **no AEoI of the Lundy Island SAC in relation to the**

conservation objectives for grey seal from EMF effects on prey species during the operation and maintenance phase.

7.2.2.3.11.5 Barrier Effects

952. Barrier effects to prey species occur from a number of sources, including suspended sediment plumes, noise, EMFs, and anthropogenic structures within the water column.

953. Physical barrier effects due to operation and maintenance will be similar to those occurring during construction, with the exception of any future plans to lay additional cable protection on the seabed. This activity will decrease the opportunity of some species to move between sites straddling the protection and, therefore, present a slightly elevated risk of barrier effects for demersal fish and shellfish species. The laying of additional cable protection will be assessed the same as that discussed in the construction scenario as a worst-case (**Section 7.2.1.2.8**).

954. The potential effect associated with barrier effects is based on the worst-case scenario of water volume lost within the Offshore Development Area. This represents approximately 356,139.39m³, constituting 0.0098% of the Offshore Development Area. Therefore, the magnitude of barrier effects is considered negligible to prey species (**Chapter 11: Fish and Shellfish Ecology** of the Offshore ES).

955. Therefore, the effect of barrier effects on prey species and any changes in prey availability would be low and there would be **no AEoI of the Lundy Island SAC in relation to the conservation objectives for grey seal from barrier effects on prey species during the operation and maintenance phase**.

7.2.2.3.11.6 Fish Aggregation Effects

956. See Section **7.2.1.3.8.6** for information on the general effects of fish aggregations.

957. Seal species in particular have been shown to forage actively around submerged pipelines and wind turbine structures within a year of their construction (Russel *et al.,* 2014; Arnould *et al.,* 2015).

958. A study of the use of marine structures in the North Sea by marine mammal species indicate that the structures are visited commonly by grey seal (Delefosse *et al.,* 2018). Note that this study uses incidental sightings only, and therefore no firm conclusions can be drawn from the use of the structures by marine mammals in comparison to the wider area.

959. While there is potential for a benefit to marine mammals through the improvement in the quality of prey, the effect of this on marine mammal species is not well

understood. In addition, as the Project is to use floating WTG structures, the potential beneficial effect is likely reduced (as noted above for fish species).

960. Therefore, the effect of fish aggregation effects on prey species and any changes in prey availability would be insignificant. Therefore, there would be **no AEoI of the Lundy Island SAC in relation to the conservation objectives for grey seal from fish aggregation effects on prey species during the operation and maintenance phase**.

7.2.2.3.11.7 Ghost Fishing

961. Ghost fishing refers to the trapping/entanglement of individuals within man-made debris, most commonly abandoned, lost, or discarded fishing gear (ALDFG) (Richardson *et al*., 2019). In the context of the Project, ALDFG may drift onto suspended cables and chains that form the anchor/mooring system. Ghost nets are a well-known cause of mortality in all fish and shellfish receptor groups.

962. However, the degree of impact is dependent on the size and location of ALDFG. For example, elasmobranch and pelagic species may be impacted by free-floating netting and hooks within the water column or caught on infrastructure in mid-water. Demersal and shellfish species are more likely to be impacted by ALDFG on, or near, the seabed (such as pots and traps), and nets caught on structures such as anchors/moorings, surface-laid cables and cable protection, and the base of the offshore substation. Elasmobranch species are at an elevated risk of entanglement in ALDFG due to their size, with ALDFG causing 74% of entanglement observations in published literature (Parton *et al*., 2019).

963. It is thought that lost static gear such as pots and traps have a low impact due to the relatively high retrieval rate, and the possibility of escape for most species that may reduce mortality (Brown and Macfadyen, 2007).

964. Ghost fishing, typically, has a reduced impact on fish populations in comparison to targeted fishing, particularly in the case of lost trawling nets, as nets are often tangled and have a reduced area of coverage compared to their normal use within the fishing industry. In addition, ghost fishing has a reduced degree of selectivity, and may impact all receptor groups (including mammals and birds) for an extended period of time, exceeding that of normal industry use. The passive nature of ALDFG such as trawling nets may elevate this risk due to a fish aggregating effect, particularly of predatory species that are attracted to trapped carcasses, and which may themselves be trapped/entangled.

965. A worst-case scenario for this impact is difficult to determine due to the unknown location and likelihood of lost gear entering the array at any point in time. Data can

be inferred from multiple sources, including fisheries data (Piet *et al.*, 2021) and charitable citizen science, however this is not likely to be sufficiently representable within the array area. Annual monitoring of anchor/moorings will be undertaken during the lifetime of the Project. Remotely operated vehicles (ROVs) will be used to identify any entanglement hazards such as ALDFG snagged on Project substructures.

966. **Chapter 11: Fish and Shellfish Ecology** of the Offshore ES has assessed a minor adverse effect to all prey species (which would not be significant). Given that grey seal are able to prey upon a wide range of species, that there would be very little effect to fish species, there would not be a significant loss of prey to any grey seal, and there would be no potential to adversely affect the grey seal population.

967. Therefore, there would be **no AEoI of the Lundy Island SAC in relation to the conservation objectives for grey seal from ghost fishing effects on prey species during the operation and maintenance phase**.

7.2.2.3.12 Changes to water quality

968. Throughout the operation and maintenance phase, due diligence and best practice techniques regarding the potential for pollution will be followed throughout the required activities. **Appendix 5.A: Outline CEMP** of the Offshore ES will include the embedded mitigation measures regarding best practice techniques to avoid the accidental release of contaminants (**Table 7.1**). Any risk of accidental release of contaminants (e.g. through spillage) will be mitigated in line with the **Appendix 5.A: Outline CEMP** of the Offshore ES and any changes to water quality as a result of any accidental release of contaminants (e.g. through spillage or vessel collision) would be negligible.

969. During operation and maintenance disturbance of seabed sediments will be localised to specific foundations or sections of cable and considerably less than that during construction phase.

970. Potential changes in water quality during operation and maintenance include (see **Chapter 9: Marine Water and Sediment Quality** of the Offshore ES for more information):

- Localised temporary increases in suspended sediments
- Remobilisation of existing contaminated sediments.

971. Changes in water quality are considered to have negligible effect on marine mammals. As assessed in **Chapter 9: Marine Water and Sediment Quality** of

the Offshore ES, any potential changes in water quality during operation and maintenance would be negligible.

972. Therefore, there would be <u>**no AEoI of the Lundy Island SAC in relation to the conservation objectives for grey seal as a result of any changes to water quality during operation and maintenance**</u>.

973. No additional mitigation is required or proposed, other than the embedded mitigation outlined in **Table 7.1**.

7.2.2.4 Potential effects during decommissioning

974. Potential effects on grey seal associated with decommissioning have not been assessed in detail, as further assessments will be carried out ahead of any decommissioning works to be undertaken taking account of known information at that time, including relevant guidelines and requirements. A detailed decommissioning programme will be provided to the regulator prior to construction that will give details of the techniques to be employed and any relevant mitigation measures required.

975. Decommissioning would most likely involve the removal of the accessible installed components comprising: all of the wind turbine components; part of the mooring structures (those above sea bed level); and the sections of the infield cables close to the offshore structures, as well as sections of the export cables. The process for removal of foundations is generally the reverse of the installation process. There would be no piling, and foundations may be cut to an appropriate level.

976. It is not possible to provide details of the methods that will be used during decommissioning at this time. However, it is expected that the activity levels will be comparable to construction (with the exception of pile driving noise which would not occur).

977. Therefore, the potential effects on grey seal during decommissioning would be the same or less than those assessed for construction due to the processes of decommissioning potentially being the reverse of the installation, without the need for piling. Leading to there being <u>**no AEoI of the Lundy Island SAC in relation to the conservation objectives for grey seal due to the decommissioning effects as mentioned above**</u>.

7.2.2.5 Potential In-Combination Effects

978. The in-combination assessment considers plans, projects and activities where the predicted effects have the potential to combine with the potential effects during

construction of the Project. The construction phase has been assessed as the worst-case for potential in-combination effects.

979. The activities, plans and projects screened into the in-combination assessment for grey seal are those that are located in the relevant MUs. Full information on the screening is provided in **Appendix 12.B Marine Mammals Cumulative Effects Assessment (CEA) Report** of the Offshore ES.

980. The potential in-combination effects for grey seal within the Lundy Island SAC have been identified as:

- Disturbance from underwater noise
- Increased collision risk
- Entanglement
- Changes to prey availability.

981. The in-combination screening identified that there is the potential for in-combination effects on grey seals as a result of disturbance from underwater noise during piling and other construction activities. Other potential effects, including PTS from underwater noise and TTS from underwater noise, were screened out of the in-combination assessment. All operational impacts have also been screened out of the assessment. Further information is provided in **Section 7.2.1.5** and in **Appendix 12.B Marine Mammals Cumulative Effects Assessment (CEA) Report** of the Offshore ES.

7.2.2.5.1 Assessment of Disturbance from Underwater Noise

982. The potential sources of in-combination underwater noise which could disturb grey seals, and which are screened into the assessment are:

- Piling at other OWFs
- Other construction activities at OWFs (such as vessels, cable installation works, dredging, sea bed preparation and rock placement)
- Other construction activities at other marine renewable projects (e.g. wave and tidal) (such as vessels, cable installation works, dredging, sea bed preparation and rock placement)
- Aggregate extraction and dredging
- Oil and gas installation projects
- Oil and gas seismic surveys
- Subsea cables and pipelines
- Other marine industries, such as gas storage, offshore mines, and carbon capture

- High resolution geophysical surveys (such as for OWFs)
- UXO clearance.

983. The approach to the assessment for in-combination disturbance from underwater noise has been based on the approach for the assessment of disturbance for those same activities as presented in **Section 7.2.1.5.**

984. The commitment to the mitigation measures agreed through the MMMP (in accordance with the **Appendix 12.C: Draft MMMP** of the Offshore ES) for piling would reduce the risk of physical injury or permanent auditory injury (PTS) in grey seal. In light of this, and taking account of the type, scale and extent of potential effects arising from the Project assessment, which concluded no AEoI for grey seal from physical injury or PTS from construction (see **Section 7.2.1.2.1.1**).

985. The number of grey seals in the potential effect areas has been estimated based on the seal at sea usage maps (Carter *et al.,* 2022) for each relevant project or area, and the approach to determining the area of effect as presented in **Section 12.10.3.1** of **Chapter 12: Marine Mammal and Marine Turtle Ecology** of the Offshore ES. For the Project, an assessment is provided based on both the SAC specific density, and for the density for the total seals at-sea.

986. It is intended that this approach to assessing the potential effects of disturbance from underwater noise will reduce some of the uncertainties and complications in using the different assessments from HRAs, based on different noise models, thresholds and criteria, as well as different approaches to density estimates.

987. It should be noted that a large amount of uncertainty is inherent in the in-combination assessment see **Section 7.2.1.5**.

988. **Table 7.44** and **Table 7.45** show the quantitative assessments for grey seals from various activities that could be happening at the same time as the Project. **Table 7.45** includes all potential noisy activities, and includes only those activities that are currently expected to take place at the same time as works at the Project have been included, to provide a realistic but still worst-case assessment.

Table 7.44 Quantitative assessment for grey seal for the potential disturbance of grey seal from various activities that could be happening at the same time as the Project (cells in grey present the unrealistic scenario)

Project	**Grey seal density (/km²)**	**Area of Effect (km²)**	**Maximum Number of Individuals Potentially Disturbed During Single Piling**
Single piling at other OWFs that could be piling at the same time as the Project			
White Cross	0.005	1,963.5	9.82
Codling	0.015	1,963.5	29.45
Dublin Array	0.014	1,963.5	27.49
North Irish Sea Array	0.012	1,963.5	23.56
South Irish Sea	0.007	1,963.5	13.74
Awel y Môr OWF	0.182	1,963.5	357.36
Total number of grey seal *(without* the Project*)*			**461.42** *451.61*
Percentage of wider reference population *(without* the Project*)*			**3.67%** *3.59%*
Construction at other OWFs at the same time as construction at the Project			
White Cross	0.005	1,963.5	9.82
Arklow Bank Phase II	0.011	351.86	3.87
Erebus	0.005	351.86	1.79
Total number of grey seal *(without* the Project*)*			**15.48** *5.66*
Percentage of wider reference population *(without* the Project*)*			**0.12%** *0.05%*
Other noisy activities (grey shaded cells are those not currently expected to be taking place and therefore present an unrealistic scenario)			
White Cross	0.005	1963.5	9.8
Geophysical surveys	*0.0253*	*157.0*	*4.0*
Aggregates and dredging	0.0253	4.52	0.11
Cable and pipelines [X-Links 1 & 2]	0.0253	703.7	17.8
Coastal works [Hinkley Point C]	0.0253	351.86	8.9
Seismic surveys	*0.0253*	*907.9*	*23.0*
UXO clearance [high-order]	*0.0253*	*804.3*	*20.3*
UXO clearance [low-order]	*0.0253*	*7.1*	*0.2*
Total for all projects that are currently (or expected to be) in the planning process (realistic worst-case scenario)			
Total number of grey seal *(without* the Project*)*			**13.7** *3.9*
Percentage of wider reference population *(without* the Project*)*			**0.11%** *0.03%*

Project	Grey seal density (/km^2)	Area of Effect (km^2)	Maximum Number of Individuals Potentially Disturbed During Single Piling
Total for all projects and activities that may take place (unrealistic scenario)			
Total number of grey seal *(without* the Project*)*			**61.2** *51.4*
Percentage of wider reference population *(without* the Project*)*			**0.49%** *0.41%*

Table 7.45 In-Combination Assessment for the Potential Disturbance of Grey Seal from All Possible Noise Sources During Piling

Project and industry	Number of grey seals potentially disturbed
Worst-case disturbance from the Project	9.8 *based on either the SAC or the total at-sea density estimate*
Piling at other OWFs	451.6
Construction activities at other OWFs	5.7
Aggregates and dredging	0.11
Cable and pipelines	2.5
Coastal works	1.3
Total number of individuals *(without* the Project*)*	**471.0** *461.2*
Percentage of MU *(without* the Project*)*	**3.74%** *3.66%*

989. Based on less than 5% of the wider population being potentially disturbed, there would be no significant disturbance and **<u>no AEoI of the Lundy Island SAC in relation to the conservation objectives for grey seal in-combination with other plans and projects</u>**.

7.2.2.5.2 Increased Collision Risk

7.2.2.5.2.1 Increased Collision Risk Due to Vessels

990. The in-combination effects from an increase in the number of vessels and vessel movements can pose a potential collision risk for grey seal.

991. As outlined in **Sections 7.2.1.2.6** and **7.2.1.3.4**, the increased collision risk due to project vessels, even using a very precautionary approach, would result in less than one individual (0.3 harbour porpoise) being at risk of vessel collision per year (**Table 7.21**) for construction phase related vessel collision risk. Less than one (0.12) harbour porpoise per year (**Table 7.22**) would be at risk for operation and maintenance phase related vessel collision risk).

992. As outlined in the **CEMP**, vessel movements, where possible, will be incorporated into recognised vessel routes and hence to areas where grey seal are accustomed to vessels, in order to reduce any collision risk. All vessel movements will be kept to the minimum number that is required to reduce any potential for collision risk, and with a vessel speed limit of 10 knots. Additionally, vessel operators will use good practice to reduce any risk of collisions with grey seal. It is expected that other offshore projects and industries would follow similar measures in order to reduce the potential for collision risk of grey seal with vessels.

993. Vessels associated with aggregate extraction and dredging are large and typically slow moving, using established transit routes to and from ports. Therefore, the potential increased collision risk with vessels is considered to be extremely low.

994. In addition, based on the assumption that grey seal would be disturbed as a result of underwater noise from piling, other construction activities, operational and maintenance activities and vessels, there should be no potential for increased collision risk with vessels.

995. Therefore, there would be **no AEoI of the Lundy Island SAC in relation to the conservation objectives for grey seal due an increase in collision risk with construction vessels**.

7.2.2.5.2.2 Increase in Collision Risk from Wave and Tidal Projects

996. **Appendix 12.B Marine Mammals CEA Screening Report** of the Offshore ES screens for the potential for wave and tidal projects to be operational at the same time as the Project is undergoing construction, or through its operational phase. Three wave or tidal projects have the potential to be operational prior to the construction of the Project, and therefore have the potential for a cumulate effect during both the construction and operation and maintenance phases of the Project. None of those projects are within the Lundy Island SAC, however, all are within the wider MUs.

997. For those projects where sufficient information is known, an assessment for the potential for collision risk is provided below (**Table 7.46**). This is based on the assessments undertaken for each of those projects.

Table 7.46 Potential for In-Combination Collision Risk from Vessels at the Project and Wave and Tidal Projects

Project with the Potential for Collision Risk	Project Phase	Summary of Assessments for Collision Risk from the Project and Wave and Tidal Energy Projects for Grey Seal
White Cross	Construction	0.18 at risk of collision
	Operation and Maintenance	0.07 at risk of collision
Morlais[26]	Operation	3.94 at risk of collision
Marine Energy Test Area (META)[27]	Operation	Minor adverse
Perpetuus Tidal Energy Centre (PTEC)[28]	Operation	Minor adverse
Total number of grey seal at risk during construction of the Project (% of reference population)		**4.1 (0.03%)**
Total number of grey seal at risk during Operation and Maintenance of the Project (% of reference population)		**4.0 (0.03%)**[29]

998. The assessment shows that up to 4.1 grey seal may be at risk of collision in-combination with other projects[30] (**Table 7.46**). It should be noted there is no specific data for META and PTEC, although these projects have been assessed as minor adverse. The majority of the collision risk is from the Morlais project (n=3.94). With mitigation and management measures which would be applied to wave and tidal projects, the overall potential for effect would be further reduced. Therefore,

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[26] ORML1938 MDZ_A31.15 MMC366 MOR-RHDHV-APP-0022 (02) Vol III_Chapter 12.2 Marine Mammals [https://publicregister.naturalresources.wales/Search/Download?RecordId=43392]

[27] ORML1957v2 ES Addendum [https://publicregister.naturalresources.wales/Search/Download?RecordId=90526] & Environmental Statement, Chapter 9 META Marine Mammals , Basking Shark and Otter [https://publicregister.naturalresources.wales/Search/Download?RecordId=22891]

[28] PTEC Environmental Statement, Chapter 13 Marine Mammals [https://marinelicensing.marinemanagement.org.uk/mmofox5/download/parcel/77kt1hpovnuijca2o9nud7dvr36968vtn8vagjn73b9sph5pncp6k40tjkdt5opt2m1l5rr12j0pabhj3fcke8q2n0ng833k403s/df1c3fedc48e332d16470aa88ca31626/Volume+II+ES+Chapters+1+to+16.zip?]

[30] Note that a quantitative assessment was not undertaken for META or PTEC

there would be **<u>no AEoI of the Lundy Island SAC in relation to the conservation objectives for grey seal due to in-combination collision risk</u>**.

7.2.2.5.3 Entanglement

999. For the potential for entanglement, as discussed in **Section 7.2.2.3.7**, grey seal are not expected to be at risk of entanglement with the dynamic cables and mooring lines associated with the Offshore Windfarm Project, due to either direct or secondary entanglement. **Section 7.2.2.3.7** discusses the baseline levels of entanglement of grey seal in the UK due to entanglements in fishing gear. The operation and maintenance of the Project is not expected to increase the rates of entanglement in fishing gear, as it is likely that the presence of the wind farm infrastructure would provide individuals greater opportunity to detect (and avoid) any fishing gear that may be present in the area and caught on the cables associated with the Project.

1000. While there is the potential for a number of other floating OWFs to be developed in the Celtic and Irish Seas, it is expected that these projects would also not pose a risk of entanglement to grey seal, in line with the reasons outlined above for the Project. In addition, it is expected that all floating wind farms and other marine renewable projects (such as wave and tidal projects) will be required to undertake monitoring to ensure that no fishing gear is caught on the infrastructure, and all Projects would need to undertake such monitoring for infrastructure integrity purposes as well as for management of entanglements, and therefore the risk for any grey seal entanglement to occur is very low.

1001. Therefore, it is not expected that would be any potential for an in-combination entanglement risk, and there would be **<u>no AEoI of the Lundy Island SAC in relation to the conservation objectives for grey seal due to in-combination entanglement risk</u>**.

7.2.2.5.4 Changes to Prey Availability

1002. Potential effects on prey species can result from increased SSCs and sediment re-deposition and underwater noise (leading to mortality, physical injury, auditory injury or behavioural responses); the potential effects on fish species during operation and maintenance can include physical disturbance and loss or changes to sea bed habitat, introduction of hard substrate, operational noise, and EMF. During decommissioning, potential effects on fish species can include physical disturbance, loss or changes to habitat, increased SSCs, re-mobilisation of contaminated sediments and underwater noise. Some of the effects could be adverse with fish species moving away or being lost from an area, while some effects could have an adverse or beneficial effect, such as possible changes in species composition, and other effects could result in a beneficial effect, such as the aggregation of prey around seabed structures.

1003. The potential effects on grey seal as a result of any changes to prey availability can include changes in distribution, abundance and community structure, increased competition with other marine mammal species, increased susceptibility to disease and contaminants, and implications for reproductive success, which could potentially affect individuals throughout their range or at different times of the year. However, any changes to prey tend to be localised and temporary in nature. In addition, if prey species are disturbed from an area, it is highly likely that grey seal will also be disturbed from the area over a potentially wider range than prey species.

1004. The in-combination assessment on potential changes to prey availability has assumed that any potential effects on grey seal prey species from underwater noise, including piling, would be the same or less than those for grey seal. Therefore, there would be no additional effects other than those assessed for grey seal, i.e. if prey are disturbed from an area as a result of underwater noise, grey seal will be disturbed from the same or greater area, therefore any changes to prey availability would not affect grey seal as they would already be disturbed from the same area.

1005. Any effects on prey species are likely to be intermittent, temporary and highly localised, with potential for recovery following cessation of the disturbance activity. Any permanent loss or changes of prey habitat will typically represent a small percentage of the potential habitat in the surrounding area. Therefore, there would be **no adverse effect on the integrity of the Lundy Island SAC in relation to the conservation objectives for grey seal arising due to changes in prey availability**.

7.2.2.6 Summary of Potential Effects on Site Integrity

1006. The assessment of the potential effects for the Project has been summarised in relation to the Lundy Island SAC conservation objectives for grey seal (**Table 7.47**).

1007. The MMMP will provide mitigation or management measures to reduce the potential for any significant disturbance of grey seal as a result of in-combination effects from underwater noise.

1008. There would be **<u>no AEoI of the Lundy Island SAC in relation to the conservation objectives for grey seal either alone or in-combination with other plans and projects</u>**.

Table 7.47 Summary of the potential effects of the Project, including in-combination effects on the Lundy Island SAC in relation to the conservation objectives for grey seal (× = no potential for AEoI; ✓ = potential for AEoI)

Conservation Objectives	**The Project effects**								**In-combination Effects**			
	Auditory Injury and disturbance from underwater noise	**Barrier effects**	**Disturbance to seal haul-out sites**	**Entanglement**	**Vessel interaction**	**Changes to water quality**	**EMFs**	**Changes to prey resources**	**Disturbance from underwater noise**	**Entanglement**	**Vessel interaction**	**Changes to prey resources**
Grey seal is a viable component of the site	×	×	×	×	×	×	×	×	×	×	×	×
There is no significant disturbance of the species	×	×	×	×	×	×	×	×	×	×	×	×
The condition of supporting habitats and processes and the availability of prey is maintained	×	×	×	×	×	×	×	×	×	×	×	×

× = no potential for any AEoI of the site in relation to the conservation objectives

7.2.3 Pembrokeshire Marine / Sir Benfro Forol SAC

7.2.3.1 Baseline and Current Conservation Status

7.2.3.1.1 Description of Designation

1009. Pembrokeshire Marine / Sir Benfro Forol SAC is one of the largest marine designated sites in the UK.

1010. The Pembrokeshire Marine / Sir Benfro Forol SAC is recognised to have a variety of habitats, from reefs to subtidal sandbanks, covering an area of 1,380km^2. The SAC is a multiple interest site that has been selected for the presence of eight marine habitat features and seven species features, including the grey seal.

1011. The closest point to the Project's Windfarm Site is approximately 36.5km from the Pembrokeshire Marine / Sir Benfro Forol SAC (**Table 7.48**).

Table 7.48 Distances of the Project to the Pembrokeshire Marine / Sir Benfro Forol SAC

Location	Closest point to Pembrokeshire Marine / Sir Benfro Forol SAC
Windfarm Site	36.5km
Export cable corridor	43km
Landfall location	60km

7.2.3.1.2 Qualifying Features

7.2.3.1.2.1 Grey seal

1012. Within the Pembrokeshire Marine / Sir Benfro Forol SAC site selection document, grey seal is a qualifying species and a primary reason for the site selection. It was estimated that Pembrokeshire Marine / Sir Benfro Forol SAC supports 5,000 individuals, 4% of the UKs population (2% global population).

1013. Grey seal pup production within the Pembrokeshire Marine / Sir Benfro Forol SAC has increased over the last decade or more (Bull *et al*., 2021) and occurs from August to December, with the peak of the pupping season becoming earlier over the observed period with no indication of reaching carrying capacity (Bull *et al*., 2021). Annual pup production within the site is approximately 980 births, which is approximately 75% of the south-west Wales population, with the largest breeding sites being Ramsey Island and Skomer.

1014. The average survival rate to weaning is 80%, though an average of one pup in five dies during first three weeks from natural causes, disease or physical injury; between half to two thirds survive their first year (NRW, 2009b).

1015. The assessments are based on mean relative density estimates from Carter *et al.* (2022) and are based on both the total mean grey seal density, and the density estimate based on those seals estimated to be from the Pembrokeshire Marine / Sir Benfro Forol SAC population (see **Figure 7.1**).

1016. Carter *et al*. (2022) provides habitat-based predictions of at sea distribution for seals around the British Isles. The habitat preference approach predicted distribution maps provide estimates per species, on a 5km^2 grid, of relative at sea density for seals hauling-out in the British Isles. It is important to note that Carter *et al.* (2022) provides relative density (i.e. percentage of the total at sea population in each grid at any one time).

1017. The grey seal density estimates for Pembrokeshire Marine / Sir Benfro Forol SAC have been calculated from the seal at sea usage maps (Carter et al., 2022) based on the 5km^2 grids that overlap with the SAC (**Figure 7.3**). The total grey seal population in the British Isles, at sea, is approximately 168,032 individuals, based on the corrected values and most recent haul-out counts for the UK (SCOS, 2022). This is the population estimate used with the Carter *et al.* (2022) data to calculate density estimates for Pembrokeshire Marine / Sir Benfro Forol SAC.

1018. The mean at sea relative density estimates (for those grey seal associated with the Pembrokeshire Marine / Sir Benfro Forol SAC) for these areas have been calculated form Carter et al. (2022):

- 0.004 individuals per km^2 for the Windfarm Site
- 0.010 individuals per km^2 for the Offshore Export Cable Corridor.

1019. The mean at sea relative density estimates have also been calculated for the total at-sea individuals, as noted in **Chapter 12: Marine Mammal and Marine Turtle Ecology** of the Offshore ES. The density estimates accounting for all grey seals (rather than just those associated with the SAC) are:

- 0.005 individuals per km^2 for the Windfarm Site
- 0.119 individuals per km^2 for the Offshore Export Cable Corridor.

1020. As noted in section **7.2.2.1.2.1**, grey seal at the Project has the potential for connectivity with Wales and RoI. In order to inform the assessments for grey seal at the Pembrokeshire Marine / Sir Benfro Forol SAC, the population estimate used is 5,000. However, for the impact assessment of grey seal, a wider population estimate is used. Within the SW England MU, the grey seal count was estimated to be 500, and for the Wales MU, the grey seal count was estimated to be 900 (SCOS, 2020). The grey seal haul out counts for these MUs has been corrected to take account of the number of seals not available to count during the surveys. Approximately 0.2515 grey seals are available to count within the August surveys (i.e. are hauled-out) (SCOS, 2021), and therefore this has been used as a correction factor, to derive total grey seal numbers within each MU, rather than the number counted within each MU. The total population of grey seal within the SW England MU is therefore 1,988, and for Wales the total population is 3,579.

1021. The total reference population for the assessment is therefore 12,588 grey seals. Assessments will be put into context of the wider reference population (of 12,588). As a worst case it is assumed that all seals are from the Pembrokeshire Marine / Sir Benfro Forol SAC (with an estimated population count of 5,000, and the SW England MU count of 1,988), although the more realistic assessment is based on the wider reference population which takes into account the total movement of seals.

1022. Further information on grey seal movements, distributions, and diet is provided in **Section 7.2.2.1.2.1**.

7.2.3.1.3 Conservation Status

1023. The most recent assessment for the conservation status of the grey seal was conducted in 2017 and found the species to be of a Favourable condition (NRW, 2018c).

7.2.3.1.4 Conservation Objectives

1024. The Conservation Objectives for grey seal (NRW, 2009b) are: "Conservation status of a species means the sum of the influences acting on the species concerned that may affect the long-term natural distribution and abundance of its populations within the territory referred to in Article 2:

1025. The conservation status will be taken as 'favourable' when:

- Population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and
- The natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- There is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis."

7.2.3.2 Assessment of Potential Effects During Construction

1026. The Pembrokeshire Marine / Sir Benfro Forol SAC is located at closest point, 36.5km from the Project and 43km from the Offshore Export Cable Corridor. Therefore, there is no potential for direct effect on the SAC from the Project.

However, due to the foraging range of grey seal and the movement of grey seal along the west coast of the UK (for further details see **Section 7.2.2.1.2.1**) there is the potential for effects on foraging grey seal from the Pembrokeshire Marine / Sir Benfro Forol SAC in the vicinity of the Project.

1027. The potential effects during the construction the Project in relation to grey seal from the Pembrokeshire Marine / Sir Benfro Forol SAC were agreed in consultation with the marine mammal ETG as part of the EPP. The potential effects of the Project are assessed to determine any potential for an AEoI of the Pembrokeshire Marine / Sir Benfro Forol SAC in relation to the Conservation Objectives for grey seal are:

- Auditory injury and disturbance resulting from underwater noise during impact piling
- Auditory injury and disturbance resulting from underwater noise during UXO clearance
- Auditory injury and disturbance resulting from underwater noise during other construction activities, including seabed preparations, rock placement and cable installation
- Auditory injury and disturbance resulting from underwater noise due to construction vessels
- Barrier effects as a result of underwater noise
- Interaction and Collision Risk with Vessels
- Entanglement
- Disturbance at seal haul-out sites
- Barrier effects due to physical presence
- Electromagnetic Fields (EMFs)
- Changes to prey availability
- Changes to water quality.

7.2.3.2.1 Auditory Injury and Disturbance Resulting from Underwater Noise During Impact Piling

1028. There is the potential for impact piling to be used to install pin-piles for the OSP and for the mooring anchors. Other methods of installation for the anchoring systems include drag embedment anchors and suction piles. It should be noted that an OSP may not be required, and that the mooring anchors would be installed using an alternative method to piling, and therefore there is the potential that impact piling would not be required for the construction of the Project. However, impact piling has been fully assessed as it remains an option to be used and is the worst-case in terms of underwater noise effects to marine mammals. Other foundation options are considered within the underwater noise modelling, and assessed where appropriate in the following sections (e.g. suction piles or drag embedment anchors, assessed in **Section 0**).

1029. Impact piling is a source of high-level underwater noise. Underwater noise can cause both physiological (e.g. lethal, physical injury and auditory injury) and behavioural (e.g. disturbance and masking of communication) impacts on grey seals.

7.2.3.2.1.1 Potential for Permanent Auditory Injury (PTS) During Impact Piling

1030. Underwater noise modelling was carried out by Subacoustech to estimate the noise levels likely to arise during piling and determine the maximum potential areas of effect (see **Chapter 12: Marine Mammal and Marine Turtle Ecology** and **Appendix 12.A: Marine Mammal and Marine Turtle Underwater Noise Report** of the Offshore ES for further details).

1031. A summary of the underwater noise modelling and piling parameters are provided in **Section 7.2.1.2.1.1**, and the potential PTS effect ranges are provided in **Table 7.33**. The maximum PTS range for grey seal is 100m for cumulative exposure (for either OSP jacket piles or mooring pin-piles), and less than 50m for instantaneous PTS (for either OSP jacket piles or mooring pin-piles).

1032. At the closest point, the Project Windfarm Site is 36.5km from the Pembrokeshire Marine / Sir Benfro Forol SAC area and the Offshore Export Cable Corridors does not overlap the SAC, approximately 43km from the Pembrokeshire Marine / Sir Benfro Forol SAC. Therefore, there is no direct overlap with the cable corridor or the Windfarm Site itself, for the maximum impact range for PTS (without mitigation) with the Pembrokeshire Marine / Sir Benfro Forol SAC. However, it is assumed that grey seals in and around the Project could be from the Pembrokeshire Marine / Sir Benfro Forol SAC.

1033. The maximum potential number of grey seal that could be at possible risk of PTS from SEL_{cum} during piling, without any mitigation, could be 0.0004 individuals, (0.0000008% of the Pembrokeshire Marine / Sir Benfro Forol SAC) based on the Pembrokeshire Marine / Sir Benfro Forol SAC density for the Windfarm Site of 0.004/km^2, which will be the worst-case (**Table 7.49**).

Table 7.49 Maximum Number of Grey Seal (and % of Reference Population) That Could be at Risk of PTS for Jacket Pile or Pin-Pile Installation Without Mitigation, Based on Worst-Case

Species	Criteria and Threshold (Southall *et al*., 2019)	OSP Jacket Pile with Maximum Hammer Energy of 2,500kJ Maximum Number of Individuals (% of Reference Population)	Mooring Pin-Pile with Maximum Hammer Energy of 800kJ Maximum Number of Individuals (% of Reference Population)
Single strike at maximum energy without mitigation			
Grey seal	SPL_{peak} Unweighted (218 dB re 1µPa) Impulsive	0.00004 (0.00000008% of the Pembrokeshire Marine / Sir Benfro Forol SAC population; 0.000002% of the SW MU; 0.0000003% of the combined MU)	0.00004 (0.0000008% of the Pembrokeshire Marine / Sir Benfro Forol SAC population; 0.000002% of the SW MU; 0.0000003% of the combined MU)
PTS from cumulative exposure without mitigation			
Grey seal	SEL_{cum} Weighted (185 dB re 1µPa^{2}s) Impulsive	0.0004 (0.000008% of the Pembrokeshire Marine / Sir Benfro Forol SAC population; 0.00002% of the SW MU; 0.000003% of the combined MU)	0.0004 (0.000008% of the Pembrokeshire Marine / Sir Benfro Forol SAC population; 0.00002% of the SW MU; 0.000003% of the combined MU)

1034. As outlined in **Section 7.1.1**, a MMMP for piling in accordance with the **Appendix 12.C: Draft MMMP** of the Offshore ES will be produced post-consent in consultation with the MMO and relevant SNCBs, and will be based on the latest scientific understanding and guidance, as well as detailed Project design. The implementation of the agreed mitigation measures within the MMMP for piling will reduce the risk of PTS from the first strike of the soft-start, single strike of the maximum hammer energy and cumulative exposure.

1035. Mitigation to further reduce the risk of PTS from cumulative exposure during installation of jacket piles and pin-piles would include mitigation for the maximum potential impact range (which is up to 4.6km for grey seal; **Table 7.8**). Mitigation measures such as increasing the activation of ADDs prior to the soft-start to 62 minutes prior to start of OSP jacket piling, or up to 31 minutes prior to the start of mooring pin pile piling. This should deter grey seal outside of the PTS cumulative effect ranges prior to piling.

1036. Development of the MMMP (in accordance with the **Appendix 12.C: Draft MMMP** of the Offshore ES) prior to construction will also consider other mitigation methods based on the latest information and requirements.

1037. The effective implementation of the MMMP for piling will reduce the risk of PTS to grey seal during piling at the Windfarm Site. Therefore, there would be **no AEoI of the Pembrokeshire Marine / Sir Benfro Forol SAC in relation to the conservation objectives for grey seals, due to PTS from piling during construction**.

7.2.3.2.1.2 Potential for Disturbance Resulting from Underwater Noise During Impact Piling

1038. There are currently no agreed thresholds or criteria for modelling the potential disturbance of other marine mammal species from underwater noise. For marine mammals, including grey seal, a fleeing response is assumed to occur at the same noise levels as TTS.

1039. A review of the potential for effect to grey seal due to piling activities is provided in **Section 12.7.1.3.3.4** of the **Chapter 12 Marine Mammal and Marine Turtle Ecology** of the Offshore ES. A potential disturbance range of 25km for grey seal has been used to inform the assessment of potential disturbance from piling.

1040. Up to eight (7.9) grey seal may be disturbed from piling (or 0.16% of the Pembrokeshire Marine / Sir Benfro Forol SAC) based on the Windfarm Site density for the Pembrokeshire Marine / Sir Benfro Forol SAC (**Table 7.50**).

Table 7.50 Maximum Number of Grey Seal (and % of Reference Population) that could be Disturbed During Piling at the Project based on their Known Disturbance Range

Species	Known Disturbance Range for Piling	Maximum Number of Individuals (% of Reference Population)
Grey seal	25km (Russell et al., 2016)	7.9 (0.16% of the Pembrokeshire Marine / Sir Benfro Forol SAC; 0.40% of SW MU; 0.06% of the combined MU)

1041. Disturbance during piling would be temporary and for a relatively short duration (i.e. during active piling). It is unlikely that all grey seal potentially affected would be from the Pembrokeshire Marine / Sir Benfro Forol SAC, which is located over 36.5km from The Project (at closest point).

1042. Mitigation to reduce the risk of PTS could include activation of ADDs prior to the soft-start commencing. Based on the worst-case of ADD activation of 62 minutes, this would disturb grey seal over 5.58km. Up to 0.4 grey seal (0.008% of the

Pembrokeshire Marine / Sir Benfro Forol SAC population; 0.03% of SW MU; 0.004% of the combined MU) could be disturbed due to ADD activation of 62 minutes for OSP jacket piles.

1043. With less than 0.000002% of the Pembrokeshire Marine / Sir Benfro Forol SAC count temporarily disturbed there would be **no AEoI of the Pembrokeshire Marine / Sir Benfro Forol SAC in relation to the conservation objectives for grey seal**.

7.2.3.2.2 Auditory Injury and Disturbance Resulting from Underwater Noise During UXO Clearance

1044. Prior to construction, there is the potential for UXO clearance to be required. While any identified UXO will either be avoided or removed and disposed of onshore in a designated place, there is the potential that underwater detonation could be required where it is necessary and unsafe to remove the UXO.

1045. The precise details and locations of potential UXO are unknown at this time. For the purposes of the underwater noise modelling and this assessment, three UXO clearance scenarios have been considered:

- High-order detonation, unmitigated
- High-order detonation, with bubble curtain
- Low-order clearance (e.g., deflagration).

1046. For further information on the UXO clearance scenarios, see **Appendix 12.A: Marine Mammal and Marine Turtle Underwater Noise Report** of the Offshore ES.

7.2.3.2.2.1 Potential for Permanent Auditory Injury (PTS) During Impact UXO Clearance

1047. The maximum effect ranges (and areas) are used to inform the assessments. The results of the underwater noise modelling for PTS in grey seal are presented in **Table 7.36** for both low-order and high order clearances. The number of individuals at risk for the worst-case scenario and low-order clearance are also shown in **Table 7.51** for PTS, based off the grey seal at-sea densities for individuals associated with the Pembrokeshire Marine / Sir Benfro Forol SAC (assessments are made for both the Windfarm Site and ECC densities, as UXO clearance could take place in either).

1048. For high-order clearance, there is the potential for PTS at up to 2.0km from the UXO clearance location, and for low-order clearance, there is the potential for PTS to occur at up to 0.39km from the UXO clearance location. At the closest point the Windfarm Site is 2.2km from the Pembrokeshire Marine / Sir Benfro Forol SAC, therefore, there would be no direct overlap with the Windfarm Site and ECC for PTS effects to grey seal (**Table 7.51**).

1049. The number of individuals at risk for the worst-case scenario and low-order clearance are shown in **Table 7.36** for both PTS and TTS, based of Carter's (2022) results.

1050. At the closest point, the Windfarm Site is 36.5km from the Pembrokeshire Marine / Sir Benfro Forol SAC and 43km from the Offshore Export Cable Corridor (**Table 7.48**). The maximum impact range for PTS in grey seal is 2km, and there would therefore be no direct effect within the SAC itself.

1051. With less than 1% of the Pembrokeshire Marine / Sir Benfro Forol SAC population being impacted (**Table 7.51**), there would be **no AEoI of the Pembrokeshire Marine / Sir Benfro Forol SAC in relation to the conservation objectives for grey seals, due to PTS from UXO clearance during construction**.

7.2.3.2.2.2 Potential for Disturbance Resulting from Underwater Noise During UXO Clearance

1052. A summary of the potential for disturbance to grey seal due to UXO clearance is provided in **Section 775**.

1053. The maximum effect ranges (and areas) are used to inform the assessments. The results of the underwater noise modelling for TTS / fleeing response (used to inform the assessment of disturbance) in grey seal are presented in **Table 7.52** for both low-order and high order clearances. The number of individuals at risk for the worst-case scenario and low-order clearance are also shown in **Table 7.52.** For TTS / fleeing response, based on the grey seal at-sea densities for individuals associated with the Pembrokeshire Marine / Sir Benfro Forol SAC (assessments are made for both the Windfarm Site and ECC densities, as UXO clearance could take place in either).

1054. For high-order clearance, there is the potential for TTS / fleeing response at up to 16.0km from the UXO clearance location, and for low-order clearance, there is the potential for TTS / fleeing response to occur at up to 1.5km from the UXO clearance location.

Table 7.51 Maximum Number of Grey Seals Potentially at Risk of PTS During UXO Clearance

Species	**Maximum Effect Range (and Area)**	**Maximum Number of Individuals**	**% of Reference Population**	**Potential Adverse Effect on Site Integrity**
PTS during UXO clearance				
Grey seal	High-order detonation (309kg (NEQ) + donor charge) 2.0km (12.57km^2)	0.13 based on the Pembrokeshire SAC ECC density estimate 0.05 based on the Pembrokeshire SAC Windfarm Site density estimate	0.003% of the Pembrokeshire SAC population; 0.006% of the SW MU, and 0.001% of the combined MU, based on the Pembrokeshire SAC ECC density estimate 0.001% of the Pembrokeshire SAC population; 0.003% of the SW MU, and 0.0004% of the combined MU, based on the Pembrokeshire SAC Windfarm Site density estimate	**No** Permanent effect. 0.006% or less of the reference population could be at risk of permanent auditory injury (PTS) during UXO, based on the worst-case scenario.
	Low-order clearance (2kg (NEQ)) 0.39km (0.48km^2)	0.005 based on the Pembrokeshire SAC ECC density estimate 0.002 based on the Pembrokeshire SAC Windfarm Site density estimate	0.0001% of the Pembrokeshire SAC population; 0.0002% SW MU, and 0.00004% of the combined MU, based on the Pembrokeshire SAC ECC density estimate 0. 00004% of the Pembrokeshire SAC population; 0.0001% of the SW MU, and 0.00002% of the combined MU, based on the Pembrokeshire SAC Windfarm Site density estimate	

Table 7.52 Maximum Number of Grey Seals Potentially at Risk of TTS During UXO Clearance

Species	Maximum Effect Range (and Area)	Maximum Number of Individuals	% of Reference Population	Potential Adverse Effect on Site Integrity
TTS during UXO clearance				
Grey seal	High-order detonation (309kg (NEQ) + donor charge) 16.0km (804.25km^2)	8.0 based on the on the Pembrokeshire SAC ECC density estimate 3.2 based on the on the Pembrokeshire SAC Windfarm Site density estimate	0.16% of the Pembrokeshire SAC population; 0.40% of the SW MU, and 0.06% of the combined MU, based on the ECC density estimate 0.064% of the Pembrokeshire SAC population; 0.16% of the SW MU, and 0.026% of the combined MU, based on the Windfarm Site density estimate	No Temporary effect. 0.06% or less of the reference population (or up to 0.40% of the Pembrokeshire SAC population) could be temporarily displaced during UXO, based on the worst-case scenario.
	Low-order clearance (2kg (NEQ)) 1.5km (7.07km^2)	0.07 based on the on the Pembrokeshire SAC ECC density estimate 0.03 based on the on the Pembrokeshire SAC Windfarm Site density estimate	0.001% of the Pembrokeshire SAC population; 0.004% of the SW MU, and 0.0006% of the combined MU, based on the ECC density estimate 0.0006% of the Pembrokeshire SAC population; 0.001% of the SW MU, and 0.0002% of the combined MU, based on the Windfarm Site density estimate	

1055. The maximum number of grey seal that could be at possible risk of TTS / fleeing response during high-order UXO clearance, without any mitigation, could be up to eight individuals (0.16% of the Pembrokeshire Marine / Sir Benfro Forol SAC, or 0.06% of the combined MU population) (**Table 7.52**). The maximum number of grey seal that could be at possible risk of TTS / fleeing response due to low-order clearance is up to two (1.4) individuals (0.01% of the Pembrokeshire Marine / Sir Benfro Forol SAC, or up to 0.01% of the combined MU population).

1056. The assessments show that for the worst-case of a high-order clearance, at the maximum charge weight, and in the ECC, would cause a disturbance to up to 0.6% of the wider population. This would therefore not cause a significant level of disturbance to grey seal, and there would be **no AEoI of the Pembrokeshire Marine / Sir Benfro Forol SAC in relation to the conservation objectives for grey seals, due to disturbance from UXO clearance during construction**.

1057. Note that a full assessment of the potential for UXO clearance to have a significant effect on grey seal (as well as designated sites) would be undertaken once further detail is known on the location, size, and clearance method required for any UXO at the Project, as part of the separate Marine Licence process, and therefore the assessments made prior to application would represent a realistic worst-case scenario and more accurate assessment of potential significance.

7.2.3.2.3 Potential Effects of Underwater Noise during Other Construction Activities

1058. Underwater noise modelling was undertaken to assess the impact ranges of construction activities, other than piling, on grey seals, and this has been used to determine the potential area of effect (for further information see **Chapter 12: Marine Mammal and Marine Turtle Ecology** and **Appendix 12.A: Marine Mammal and Marine Turtle Underwater Noise Report** of the Offshore ES).

1059. For SEL_{cum} calculations, the duration of noise is also considered, with all sources operating for a worst-case of 24 hours in any given 24-hour period for non-impulsive noise.

7.2.3.2.3.1 Potential for Permanent Auditory Injury (PTS) During Other Construction Activities

1060. The results of the underwater noise modelling (**Section 7.2.2.2.1.1** to **7.2.2.2.4**) indicate that grey seals would have to be less than 10m (precautionary maximum range) from the continuous noise source and for a period of 12 hours be exposed to noise levels that could induce PTS or TTS based on the Southall et al. (2019) non-impulsive thresholds and criteria for SELcum. Therefore, PTS as a result of construction activity, other than piling, is highly unlikely and has not been further assessed.

1061. While there is the potential that more than one of these activities could be underway at either site or the Offshore Export Cable Corridor area at the same time. Due to the very localised effect area and that grey seal would have to be within 10m of the source for 12 hours, it is considered highly unlikely that any individuals would be at risk of PTS, and there would be **no AEoI of the Pembrokeshire Marine / Sir Benfro Forol SAC in relation to the conservation objectives for grey seal, due to PTS from construction activities other than piling**.

7.2.3.2.3.2 Potential for Disturbance Resulting from Underwater Noise During Other Construction Activities

1062. A summary of the potential for disturbance due to other construction activities is provided in **Section 3**.

1063. There is the potential that more than one of these activities could be underway at the Windfarm Site or the Offshore Export Cable Corridor area at the same time. As a worst-case and unlikely scenario, an assessment for all eight activities has been undertaken (**Table 7.64**).

1064. As stated in **Section 7.2.1.2.3.2**, harbour porpoise were found to be disturbed up to a distance of 4km due to offshore construction activities (Benhemma-Le Gall *et al.,* 2021). As harbour porpoise are the most sensitive marine mammal species, this 4km potential disturbance range (with a potential effect area of 50.3km^2) has been used to also inform the assessment for grey seal, due to the absence of grey seal data to inform an assessment.

1065. **Table 7.53** presents the assessments for the maximum number of grey seal that could be disturbed due to construction activities other than piling. As a worst-case scenario, the number of grey seal that could be disturbed from the area around the Windfarm Site has been estimated for either one activity at a time, or up to seven at the same time.

1066. The assessment indicates that 0.02% or less of the combined reference population (or 0.01% of the Pembrokeshire Marine / Sir Benfro Forol SAC population) (**Table 7.53**) could be temporarily displaced during other offshore construction activities, based on the worst-case scenario of up to seven activities taking place at the same time. The temporary disturbance of 5% or less of the combined population, or of the SAC population, would not result in any significant population effects or result in any changes to the FCS of grey seal (JNCC *et al.*, 2010).

Table 7.53 Maximum Number of Grey Seal Potentially Disturbed During Construction Activities Other Than Piling

Species	Construction Activity	Maximum Number of Individuals (% of Reference Population)	Potential Adverse Effect on Site Integrity
Grey seal	One offshore construction activity (50.3km^2)	0.20 (0.004% of the Pembrokeshire Marine / Sir Benfro Forol SAC population; 0.01% of the SW MU; 0.002% of the combined MU) based on the on the Pembrokeshire Marine / Sir Benfro Forol SAC windfarm density estimate 0.5 (0.01% of the Pembrokeshire Marine / Sir Benfro Forol SAC population; 0.03% of the SW MU; 0.004% of the combined MU) based on the on the Pembrokeshire Marine / Sir Benfro Forol SAC ECC density estimate	No Temporary effect. 0.02% or less of the reference population (or up to 0.01% of the Pembrokeshire Marine / Sir Benfro Forol SAC population) could be temporarily displaced during construction activities other than piling, based on the worst-case scenario.
	Up to seven offshore construction activities (three in the ECC, plus four in the Windfarm Site) (351.86km^2)	2.3 (0.05% of the Pembrokeshire Marine / Sir Benfro Forol SAC population; 0.1% of the SW MU; 0.02% of the combined MU) based on the on the Pembrokeshire Marine / Sir Benfro Forol SAC density estimates	

1067. Therefore, there is no potential for direct overlap with the Pembrokeshire Marine / Sir Benfro Forol SAC for underwater noise from other construction activities.

1068. No additional mitigation is required or proposed for underwater noise for construction activities, other than piling.

7.2.3.2.4 Potential Effects of Underwater Noise and Disturbance from Construction Vessels

1069. During the construction phase there will be an increase in the number of vessels. This is estimated to be up to five vessels on site at the Project at any one time. The number, type and size of vessels will vary depending on the activities taking place at any one time.

1070. Vessel movements to and from any port will be incorporated within existing vessel routes and therefore any increase in disturbance as a result of underwater noise from vessels during construction will be within the Windfarm Site and offshore cable corridor area, keeping at least a good distance from seal haul-out sites.

1071. The results of the underwater noise modelling indicate that grey seal would have to be less than 100m (precautionary maximum range) from the vessel for 24 hours, to be exposed to noise levels that could induce PTS or TTS based on the Southall *et al*. (2019) thresholds and criteria.

1072. The maximum potential impact area for PTS or TTS for each vessel is less than 0.0003km^2. The total impact area for up to five vessels is 0.0015km^2.

1073. PTS is unlikely as the modelling indicates that grey seal would have to remain less than 100m from the source for 24 hours for any potential risk.

1074. If the behavioural response is displacement from the area, it is predicted that grey seal will return once the activity has been completed. Therefore, any impacts from underwater noise as a result of construction vessels will be both localised and temporary. As a result, there is unlikely to be the potential for any significant impact on grey seal.

1075. There would be **no AEoI of the Pembrokeshire Marine / Sir Benfro Forol SAC in relation to the conservation objectives for grey seal due to auditory injury (PTS or TTS) during construction (disturbance from construction vessels)**.

7.2.3.2.5 Potential Barrier effects as a result of underwater noise

1076. Underwater noise during construction could have the potential to create a barrier effect, preventing movement of grey seal between feeding and / or breeding areas, or potentially increasing swimming distances if grey seal avoid the site and travel around it.

1077. The greatest potential barrier effect for grey seal would be from underwater noise during piling at the Project. However, piling would not be constant during the piling phases and construction periods. There will be gaps between the installations of individual piles, and if installed in groups there could be time periods when piling is not taking place as piles are brought out to the site. There will also be potential delays for weather or other technical issues.

1078. The maximum duration of any barrier effects would be for the maximum piling duration, based on worst-case scenarios, see **Section 7.1.2** for further details.

1079. There is unlikely to be the potential for any barrier effects from underwater noise for other construction activities and vessels, as it is predicted that grey seal will return once the activity has been completed and therefore any impacts from underwater noise as a result of construction activities other than piling noise will be both localised and temporary. Therefore, there is unlikely to be the potential for any barrier effects that could significantly restrict the movements of grey seal.

1080. Grey seals are wide ranging, travelling 100km to 448km to foraging sites (Carter, 2022). Therefore, if there are any potential temporary barrier effects from underwater noise during construction, grey seal would be able to compensate by travelling to other foraging areas within their range. There is unlikely to be any significant long-term impacts from any barrier effects, as any areas affected would be relatively small in comparison to the range of grey seal and would not be continuous throughout the offshore construction period.

1081. Therefore, there would be no significant disturbance of grey seal and **no AEoI of the Pembrokeshire Marine / Sir Benfro Forol SAC in relation to the conservation objectives for grey seal due to potential barrier effects from increased underwater noise during construction for the Project**.

7.2.3.2.6 Interaction and collision risk with vessels

1082. During the offshore construction phase there will be an increase in vessel traffic within and on transit to the offshore sites. However, it is anticipated that vessels would follow an established shipping route to the relevant ports in order to minimise vessel traffic in the wider area. **Appendix 12.C: Draft MMMP** of the Offshore ES will provide details on vessel good practice and code of conduct that will be implemented to avoid marine mammal collisions.

1083. The approximate number of vessels on site at any one-time during construction is estimated to be five vessels, with an average of approximately six trips per month, resulting in a daily average of approximately 0.2 vessel movements, based on 101 vessel movements over a 16-month offshore construction period.

1084. See **Section 7.2.1.2.6** for further information on the current vessel usage of the area.

1085. It is unlikely that all grey seal present in the Windfarm Site and Offshore Export Cable Corridor could be at increased collision risk with vessels during construction. Considering the minimal number of vessel movements compared to the existing number vessel movements in the area and that vessels operating within the wind farm site and cable corridor areas would be stationary or very slow moving. In addition, based on the assumption that grey seal would be disturbed as a result of the vessel noise and presence, there should be no potential for increased collision risk with construction vessels.

1086. **Section 7.2.2.2.6** provides an assessment of the potential for collision risk to grey seal during construction, concluding that up to 0.18 grey seal may be at risk of collision per construction year, due to the five construction vessels.

1087. Consequently, there would be little increased collision risk of grey seal and **no AEoI of the Pembrokeshire Marine / Sir Benfro Forol SAC in relation to the conservation objectives for grey seal due to potential vessel collision risk during construction**.

7.2.3.2.7 Entanglement

1088. Any potential risk of entanglement for grey seals has been discussed in **Section 7.2.2.2.7**, which will be the same for grey seal in the Pembrokeshire Marine / Sir Benfro Forol SAC.

1089. The Windfarm Site is not located on any known migration routes for grey seal or within any known key foraging areas, and with the lack of data on entanglement of marine mammals from mooring lines in floating windfarms, the potential risk of entanglement is considered to be low.

1090. With the existing literature suggesting that entanglement will not pose a significant risk to grey seal, with the lack of interaction of individuals and mooring lines. It is concluded that there is **no AEoI of the Pembrokeshire Marine / Sir Benfro Forol SAC in relation to the conservation objectives for grey seal due to entanglement**.

7.2.3.2.8 Potential for Disturbance at Grey seal Haul-Out Sites

1091. The Pembrokeshire Marine / Sir Benfro Forol SAC is located 36.5km from The Project at its closest point and 43km from the cable corridor. It is unknow which construction port(s) will be used, however movements to and from any port will be incorporated within existing vessel routes.

1092. Grey seal is more likely to respond to nearby vessels by moving into the water, due the speed of the vessel, rather than the distance, although movement into the water was generally observed to occur at distances of between 20 and 70m, with no detectable disturbance at 150m (Wilson, 2014; Strong and Morris, 2010). However, grey seal has been reported to move into the water when vessels are at a distance of approximately 200m to 300m (Wilson, 2014). Therefore, it is considered that, for grey seal, vessels travelling within 300m of a haul-out site may cause a grey seal to flee into water, and significant disturbance would be expected at a distance of less than 150m.

1093. Depending on which construction ports will be used, there are well known grey seal haul-out sites in North Cornwall, North Devon, Pembrokeshire and southeast Ireland. If existing vessel routes are within proximately of these sites, it is likely that seals hauled-out along these routes and in the area of the ports would be habituated to the noise, movements and presence of vessels. Therefore, the additional construction vessels using these existing vessel routes while transiting to port would not make a significant increase in the potential for disturbance at grey seal haul-out sites.

1094. Therefore, there would be **no AEoI of the Pembrokeshire Marine / Sir Benfro Forol SAC in relation to the conservation objectives for grey seal due to disturbance at seal haul-out sites during construction for The Project**.

7.2.3.2.8.1 Potential for Disturbance of Foraging Grey Seals at Sea

1095. Foraging seals have the potential to be disturbed in the vicinity of vessel transit routes due to underwater noise generating activities, and due to the increased presence of vessels at the Project.

1096. The potential for grey seal to be disturbed from foraging at sea during construction also relates to both the direct disturbance of grey seal, and the potential for an effect on fish (prey species). For construction activities, the greatest area of effect for any disturbance (i.e., the TTS impact areas) of foraging grey seal is up to 45km^2 for UXO clearance at the Project and 0.12km^2 for piling at the Project.

1097. If it is assumed, as an unlikely and worst-case scenario, that all grey seal within the total area would be disturbed, and that any disturbance could result in the cessation of foraging within that area, then a total of five grey seal could potentially be disturbed from foraging during UXO operations at the Project. Piling at the Project could potentially disturb four grey seals. This effect is temporary.

1098. It is however unlikely that there would be the potential for any significant disturbance of foraging grey seal from the Pembrokeshire Marine / Sir Benfro Forol SAC, given the distance of 36.5km from the closest point of the Project to the SAC, and that grey seal are generalist feeders with wide foraging ranges. Any disturbance of foraging grey seals would be restricted to the area and duration of the activity, and there are other suitable habitats and prey available in the surrounding area. Therefore, there would be **no AEoI of the Pembrokeshire Marine / Sir Benfro Forol SAC in relation to the conservation objectives for grey seal due to disturbance of foraging grey seals during construction for the Project**.

7.2.3.2.9 Changes in prey availability

1099. The potential effects on prey species during construction can result from physical disturbance and loss of habitat; increased SSC and sediment deposition; and underwater noise (including barrier effects from underwater noise). **Chapter 11: Fish and Shellfish Ecology** of the Offshore ES, provides an assessment of these impact pathways on the relevant fish and shellfish species and concludes impacts of negligible to minor adverse significance in EIA terms. Any reductions in prey availability would be small scale, localised and temporary. It is considered highly unlikely that potential reductions in prey availability as a result of construction activities would result in detectable changes to grey seal populations.

1100. Grey seal feed on a variety of prey species and are considered to be opportunistic feeders, feeding on a wide range of prey species and have relatively large foraging ranges (for more information see **Chapter 12: Marine Mammal and Marine Turtle Ecology** of the Offshore ES).

1101. As a worst-case, the number of grey seal that could potentially be affected by any changes in prey availability is up to 32 individuals (0.031% of CIS MU) for the Project. This means that, under the precautionary assumptions of this assessment, up to 32 grey seals could be at risk of a reduced (or removed) potential to forage within that area. More realistically, the reduction of prey (fish) species availability would not be for all fish within that area, and grey seal would be able to forage within that area still or would be able to travel outside of that area to forage, with no reduction or impact to the overall population anticipated.

1102. It is highly unlikely that there would be significant changes to prey over the entire area. It is more likely that effects would be restricted to an area around the working sites, and the potential areas for habitat loss. The temporary impact area is up to 49.35km^2 for The Project, which represents a very small proportion of the area available for grey seal foraging from the Pembrokeshire Marine / Sir Benfro Forol SAC; as noted above, grey seals typically forage up to 100km, recorded distances up to 448km (Carter, 2022) from their haul-out sites, which equates to a significantly large total foraging area for the individuals associated with the site.

1103. Mitigation measures to reduce the potential impacts of underwater noise for marine mammals would also reduce the potential impacts on prey species.

1104. Therefore, the potential impacts of physical disturbance, temporary habitat loss, increased SSC, re-mobilisation of contaminated sediment on changes in prey availability are localised and short in duration. **Therefore, there would be <u>no AEoI of the Pembrokeshire Marine / Sir Benfro Forol SAC in relation to the</u>**

conservation objectives for grey seal from changes to prey availability for the Project.

7.2.3.2.10 Changes to Water Quality

1105. The changes to water quality effect for grey seals has been discussed in **Section 7.2.1.2.11**, which will be the same for Pembrokeshire Marine / Sir Benfro Forol SAC.

1106. Therefore, any potential changes in water quality would have a negligible effect on grey seal and therefore there would be **no AEoI of the Pembrokeshire Marine / Sir Benfro Forol SAC in relation to the conservation objectives for grey seal due to changes in water quality during construction**.

7.2.3.3 Potential effects during operation and maintenance

The potential effects for marine mammals during operation and maintenance with the potential for LSE:

- Underwater noise
- Entanglement
- Interaction and Collision Risk with vessels
- Disturbance at seal haul-out sites
- Physical barrier effects
- Changes to water quality
- EMFs
- Changes to prey resources.

1107. Potential sources of underwater noise during the operation and maintenance phase include:

- Operational noise from WTGs and from movement of floating turbine moorings on the seabed
- Maintenance activities, such as cable re-burial and any additional rock placement
- operation and maintenance vessel activity.

7.2.3.3.1 Potential Effects of Underwater Noise from Operational Turbines

1108. The potential effects of underwater noise from operational wind turbines for grey seals has been discussed in **Section 7.2.2.3.1**, which will be the same for Pembrokeshire Marine / Sir Benfro Forol SAC.

7.2.3.3.1.1 Potential for Auditory Injury Due to Operational Turbines

1109. The results of the underwater noise modelling indicate that grey seal would have to be less than 10m (precautionary maximum range) for 24 hours in a 24 hour period, to be exposed to noise levels that could induce PTS or TTS based on the Southall *et al*. (2019) non-impulsive thresholds and criteria for SEL_{cum}. The maximum potential impact area for PTS for each operational turbine is less than $0.0003km^2$ (**Table 7.42**). Therefore, PTS as a result of operational wind turbine noise is highly unlikely.

1110. Given the very localised effect area and that grey seal would have to be within 10m of a WTG for 24 hours, it is considered highly unlikely that grey seal would be at risk of PTS, and there would be **no AEoI of the Pembrokeshire Marine / Sir Benfro Forol in relation to the conservation objectives for grey seal, due to PTS from operational WTGs**.

1111. No additional mitigation is required or proposed.

7.2.3.3.1.2 Potential for Disturbance Due to Operational Turbine Noise

1112. A summary of the potential for disturbance in seals due to operational turbine noise is provided in **Section 7.2.2.3.2.1**. This shows that there is no lasting disturbance or exclusion of grey seal around windfarm sites during operation, and therefore it is not expected that there would be any disturbance of grey seal.

1113. Therefore, any potential effects would not result in any significant population effects or any changes to the grey seal. There would be **no AEoI of the Pembrokeshire Marine / Sir Benfro Forol SAC in relation to the conservation objectives for grey seal due to disturbance from operational turbine noise**.

1114. No additional mitigation is required or proposed.

7.2.3.3.2 Potential Effects of Underwater Noise During Maintenance Activities, such as Cable Re-Burial and Any Additional Rock Placement

1115. The requirements for any potential maintenance work, such as additional rock placement or cable re-burial, are currently unknown. However, the work required, and associated impacts would be less than those during construction.

1116. The impacts from additional cable laying and protection are temporary in nature and will be limited to relatively short periods during the operation and maintenance phase. Disturbance responses are likely to occur at significantly shorter ranges than construction noise. Any disturbance is likely to be limited to the area in and around where the actual activity is taking place.

1117. The underwater noise from maintenance activities is considered to be the same or less than those assessed for underwater noise from other construction activities (including rock placement, trenching and cable laying).

1118. Therefore, there would be **no AEoI of the Pembrokeshire Marine / Sir Benfro Forol SAC in relation to the conservation objectives for grey seal due to underwater noise and disturbance effects from operation and maintenance activities**.

1119. No additional mitigation is required or proposed.

7.2.3.3.3 Potential Effects of Underwater Noise During Operation and Maintenance Vessel Activity

1120. The requirements for any potential maintenance work are currently unknown. However, the work required, and impacts associated with underwater noise and disturbance from vessels during operation and maintenance would be less than those during construction.

1121. It is estimated that the maximum number of vessels that could be required on site at any one-time during operation and maintenance could be five, which is the same when considered with those that could be on site during construction. Therefore, as a precautionary approach the assessment for construction has been used for the operational and maintenance assessment, as a worst-case scenario (see **Section 7.2.3.2.4** for further information).

1122. The underwater noise from maintenance vessels are considered to be the same or less than those assessed for underwater noise from construction vessels. As grey seal do not appear to be sensitive to disturbance from vessels, there would be no AEoI of the Pembrokeshire Marine / Sir Benfro Forol SAC in relation to the conservation objectives for grey seal due to disturbance from construction vessels. Therefore, there would be **no AEoI of the Pembrokeshire Marine / Sir Benfro Forol SAC in relation to the conservation objectives for grey seals due to underwater noise and disturbance effects from operation and maintenance vessels**.

1123. No additional mitigation is required or proposed.

7.2.3.3.4 Interaction and Collision Risk with Vessels

1124. It is estimated that there would be approximately 40 vessel movements, to and from the Project, for each year of the operation and maintenance phase (or an average of 0.1 transits per day (one vessel movement every 10 days, or one return trip every 20 days) (**Table 7.3**). The **Appendix 12.C: Draft MMMP** of the

Offshore ES provides details on vessel good practice and code of conduct that will be implemented to avoid marine mammal collisions.

1125. **Section 7.2.2.3.4** provides an assessment of the potential for collision risk to grey seal during operation, concluding that up to 0.07 grey seal may be at risk of collision per year of operation.

1126. Consequently, there would be little increased collision risk of grey seal and no AEoI of the Pembrokeshire Marine / Sir Benfro Forol SAC in relation to the conservation objectives for grey seal due to potential vessel collision risk during operation.

1127. Therefore there would be **no AEoI of the Pembrokeshire Marine / Sir Benfro Forol SAC in relation to the conservation objectives for grey seal due to increased collision risk from operation and maintenance vessels**.

7.2.3.3.5 Potential for Disturbance at Grey Seal Haul-Out Sites during Operation and Maintenance

1128. Any potential disturbance at grey seal haul-out sites during operation and maintenance would be less than those assessed for during construction, as there are fewer vessels. The potential for disturbance to grey seal haul-out sites from construction vessels (**Section 7.2.3.2.8**) was concluded to have no significant effects on grey seal and no AEoI of the Pembrokeshire Marine / Sir Benfro Forol SAC.

1129. Therefore, there would be no significant effects on grey seal and **no AEoI of the Pembrokeshire Marine / Sir Benfro Forol SAC in relation to the conservation objectives for grey seal due to potential disturbance at haul-out sites from operation and maintenance vessels for the Project**.

7.2.3.3.6 Entanglement

1130. As previously outlined in **Section 7.2.1.2.7**, entanglement is the potential risk of marine mammals getting caught within the WTG mooring lines, as a primary cause and the potential risk of marine mammals getting caught within fishing lines that have been caught themselves within the WTG mooring lines as a secondary cause. The worst-case scenario for entanglement is during the operation and maintenance phase of the Project due to the length of time the structures will be in place, creating a higher probability of receptors to get caught within the WTG mooring lines.

1131. Any potential risk of entanglement for grey seals has been discussed in **Section 7.2.1.2.11**, which will be the same for grey seal in the Pembrokeshire Marine / Sir Benfro Forol SAC.

1132. Therefore, there is **no AEoI of the Pembrokeshire Marine / Sir Benfro Forol SAC in relation to the conservation objectives for grey seal due to changes to prey availability (from entanglement)**.

7.2.3.3.6.1 Potential for Disturbance of Foraging Grey Seals at Sea during Operation and Maintenance

1133. Any potential disturbance of foraging grey seal during operation and maintenance would be less than those assessed for during construction. It was deemed unlikely that there would be the potential for any significant disturbance of foraging grey seal from the Pembrokeshire Marine / Sir Benfro Forol SAC, given the distance of 36.5km from the closest point of the Project to the SAC. Any disturbance of foraging grey seals would be restricted to the area and duration of the activity, and there are other suitable habitats and prey available in the surrounding area. The potential for disturbance to grey seal foraging from construction vessels were concluded to have no significant effects on grey seal and no AEoI of the Pembrokeshire Marine / Sir Benfro Forol SAC.

1134. Therefore, there would be no significant effects on grey seal and **no AEoI of the Pembrokeshire Marine / Sir Benfro Forol SAC in relation to the conservation objectives for grey seal due to potential disturbance of foraging seals during operation and maintenance for the Project**.

7.2.3.3.7 Physical Barrier Effects

1135. A summary of the potential for physical barrier effects to grey seal, due to the presence of the Project, is provided in **Section 7.2.2.3.9**.

1136. The indicative separation distance between turbines (inter-row) and between turbines in rows (in-row) would be a minimum of 1.1km (maximum of 2.62km). Therefore, there would be no overlap in the potential impact range of less than 100m (<0.1km) around each turbine and there would be adequate room for marine mammals to move through the Windfarm Site.

1137. There would be **no AEoI of the Pembrokeshire Marine / Sir Benfro Forol SAC in relation to the conservation objectives for grey seal due to barrier effects from increased underwater noise during operation and maintenance**.

1138. No additional mitigation is required or proposed.

7.2.3.3.8 Electromagnetic Fields

1139. Information on EMF have been described in **Section 7.2.1.3.7** and **Section 7.2.2.2.10** which will be the same for the Pembrokeshire Marine SAC.

1140. EMF is not expected to affect grey seal, and therefore there would be **no AEoI of the Pembrokeshire Marine SAC in relation to the conservation objectives for grey seal from EMF effects during construction**.

7.2.3.3.9 Potential for Any Changes in Prey Availability during Operation and Maintenance

1141. The potential impacts of permanent loss or change of habitat, physical disturbance, temporary habitat loss, EMF, increased SSC, re-mobilisation of contaminated sediment and underwater noise on changes in prey availability are localised and, in some cases, short in duration. The potential for effect on grey seal are summarised in **Section 7.2.2.3.11** for the Lundy Island SAC, and the same conclusions are expected for the Pembrokeshire Marine / Sir Benfro Forol SAC.

1142. **Chapter 11: Fish and Shellfish Ecology** of the Offshore ES provides an assessment of these impact pathways on the relevant fish and shellfish species and concludes impacts of negligible to minor adverse significance in EIA terms.

1143. Therefore, there would be no significant effects on grey seal and **no AEoI of the Pembrokeshire Marine / Sir Benfro Forol SAC in relation to the conservation objectives for grey seal due to potential changes in prey availability from operation and maintenance vessels for the Project**.

7.2.3.3.10 Changes to Water Quality

1144. Throughout the operation and maintenance phase, due diligence and best practice techniques regarding the potential for pollution will be followed throughout the required activities. The PEMP will include the embedded mitigation measures regarding best practice techniques to avoid the accidental release of contaminants (**Table 7.1**). Any risk of accidental release of contaminants (e.g. through spillage) will be mitigated in line with **Appendix 5.A: Outline CEMP** of the Offshore ES and any changes to water quality as a result of any accidental release of contaminants (e.g. through spillage or vessel collision) would be negligible.

1145. During operation and maintenance disturbance of seabed sediments will be localised to specific foundations or sections of cable and considerably less than that during construction phase.

1146. Potential changes in water quality during operation and maintenance include (see **Chapter 9: Marine Water and Sediment Quality** of the Offshore ES for more information):

- Localised temporary increases in suspended sediments
- Remobilisation of existing contaminated sediments.

1147. Changes in water quality are considered to have negligible effect on marine mammals. As assessed in **Chapter 9: Marine Water and Sediment Quality** of the Offshore ES, any potential changes in water quality during operation and maintenance would be negligible.

1148. Therefore, there would be **no AEoI of the Pembrokeshire Marine / Sir Benfro Forol SAC in relation to the conservation objectives for grey seal as a result of any changes to water quality during operation and maintenance**.

1149. No additional mitigation is required or proposed, other than the embedded mitigation outlined in **Table 7.1**.

7.2.3.4 Potential Effects During Decommissioning

1150. The Potential effects on grey seal associated with decommissioning have not been assessed in detail, and has been discussed in **Section 7.2.2.5**, which will be the same for Pembrokeshire Marine / Sir Benfro Forol SAC.

1151. Therefore, the potential effects on grey seal during decommissioning would be the same or less than those assessed for construction due to the processes of decommissioning potentially being the reverse of the installation, without the need for piling. As a result, there will be **no AEoI of the Pembrokeshire Marine / Sir Benfro Forol SAC in relation to the conservation objectives for grey seal due to the decommissioning effects as mentioned above**.

7.2.3.5 Potential In-Combination Effects

1152. The in-combination assessment considers plans, projects and activities where the predicted effects have the potential to combine with the potential effects during construction of the Project. The construction phase has been assessed as the worst-case for potential in-combination effects.

1153. The activities, plans and projects screened into the in-combination assessment for grey seal are those that are located in the relevant MUs. Full information on the screening is provided in **Appendix 12.B Marine Mammals Cumulative Effects Assessment (CEA) Report** of the Offshore ES.

1154. The potential in-combination effects for grey seal within the Lundy Island SAC have been identified as:

- Disturbance from underwater noise
- Increased collision risk
- Entanglement
- Changes to prey availability.

7.2.3.5.1 Assessment of Disturbance from Underwater Noise

1155. The in-combination effect for grey seals for the Pembrokeshire Marine / Sir Benfro Forol SAC have been assessed following the same process as for the Lundy Island SAC, as provided in **Section 7.2.2.5**.

1156. **Table 7.54** and **Table 7.55** show the quantitative assessments for grey seals from various activities that could be happening at the same time as the Project. **Table 7.55** includes all potential noisy activities, and includes only those activities that are currently expected to take place at the same time as works at the Project have been included, to provide a realistic but still worst-case assessment.

Table 7.54 Quantitative assessment for Grey Seal for The Potential Disturbance of Grey Seal from Various Activities that Could Be Happening at the Same Time as the Project (Cells in Grey Present the Unrealistic Scenario)

Project	**Grey seal density (/km^2)**	**Area of Effect (km^2)**	**Maximum Number of Individuals Potentially Disturbed During Single Piling**
Single piling at other OWFs that could be piling at the same time as the Project			
White Cross	0.004	1,963.5	7.85
Codling	0.015	1,963.5	29.45
Dublin Array	0.014	1,963.5	27.49
North Irish Sea Array	0.012	1,963.5	23.56
South Irish Sea	0.007	1,963.5	13.74
Awel y Môr OWF	0.182	1,963.5	357.36
Total number of grey seal *(without* the Project*)*			**459.46** *451.61*
Percentage of wider reference population *(without* the Project*)*			**3.65%** *3.59%*
Construction at other OWFs at the same time as construction at the Project			
White Cross	0.005	1,963.5	7.85
Arklow Bank Phase II	0.011	351.86	3.87
Erebus	0.005	351.86	1.79
Total number of grey seal *(without* the Project*)*			**13.52** *5.66*
Percentage of wider reference population *(without* the Project*)*			**0.11%** *0.05%*
Other noisy activities (grey shaded cells are those not currently expected to be taking place and therefore present an unrealistic scenario)			
White Cross	0.005	1963.5	7.85
Geophysical surveys	*0.0253*	*157.0*	*4.0*
Aggregates and dredging	0.0253	4.52	0.11

Project	Grey seal density (/km^2)	Area of Effect (km^2)	Maximum Number of Individuals Potentially Disturbed During Single Piling
Cable and pipelines [X-Links 1 & 2]	0.0253	703.7	17.8
Coastal works [Hinkley Point C]	0.0253	351.86	8.9
Seismic surveys	*0.0253*	*907.9*	*23.0*
UXO clearance [high-order]	*0.0253*	*804.3*	*20.3*
UXO clearance [low-order]	*0.0253*	*7.1*	*0.2*
Total for all projects that are currently (or expected to be) in the planning process (realistic worst-case scenario)			
Total number of grey seal in wider reference population range *(without* the Project*)*			**11.8** *3.9*
Percentage of wider reference population *(without* the Project*)*			**0.09%** *0.03%*
Total for all projects and activities that may take place (unrealistic scenario)			
Total number of grey seal *(without* the Project*)*			**59.3** *51.4*
Percentage of wider reference population *(without* the Project*)*			**0.47%** *0.41%*

Table 7.55 In-Combination Assessment for the Potential Disturbance of Grey Seal From All Possible Noise Sources During Piling at the Project

Project and industry	Number of grey seals potentially disturbed
Worst-case disturbance from the Project	7.9 based on the SAC density estimate *9.8 based on the total at-sea density estimate*
Piling at other OWFs	451.6
Construction activities at other OWFs	5.7
Aggregates and dredging	0.11
Cable and pipelines	2.5
Coastal works	1.3
Total number of individuals *(without* the Project*)*	**469.1 – 471.0** *461.2*
Percentage of total reference population *(without* the Project*)*	**3.73% – 3.74%** *3.66%*

1157. Based on less than 5% of the wider population being potentially disturbed, there would be no significant disturbance and **no AEoI of the Pembrokeshire Marine / Sir Benfro Forol SAC in relation to the conservation objectives for grey seal in-combination with other plans and projects**.

7.2.3.5.2 Increased Collision Risk

7.2.3.5.2.1 Increased Collision Risk Due to Vessels

1158. The in-combination effects from an increase in the number of vessels and vessel movements can pose a potential collision risk for grey seal.

1159. As outlined in **Sections 7.2.2.2.6** and **7.2.2.3.5**, the increased collision risk due to project vessels, even using a very precautionary approach, would result in less than one individual (0.18 grey seal) being at risk of vessel collision per year (**Table 7.42**) for construction phase related vessel collision risk. Less than one (0.07) grey seal per year (**Table 7.44**) would be at risk for operation and maintenance phase related vessel collision risk).

1160. Further detail on the potential for an in-combination effect on grey seal due to an increase in vessel collision risk is provided in **Section 7.2.2.5.2.1**. As the Lundy SAC and the Pembrokeshire Marine / Sir Benfro Forol SAC are within the same wider reference population, the conclusions of the assessment for the Lundy SAC (of no AEoI) are valid for the Pembrokeshire Marine / Sir Benfro Forol SAC.

1161. Therefore, there would be **no AEoI of the Pembrokeshire Marine / Sir Benfro Forol SAC in relation to the conservation objectives for grey seal due to an increase in collision risk with construction vessels**.

7.2.3.5.2.2 Increase in Collision Risk from Wave and Tidal Projects

1162. **Appendix 12.B Marine Mammals CEA Screening Report** of the Offshore ES screens for the potential for wave and tidal projects to be operational at the same time as the Project is undergoing construction, or through its operational phase. Three wave or tidal projects have the potential to be operational prior to the construction of the Project, and therefore have the potential for a cumulate effect during both the construction and operation and maintenance phases of the Project. None of those projects are within the Pembrokeshire Marine / Sir Benfro Forol SAC, however, all are within the wider MUs.

1163. Further detail on the potential for an in-combination effect on grey seal due to an increase in collision risk due to operational wave and tidal turbines is provided in **Section 7.2.2.5.2.2**. As the Lundy SAC and the Pembrokeshire Marine / Sir Benfro Forol SAC are within the same wider reference population, the conclusions of the assessment for the Lundy SAC (of no AEoI) are valid for the Pembrokeshire Marine / Sir Benfro Forol SAC.

1164. Therefore, there would be **no AEoI of the Pembrokeshire Marine / Sir Benfro Forol SAC in relation to the conservation objectives for grey seal due to an increase in collision risk with tidal and wave operational turbines**.

7.2.3.5.3 Entanglement

1165. An assessment for the potential for an in-combination effect on grey seal due to entanglement is provided in **Section7.2.2.5.3**. As the Lundy SAC and the Pembrokeshire Marine / Sir Benfro Forol SAC are within the same wider reference population, the conclusions of the assessment for the Lundy SAC (of no AEoI) are valid for the Pembrokeshire Marine / Sir Benfro Forol SAC.

1166. Therefore, there would be **no AEoI of the Pembrokeshire Marine / Sir Benfro Forol SAC in relation to the conservation objectives for grey seal due to entanglement during operation**.

7.2.3.5.4 Changes to Prey Availability

1167. The potential effects on grey seal as a result of any changes to prey availability can include changes in distribution, abundance and community structure, increased competition with other marine mammal species, increased susceptibility to disease and contaminants, and implications for reproductive success, which could potentially affect individuals throughout their range or at different times of the year. However, any changes to prey tend to be localised and temporary in nature. In addition, if prey species are disturbed from an area, it is highly likely that grey seal will also be disturbed from the area over a potentially wider range than prey species.

1168. A Full assessment for the potential for a change in prey availability to affect grey seal is provided in **Section 7.2.2.5.4**. As the Lundy SAC and the Pembrokeshire Marine / Sir Benfro Forol SAC are within the same wider reference population, the conclusions of the assessment for the Lundy SAC (of no AEoI) are valid for the Pembrokeshire Marine / Sir Benfro Forol SAC.

1169. Any effects on prey species are likely to be intermittent, temporary and highly localised, with potential for recovery following cessation of the disturbance activity. Any permanent loss or changes of prey habitat will typically represent a small percentage of the potential habitat in the surrounding area. Therefore, there would be **no AEoI of the Pembrokeshire Marine / Sir Benfro Forol SAC in relation to the conservation objectives for grey seal arising due to changes in prey availability**.

7.2.3.6 Summary of Potential Effects on Site Integrity

1170. The assessment of the potential effects for the Project has been summarised in relation to the Pembrokeshire Marine / Sir Benfro Forol SAC conservation objectives for grey seal (**Table 7.56**).

1171. The MMMP will provide mitigation or management measures to reduce the potential for any significant disturbance of grey seal as a result of in-combination effects from underwater noise.

1172. There would be no AEoI of the Pembrokeshire Marine / Sir Benfro Forol SAC in relation to the conservation objectives for grey seal either alone or in-combination with other plans and projects.

1173. For the reasons mentioned in **Sections 7.2.3.1** to 7.2.3.5 there would be **no AEoI of the Pembrokeshire Marine / Sir Benfro Forol SAC in relation to the conservation objectives for grey seal from the Project either alone or in-combination**.

7.2.4 Cardigan Bay / Bae Ceredigion SAC

7.2.4.1 Baseline and Current Conservation Status

7.2.4.1.1 Description of Designation

1174. Cardigan Bay SAC was designated in 2004, and bottlenose dolphin are a primary reason for selection of the site. Bottlenose dolphins occur year-round, although individuals may range further afield during certain times of the year.

1175. Cardigan Bay SAC is located on the north coast of Pembrokeshire and the Cardiganshire coast, covering an area of approximately 958.6km^2. The closest point of Cardigan Bay SAC to the Windfarm Site is approximately 105km away (**Table 7.57**).

7.2.4.1.2 Qualifying Features

7.2.4.1.2.1 Bottlenose dolphin

1176. The population of bottlenose dolphin in the Cardigan Bay SAC has been estimated to consist of around 125 individuals, which use the inshore waters of Cardigan Bay for feeding and reproduction (JNCC, 2021a). The site is one of only two sites in UK waters to hold substantial semi-resident populations, with the other site being the Moray Firth in Scotland.

Table 7.56 Summary of The Potential Effects of the Project, Including In-Combination Effects on the Pembrokeshire Marine / Sir Benfro Forol SAC in Relation to the Conservation Objectives for Grey Seal (☐ = no potential for AEoI; ☐ = potential for AEoI)

Conservation Objectives	**The Project effects**								**In-combination Effects**			
	Auditory Injury and disturbance from underwater noise	**Barrier effects**	**Disturbance to seal haul-out sites**	**Entanglement**	**Vessel interaction**	**Changes to water quality**	**EMFs**	**Changes to prey resources**	**Disturbance from underwater noise**	**Entanglement**	**Vessel interaction**	**Changes to prey resources**
Grey seal is a viable component of the site	×	×	×	×	×	×	×	×	×	×	×	×
There is no significant disturbance of the species	×	×	×	×	×	×	×	×	×	×	×	×
The condition of supporting habitats and processes and the availability of prey is maintained	×	×	×	×	×	×	×	×	×	×	×	×

Table 7.57 Distances of the Project to the Cardigan Bay SAC

Location	Closest point to Cardigan Bay SAC
Windfarm Site	105km
Export cable corridor	114km
Landfall location	114km

1177. Monitoring work was undertaken for Cardigan Bay SAC by the Sea Watch Foundation between 2014 and 2016, on behalf of Natural Resource Wales (NRW). Monitoring was conducted due to a requirement to monitor and report on the condition of the SAC features, such as information on distribution and abundance, population dynamics, life history parameters, and health of the species. Based on this monitoring, abundance estimates were calculated based on distance sampling (Lohrengel *et al.*, 2018):

- 64 individuals (CI = 19-220; CV = 0.65) in 2015
- 84 (CI = 44-160; CV = 0.33) in 2016
- For the wider Cardigan Bay, 277 (CI = 138-555; CV = 0.36) in 2015
- 289 (CI = 184-453; CV = 0.23) in 2016.

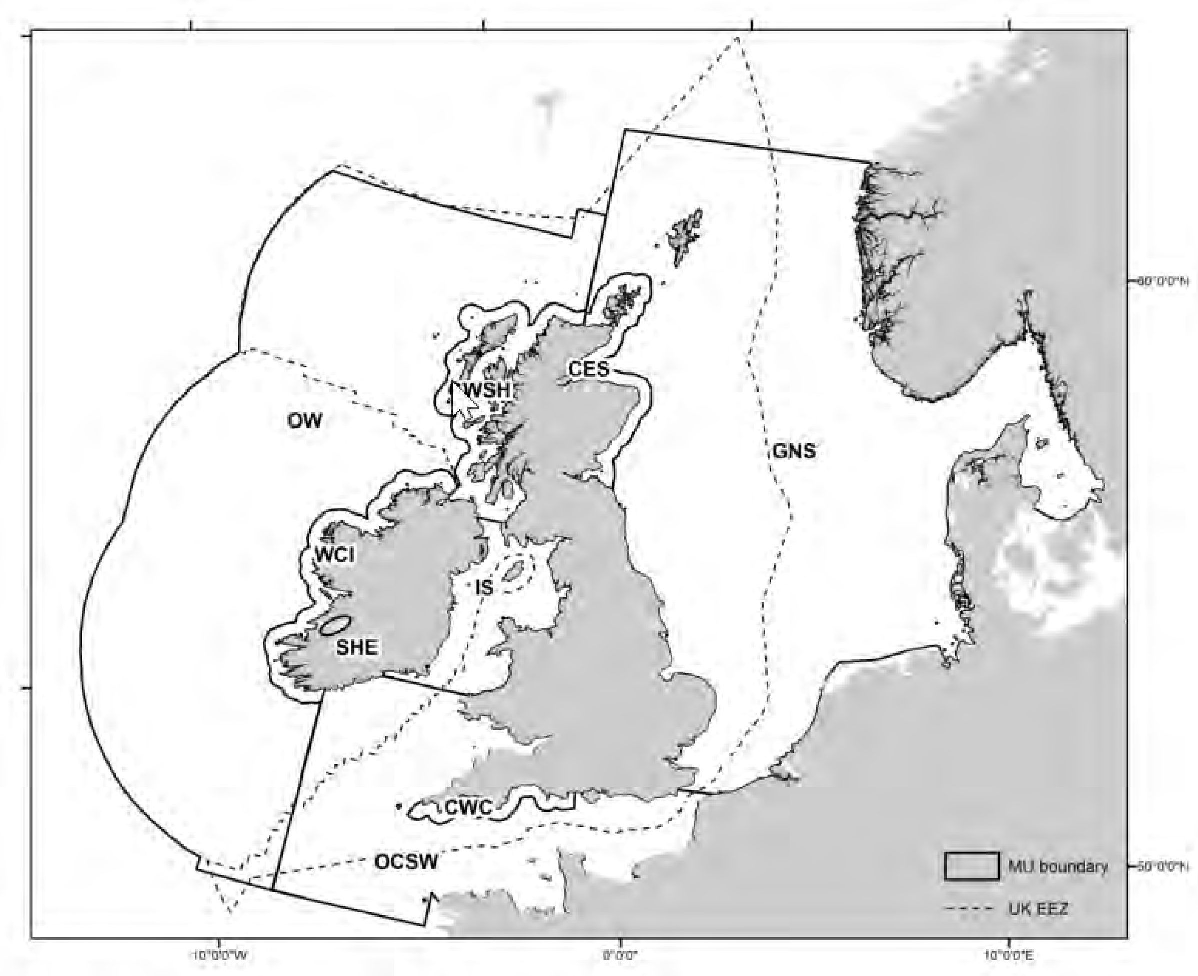
1178. Lohrengel *et al.* (2018), also conducted trend analysis and noticed a significantly decline in abundance for the period of 2001-2016 for the Cardigan Bay SAC, but no significant decline was identified within the most recent years (2007 – 2016). Bottlenose dolphins associated with Cardigan Bay SAC do not form a discrete site-based population and tend to be part of the wider Irish Sea (IS) MU (**Figure 7.8**). Therefore, the IS MU estimate of 293 bottlenose dolphin (IAMMWG, 2022) is used to inform the following assessments against the SAC population. An assessment is also provided against the OCSW MU as that is the MU of relevant to the Project.

1179. The SCANS-III surveys found 2,938 (CL = 914-5,867) within survey area D, which is where the Windfarm Site is located. Higher densities are found in the neighbouring survey area B, which is located around the coastline of Wales where the Cardigan Bay SAC is found, where 6,926 (CL = 2,713-13,389) bottlenose dolphins were estimated from the aerial surveys.

1180. Examination of the data and distribution maps by Waggitt *et al.* (2020), including all 10km grids that overlap with the Windfarm Site and Offshore Export Cable Corridor, indicates an average annual density estimate for bottlenose dolphin of:

- 0.0199 individuals per km^2.

Figure 7.8 Bottlenose dolphin MU's



1181. During the site-specific aerial surveys for the Project and buffer area, undertaken from 2020 to 2022, no specific bottlenose dolphin were recorded. However, a number of unidentified dolphin sighting which have the potential to be bottlenose dolphins were recorded (further detail present in **Chapter 12: Marine Mammal and Marine Turtle Ecology** of the Offshore ES).

1182. The IAMMWG (2022) define seven MUs for bottlenose dolphin. The Windfarm Site is located in The OCSW MU. The OCSW MU for bottlenose dolphin has an abundance estimate of 10,947 (CV = 0.25; 95% CI = 6,727 – 17,814; IAMMWG, 2022).

7.2.4.1.3 Conservation Status

1183. Although the extent and distribution, structure, and function of supporting habitats, and prey availability and quality are all unknown, the bottlenose dolphin population size and structure, and the species range within the SAC are both considered to be in favourable condition (NRW, 2018a).

1184. Therefore, the overall feature condition is favourable. Overall confidence in the assessment is considered to be medium.

7.2.4.1.4 Conservation objectives

1185. The Conservation Objectives for bottlenose dolphins (NRW, 2009a) are:

- "To ensure that the qualifying features of the Cardigan Bay SAC are in favourable condition and make an appropriate contribution to achieving FCS; and
- To ensure that the integrity of the Cardigan Bay SAC is maintained or restored in the context of environmental changes by meeting objectives for each qualifying feature:
    - *The population of bottlenose dolphin is a viable component of the site;*
    - *The distribution of bottlenose dolphin throughout the site is maintained by avoiding significant disturbance; and*
    - *The supporting habitats and processes relevant to bottlenose dolphin and the availability of prey for bottlenose dolphin are maintained."*

1186. For the purposes of the assessments, the potential effects are considered in relation to the Cardigan Bay SAC Conservation Objectives as outlined in **Table 7.58**.

Table 7.58 Potential effects in relation to the conservation objectives of the cardigan bay SAC for bottlenose dolphin

Conservation Objective for bottlenose dolphin	Potential for Adverse Effect
Bottlenose dolphin is a viable component of the site	Physical and permanent auditory injury (PTS) from underwater noise will be mitigated and therefore there is no potential for LSE.
	Significant disturbance as a result of increased underwater noise levels has the potential to have an adverse effect on bottlenose dolphin and will be considered further.
	Any potential increased collision risk with vessels will be considered further.
Distribution of the species within site is maintained by avoiding significant disturbance	Significant disturbance as a result of increased underwater noise levels has the potential to have an adverse effect on bottlenose dolphin and will be considered further.
The supporting habitats and processes relevant to bottlenose dolphin and the availability of prey for bottlenose dolphin are maintained	No potential LSE. There will be no potential for any change to the distribution and extent of the habitats in the Cardigan Bay SAC supporting bottlenose dolphin. There will be no potential for any change to the availability of prey for bottlenose dolphin in the Cardigan

Conservation Objective for bottlenose dolphin	Potential for Adverse Effect
	Bay SAC. Although potential changes to prey availability in and around the Windfarm Site will be considered further.

7.2.4.2 Assessment of Potential Effects During Construction

1187. The potential effects to be considered during construction, operation and maintenance, and decommissioning of the Project (in relation to bottlenose dolphin from the Cardigan Bay SAC were agreed during consultation with the marine mammal ETG as part of the EPP and confirmed by Natural England at Section 42 consultation (see **Section 4.2**). The potential effects of the Project that are assessed to determine any potential for an AEoI of the Cardigan Bay SAC in relation to the Conservation Objectives for bottlenose dolphin are:

- Auditory injury and disturbance or behavioural impacts resulting from underwater noise during piling or UXO clearance
- Disturbance impacts resulting from underwater noise during other construction activities, including seabed preparations, rock placement and cable installation
- Potential effects resulting from construction vessels
- Underwater noise and disturbance from construction vessels
- Interaction and Collision Risk with Vessels
- Barrier effects as a result of underwater noise
- Changes to prey availability
- Entanglement
- EMF
- Changes to water quality.

7.2.4.2.1 Potential Effects of Underwater Noise During Piling

1188. Underwater noise modelling was carried out by Subacoustech Ltd to estimate the noise levels likely to arise during piling and determine the maximum potential areas of effect (see **Chapter 12: Marine Mammal and Marine Turtle Ecology** and **Appendix 12.A: Marine Mammal and Marine Turtle Underwater Noise Modelling Report** of the Offshore ES for further details).

1189. The assessments are based on the latest Southall *et al.* (2019) thresholds and criteria for marine mammals. The maximum impact ranges and areas are used to inform the assessments.

7.2.4.2.1.1 Potential for Auditory Injury due to Piling

1190. The maximum predicted auditory injury impact area for bottlenose dolphin is 0.1km^2 for TTS from cumulative SEL ((SEL$_{cum}$) including soft-start and ramp-up) of jacket pile with maximum hammer energy of 2,500kJ.

1191. There is no potential for any direct overlap with the Cardigan Bay SAC (closest distance 105km (**Table 7.57**). However, it is assumed that bottlenose dolphin in and around the Windfarm Site could be from the Cardigan Bay SAC due to the known connectivity with the OCSW and the bottlenose dolphin's residency within the Cardigan Bay SAC.

1192. This is a precautionary and worst-case approach, as it is more likely that bottlenose dolphin at the Windfarm Site would be from the wider population, rather than the Cardigan Bay SAC population, due to the distance of the Project. The maximum potential number of bottlenose dolphin that could be at possible risk of PTS during piling is up to 0.0006 individuals (which represents 0.000006% of the latest OCSW count of 10,947 bottlenose dolphin) (**Table 7.59**).

Table 7.59 Maximum number of bottlenose dolphin potentially at risk of PTS during piling

Species	Maximum area (for OSP jacket piles or mooring pin piles)	Maximum number of individuals (% of reference population)	Potential adverse effect on site integrity
Bottlenose dolphin (HF)	PTS (SPL$_{peak}$ and SEL$_{cum}$) = 0.1km (0.1km^2)	0.0006 (0.0002% of the IS MU (for the SAC population); or 0.000006% of OCSW MU)	**No** MMMP would further reduce risk of PTS

1193. As outlined in **Section 7.1.1**, a MMMP for piling in accordance with **Appendix 12.C: Draft MMMP** of the Offshore ES, will be produced post-consent in consultation with the MMO and relevant SNCBs, and will be based on the latest scientific understanding and guidance, as well as detailed project design. The implementation of the agreed mitigation measures within the MMMP for piling will further reduce the risk of any permanent auditory injury (PTS) from the first strike of the soft-start, single strike of the maximum hammer energy and cumulative exposure.

1194. The effective implementation of the MMMP for piling will reduce the risk of PTS or TTS for bottlenose dolphin during piling, therefore. There would be **no AEoI of the Cardigan Bay SAC in relation to the conservation objectives for bottlenose**

<u>dolphin due to auditory injury (PTS or TTS) as a result of underwater noise during piling</u>.

7.2.4.2.1.2 Potential for Disturbance due to Piling

1195. The range of possible behavioural reactions that may occur as a result of exposure to noise include orientation or attraction to a noise source, increased alertness, modification of characteristics of their own sounds, cessation of feeding or social interaction, alteration of movement / diving behaviour, temporary or permanent habitat abandonment and, in severe cases, panic, or stranding, sometimes resulting in injury or death (Southall *et al.,* 2007).

1196. There are currently no agreed thresholds or criteria for the behavioural response and disturbance of bottlenose dolphin, therefore it is not possible to conduct underwater noise modelling to predict effect ranges.

1197. A summary of the potential reaction of bottlenose dolphin to piling is provided in **Section 12.7.1.1.3.**2 of **Chapter 12 Marine Mammals and Marine Turtle Ecology** of the Offshore ES.

1198. The potential disturbance of marine mammals from underwater during piling has been assessed based on:

- Behavioural response
- Disturbance during ADD activation.

1199. For dolphin species, there is very little information on the potential disturbance ranges due to impact piling (or any impulsive noise source). For marine mammals a fleeing response is assumed to occur at the same noise levels as TTS, therefore, in the absence of any further information, the assessment as undertaken for TTS / fleeing response is used to inform the potential for a disturbance effect for bottlenose dolphin, and represents the worst-case for currently available information (**Table 7.60**).

1200. Mitigation to reduce the risk of PTS could include activation of ADDs prior to the soft-start commencing. Based on the worst-case of ADD activation of 62 minutes, this would disturb bottlenose dolphin over 5.58km. Up to 5.9 (2.0% of the IS MU (for the SAC population); or 0.05% of the OCSW MU) could be disturbed due to ADD activation of 62 minutes for OSP jacket piles.

Table 7.60 Maximum Number of Bottlenose Dolphin Potentially at Risk of TTS / Fleeing Response During Piling

Species	Maximum area (for OSP jacket piles or mooring pin piles)	Maximum number of individuals (% of reference population)	Potential adverse effect on site integrity
Bottlenose dolphin (HF)	PTS (SPL_{peak} and SEL_{cum}) = 0.1km ($0.1km^2$)	0.0006 (0.0002% of the IS MU (for the SAC population); or 0.000006% of OCSW MU)	**No** MMMP would further reduce risk of PTS

1201. For all dolphin species, the potential for disturbance from the use of ADD prior to piling is higher than the potential for disturbance from piling itself. While it is not a significant effect for bottlenose dolphin (with 2.0% or less of the populations potentially disturbed), the balance of potential for disturbance against the requirement to mitigate against permanent auditory injury is an important consideration that will be made during the finalisation of the Draft MMMP (**Appendix 12.C Draft MMMP** of the Offshore ES), and submission of EPS licence application, in the post-consent phase.

1202. Given the very low number of bottlenose dolphin that may be disturbed due to piling or ADD activation, and the distance between the Project and the Cardigan Bay SAC, there would be **no AEoI of the Cardigan Bay SAC in relation to the conservation objectives for bottlenose dolphin due to disturbance as a result of underwater noise during piling**.

7.2.4.2.2 Potential Effects of Underwater Noise from UXO

1203. Prior to construction, there is the potential for UXO clearance to be required. While any identified UXO will either be avoided or removed and disposed of onshore in a designated place, there is the potential that underwater detonation could be required where it is necessary and unsafe to remove the UXO.

1204. The precise details and locations of potential UXO are unknown at this time. For the purposes of the underwater noise modelling and this assessment, three UXO clearance scenarios have been considered:

- High-order detonation, unmitigated
- High-order detonation, with bubble curtain
- Low-order clearance (e.g., deflagration).

1205. For further information on the UXO clearance scenarios, see **Appendix 12.A: Marine Mammal and Marine Turtle Underwater Noise Report** of the Offshore ES.

1206. The number of individuals at risk for the worst-case scenario and low-order clearance are shown in **Table 7.61** for PTS.

Table 7.61 Maximum Number of Bottlenose Dolphin Potentially at Risk of PTS During UXO Clearance

Species	Maximum Effect Range (and Area)	Maximum Number of Individuals	% of Reference Population	Potential adverse effect on site integrity
PTS during UXO clearance				
Bottlenose dolphin (HF)	High-order detonation (309kg (NEQ) + donor charge) 0.61km (1.17km^2)	0.07	0.02% of the IS MU (for the SAC population); or 0.0006% of the OCSW MU	**No** Temporary effect. 0.0006% or less of the reference population could be temporarily displaced during UXO, based on the worst-case scenario.
	Low-order clearance (2kg (NEQ)) 0.11km (0.04km^2)	0.002	0.0007% of the IS MU (for the SAC population); or 0.00002% of the OCSW MU	

1207. At the closest point the Windfarm Site is 105km (**Table 7.57**) from the Cardigan Bay SAC. Therefore, there is no direct overlap with the Windfarm Site or Offshore Export Cable Corridor for the maximum impact range for PTS (0.61km^2 (**Table 7.61**)) with the Cardigan Bay SAC.

1208. Therefore, as there is no overlap there would be **no AEoI of the Cardigan Bay SAC in relation to the conservation objectives for bottlenose dolphin, due to disturbance from UXO clearance during construction**.

7.2.4.2.2.1 Potential Disturbance due to UXO Clearance

1209. For marine mammal species, there is currently no agreed threshold for disturbance from underwater noise, however, a fleeing response is assumed to occur at the same noise levels as TTS. As outlined in Southall *et al.* (2007), the onset of behavioural disturbance is proposed to occur at the lowest level of noise exposure that has a measurable transient effect on hearing (i.e. TTS). Although, as Southall *et al.* (2007) recognise that this is not a behavioural effect *per se*, exposures to lower noise levels from a single pulse are not expected to cause disturbance. However, any compromise, even temporarily, to hearing functions could have the potential to affect behaviour.

1210. The use of the TTS threshold is appropriate for UXO disturbance, because the noise from the UXO explosion is only fleetingly in the environment. Therefore, the assumption is that although noise levels lower than TTS threshold may startle the individual, this has no lasting effect. TTS results in a temporary reduction in hearing ability, and therefore may affect the individuals' fitness temporarily (as recommended in Southall *et al.* (2007) for a single pulse).

1211. As outlined in Southall *et al.* (2021), thresholds that attempt to relate single noise exposure parameters (e.g. received noise level) and behavioural response across broad taxonomic grouping and sound types can lead to severe errors in predicting effects. Differences between species, individuals, exposure situational context, the temporal and spatial scales over which they occur, and the potential interacting effects of multiple stressors can lead to inherent variability in the probability and severity of behavioural responses.

1212. The assessments for TTS / fleeing response have therefore been used for assessing the potential disturbance ranges for UXO clearance for bottlenose dolphin.

1213. The number of individuals at risk for the worst-case scenario and low-order clearance are shown in **Table 7.62** for TTS.

Table 7.62 Maximum number of bottlenose dolphin potentially at risk of TTS (as a Proxy for Disturbance) during UXO clearance

Species	Maximum Effect Range (and Area)	Maximum Number of Individuals	% of Reference Population	Potential adverse effect on site integrity
TTS (disturbance) during UXO clearance				
Bottlenose dolphin (HF)	High-order detonation (309kg (NEQ) + donor charge) 1.1km (3.8km^2)	0.23	0.08% of the IS MU (for the SAC population); or 0.002% of the OCSW MU	**No** Temporary effect. 0.002% or less of the reference population could be temporarily displaced during UXO, based on the worst-case scenario.
	Low-order clearance (2kg (NEQ)) 0.21km (0.14km^2)	0.008	0.003% of the IS MU (for the SAC population); or 0.00008% of the OCSW MU	

1214. At the closest point the Windfarm Site is 105km (**Table 7.57**) from the Cardigan Bay SAC. Therefore, there is no direct overlap with the Windfarm Site or Offshore Export Cable Corridor for the maximum impact range for PTS (1.1km (**Table 7.61**)) with the Cardigan Bay SAC.

1215. Therefore, as there is no overlap there would be **no AEoI of the Cardigan Bay SAC in relation to the conservation objectives for bottlenose dolphin, due to disturbance from UXO clearance during construction**.

7.2.4.2.3 Auditory Injury and Disturbance resulting from underwater noise during other construction activities

1216. Potential sources of underwater noise during construction activities, other than piling, include seabed preparation, dredging, rock placement, drilling (if piling is refused at any location), trenching and cable installation.

1217. Underwater noise modelling was undertaken to assess the impact ranges of construction activities, other than piling, on bottlenose dolphin, and this has been used to determine the potential area of effect (for further information see **Chapter 12: Marine Mammal and Marine Turtle Ecology** and **Appendix 12.A: Marine Mammal and Marine Turtle Underwater Noise Report** of the Offshore ES).

1218. For SEL_{cum} calculations, the duration of noise is also considered, with all sources operating for a worst-case of 12 hours in any given 24-hour period for non-impulsive noise.

7.2.4.2.3.1 Potential for Permanent Auditory Injury (PTS) During Other Construction Activities

1219. To account for the weightings required for modelling using the Southall *et al.* (2019) criteria, reductions in source level have been applied to the various noise sources (see **Appendix 12.A: Marine Mammal and Marine Turtle Underwater Noise Report** of the Offshore ES for further information).

1220. The cumulative impact ranges are to the nearest 10m. However, they are likely to be less than 10m. The results of the underwater noise modelling (**Table 7.63**) indicate that bottlenose dolphin would have to be less than 10m (precautionary maximum range) from the continuous noise source for 12 hours, to be exposed to noise levels that could induce PTS based on the Southall *et al.* (2019) non-impulsive thresholds and criteria for SEL_{cum}. Therefore, PTS as a result of construction activity, other than piling, is highly unlikely and has not been further assessed.

Table 7.63 Predicted impact ranges (and areas) for TTS from cumulative exposure of other construction activities

Southall et al., (2019) Weighted SEL_{cum}	Impact	Bottlenose dolphin (HF) SEL_{cum} Weighted (170 dB re 1 μPa^{2}s)
Drag embedment anchors	TTS	<10m (0.0003km^2)
Suction pile installation	TTS	<10m (0.0003km^2)
Cable laying	TTS	<10m (0.0003km^2)
Trenching	TTS	<10m (0.0003km^2)
Cable cutting / removal	TTS	<10m (0.0003km^2)
Dredging	TTS	<10m (0.0003km^2)
Rock placement	TTS	<10m (0.0003km^2)
Total area for all activities	TTS	<10m (0.002km^2)

1221. While there is the potential that more than one of these activities could be underway at either site or the Offshore Export Cable Corridor area at the same time, given the very localised effect area and that bottlenose dolphin would have to be within 10m of the source for 12 hours, it is considered highly unlikely that any individual would be at risk of PTS, and there would be **no AEoI of the Cardigan Bay SAC in relation to the conservation objectives for bottlenose dolphin, due to PTS from construction activities (other than piling)**.

7.2.4.2.3.2 Potential for Disturbance Resulting from Underwater Noise During Other Construction Activities

1222. The maximum duration for the offshore construction period is up to 18 months. However, construction activities would not be underway constantly throughout this period. The duration of offshore export cable installation and trenching activities is expected to take approximately 300 days.

1223. There is the potential that more than one of these activities could be underway at either site or the Offshore Export Cable Corridor area at the same time. As a worst-case and unlikely scenario, an assessment for all eight activities has been undertaken (**Table 7.64**).

1224. The potential effects that could result from underwater noise during other construction activities, including cable laying and protection would be temporary in nature, not consistent throughout the offshore construction periods and would be limited to only part of the overall construction period and area at any one time.

Table 7.64 Maximum number of individuals (and % of reference population) that could be impacted as a result of underwater noise associated with non-piling construction activities based on underwater noise modelling for each individual activity and for all activities at the same time

Species	Potential Impact	Maximum number of individuals (% of reference population) for TTS for each individual activity	Maximum number of individuals (% of reference population) for TTS for all activities at the same time	Potential adverse effect on site integrity
Bottlenose dolphin (HF)	TTS from cumulative SEL, based on 24 hour exposure, for: • Drag embedment anchors • cable laying • Trenching • Dredging • Cable cutting / removal • Suction pile installation • Rock placement	0.00002 (0.000007% of the IS MU (for the SAC population); or 0.0000002% of OCSW MU)	0.0001 (0.00003% of the IS MU (for the SAC population); or 0.000001% of OCSW MU)	No Temporary effect. Up to 0.000001% of the reference population could be affected during other construction activities, based on the worst-case scenario for TTS SEL_{cum}.

1225. For dolphin species, there is very little information on the potential disturbance ranges due to construction activities. However, it is likely that dolphin species are less sensitive to noisy activities than other marine mammal species, given their significantly lower PTS and TTS effect ranges than is seen for other marine mammal species.

1226. Therefore, in the absence of any further information, for dolphin species, the assessment is based on the potential impact ranges for a TTS / fleeing response (**Table 8.63**) is used to inform the potential for a disturbance effect for bottlenose dolphin, and represents the worst-case for currently available information.

1227. If the behavioural response is displacement from the area, it is predicted that bottlenose dolphin will return once the activity has been completed and any impacts from underwater noise as a result of construction activities other than piling noise will be both localised and temporary. Therefore, there is unlikely to be the potential for any significant impact on bottlenose dolphin.

1228. As previously outlined, at the closest point, the Windfarm Site is 105km from the Cardigan Bay SAC (**Table 7.57**). Therefore, there is no direct overlap with the Cardigan Bay SAC for underwater noise from other construction activities, and with the small number of individuals at risk of disturbance, there would be **no AEoI of the Cardigan Bay SAC in relation to the conservation objectives for bottlenose dolphin due to disturbance during construction (activities other than piling)**.

1229. No additional mitigation is required or proposed for underwater noise for construction activities, other than piling.

7.2.4.2.4 Auditory Injury and Disturbance Resulting from Underwater Noise Due to Construction Vessels

1230. During the construction phase there will be an increase in the number of vessels; this is estimated to be up to a total of five vessels at the Project including the Offshore Export Cable Corridor area, at any one time (**Table 7.3**). The number, type and size of vessels will vary depending on the activities taking place.

1231. As previously outlined, at the closest point, the Windfarm Site is 105km from the Cardigan Bay SAC (**Table 7.57**). Vessel movements to and from any port will be incorporated within existing vessel routes and therefore any increase in disturbance as a result of underwater noise from vessels during construction will be within the Windfarm Site and offshore cable corridor. Therefore, there is no direct overlap with the Cardigan Bay SAC for underwater noise and the presence of vessels when cable laying.

1232. A review of the potential underwater noise levels associated with vessels is provided in **Section 12.7.4.2** of **Chapter 12: Marine Mammal and Marine Turtle Ecology** of the Offshore ES.

1233. Underwater noise modelling was undertaken to assess the potential effect ranges of vessels on bottlenose dolphin, and this has been used to determine the potential area of effect for permanent auditory injury (PTS) (for further information see **Chapter 12: Marine Mammal and Marine Turtle Ecology** and **Appendix 12.A: Marine Mammal and Marine Turtle Underwater Noise Report** of the Offshore ES).

1234. For SEL_{cum} calculations, the duration of noise is also considered, with all sources operating for a worst-case of 24 hours in any given 24-hour period.

7.2.4.2.4.1 Potential for Permanent Auditory Injury (PTS) Due to Construction Vessels

1235. The results of the underwater noise modelling (**Table 7.60**) indicate that bottlenose dolphin would have to be less than 10m (precautionary maximum range) from the vessel for 24 hours, to be exposed to noise levels that could induce PTS based on the Southall *et al.* (2019) thresholds and criteria.

1236. While there is the potential that up to five vessels could be present at the Project at the same time, given the very localised effect area and that bottlenose dolphin would have to be within 10m of the source for 24 hours, it is considered highly unlikely that any individuals would be at risk of PTS. As a result, there would be **no AEoI of the Cardigan Bay SAC in relation to the conservation objectives for bottlenose dolphin, due to PTS from construction vessels**.

7.2.4.2.4.2 Potential for Disturbance Resulting from Underwater Noise from Construction Vessels

1237. Disturbance from vessel noise could occur where increased noise from construction vessels associated is greater than the background ambient noise.

1238. During the periods when piling is underway, vessel noise is unlikely to add an additional impact to those assessed for piling, as the vessels and vessel noise would be within the maximum impact areas assessed. The distance at which animals may react to vessels is difficult to predict and behavioural responses can vary a great deal depending on species, location, type and size of vessel, vessel speed, noise levels and frequency, ambient noise levels and environmental conditions.

1239. Five vessels at the Windfarm Site (49.3km^2) would equate to less than 0.11 vessels per km^2 (approximately one vessel per 9km^2). In addition, due to safety and logistical considerations during piling, it is likely that the number of vessels in a small area, for example, around a pile location during pile installation, would be limited to a very low number of essential vessels only.

1240. The maximum duration for the offshore construction period, including piling and export cable installation, is up to 16 months. Therefore, it is assumed that construction vessels could be at the offshore site for up to 16 months.

1241. If the behavioural response is displacement from the area, it is predicted that bottlenose dolphin will return once the activity has been completed and any impacts from underwater noise as a result of construction vessels will be both localised and temporary. Therefore, there is unlikely to be the potential for any significant disturbance of bottlenose dolphin.

1242. There would be **no AEoI of the Cardigan Bay SAC in relation to the conservation objectives for bottlenose dolphin due to disturbance from vessels during construction**.

1243. No additional mitigation is required or proposed for underwater noise from construction vessels.

7.2.4.2.5 Barrier Effects as a Result of Underwater Noise

1244. Underwater noise during construction could have the potential to create a barrier effect, preventing movement of bottlenose dolphin or potentially increasing swimming distances if they avoid the area. Bottlenose dolphins are known to move along the coast and are therefore unlikely to be affected as a result of underwater noise at the OWF sites.

1245. The worst-case scenario in relation to barrier effects as a result of underwater noise is based on the maximum spatial and temporal (i.e. largest area and longest duration) scenarios.

1246. For bottlenose dolphin this would be the maximum predicted impact area for TTS from cumulative SEL during piling, which as previously assessed is up to 0.006 individuals (which represents 0.00006% of the OCSW MU, or 0.002% of the IS MU (for the SAC population)) (**Table 7.59**).

1247. Therefore, there would be no significant disturbance of bottlenose dolphin and **no AEoI of the Cardigan Bay SAC in relation to the conservation objectives for bottlenose dolphin due to potential barrier effects as a result of underwater noise during construction**.

7.2.4.2.6 Interaction and Collision Risk with Vessels

1248. During the offshore construction phase there will be an increase in vessel traffic within and on transit to the offshore sites. However, it is anticipated that vessels would follow an established shipping route to the relevant ports in order to minimise vessel traffic in the wider area. The **Appendix 5.A: Outline CEMP** of the Offshore ES will provide details on vessel good practice and code of conduct that will be implemented to avoid marine mammal collisions.

1249. The approximate number of vessels on site at any one-time during construction is estimated to be five vessels, with an average of approximately six trips per month, resulting in a daily average of approximately 0.2 vessel movements, based on 101 vessel trips over a 16-month construction period.

1250. See **Section 7.2.1.2.6** for further information on the current vessel usage of the area.

1251. Predictability of vessel movement by marine mammals is known to be a key aspect in minimising the potential risks imposed by vessel traffic (Nowacek *et al.,* 2001, Lusseau, 2003, 2006).

1252. Strandings data was collated for bottlenose dolphin as it was for harbour porpoise (described in **Section 7.2.1.2.6**), from SMASS, CSIP, and CWT. SMASS and CSIP identified the cause of death for a total of 45 bottlenose dolphin strandings and for a total of 992 dolphins. Of these, 15 total dolphins died as a result of physical trauma following probable impact from a ship or boat (**Table 7.65**). This results in collision risk rates of 0.022 and 0.044 for bottlenose dolphin and all dolphin species respectively. As a precautionary approach, the collision risk rate used to inform the assessments will be the species specific rate, or the dolphin rate, whichever is highest.

1253. The potential for collision risk for bottlenose dolphin was calculated in the same method as for harbour porpoise, described in **Section 7.2.1.2.6**. The total UK populations for bottlenose dolphin are taken from SCOS (2021).

1254. The assessment of collision risk (**Table 7.66**) predicts that 0.009 bottlenose dolphin per year could be at risk of vessel collision due to the vessels associated with construction (equating to 0.003% of the IS MU (for the SAC population); or 0.0001% of OCSW MU). Therefore, this is not predicted to result in any significant population effects or any changes to the conservation status of bottlenose dolphin.

Table 7.65 Summary of UK Bottlenose Dolphin Strandings (2011-2017) and Causes of death From Physical Trauma of Unknown Cause and Physical Trauma Following Probable Impact from a Ship or Boat (Data from CSIP[31], SMASS[32], CWT[33], MEM[34], Marine Institute[35])

Species	Number of Post-Mortems Where Cause of Death Established	Cause of Death: Physical Trauma of Unknown Cause	Cause of Death: Physical Trauma Following Probable Impact From a Ship or Boat	Collision Risk Rate (Number Attributed to Vessels Strike / Other Physical Trauma as Proportion of Total Number Necropsied)
Bottlenose dolphin	45	1	0	0.022
All dolphin species	*992*	*29*	*15*	*0.044*

Table 7.66 Predicted Number of Grey Seal at Risk of Vessel Collision During Construction, Based on Current UK Collision Rates and Vessel Presence

Bottlenose Dolphin Collision Risk Rate	Estimated Total Number in UK Waters	Estimated Number Within UK Waters (Collision Risk Rate x Total UK Population)	Annual Number of Vessel Transits in UK and RoI for 2015	Number at Risk of Collision per Vessel in UK Waters	Number Annual Vessel Transits Associated with Construction	Additional Individuals at Risk Due to Increase in Vessel Number per annum (Number of Vessels * Number at Risk per Vessel)
0.044*	7,545	334.7	3,852,030	0.00009	101	0.009

** using the collision risk rate of the species group as a worst-case*

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[31] CSIP (2004); CSIP (2005); CSIP (2011); CSIP (2018) [available from: https://ukstrandings.org/csip-reports/]

[32] SMASS (2010); SMASS (2011); SMASS (2013); SMASS (2014); SMASS (2015); SMASS (2016); SMASS (2017); SMASS (2018); SMASS (2019); SMASS (2020); SMASS (2021) [available from: https://stranding's.org/publications/]

[33] CWT (2021), CWT (2020), CWT (2019), CWT (2018), CWT (2017), CWT (2016)

[34] MEM & CSIP (2019), MEM & CSIP (2020)

[35] Marine Institute, 2022

1255. Vessel movements, where possible, will be incorporated into recognised vessel routes and hence to areas where bottlenose dolphin are accustomed to vessels, in order to reduce any increased collision risk. All vessel movements will be kept to the minimum number that is required to reduce any potential collision risk. Additionally, vessel operators will use good practice to reduce any risk of collisions with marine mammals (see the **Appendix 12.C: Draft MMMP** of the Offshore ES).

1256. Consequently, there would be **no AEoI of the Cardigan Bay SAC in relation to the conservation objectives for bottlenose dolphin due to potential vessel collision risk during construction**.

7.2.4.2.7 Entanglement

1257. For information regarding entanglement see **Section 7.2.1.2.7**.

1258. Monitoring and reporting on this impact pathway will be considered as part of the MMMP, to be agreed with SNCBs before the construction period. Should any monitoring suggest that the likelihood of this impact occurring is higher than expected, then contingency measures will be put in place. The exact measures within the contingency plan have yet to be determined, and consultation and agreement with stakeholders will be sought. Measures could, for example, involve more regular monitoring of lines and cables, in order to remove any snagged derelict gear/marine litter as quickly as possible, to minimise the chance of indirect entanglement.

1259. The Windfarm Site is not located on any known migration routes for bottlenose dolphin or within any known key foraging areas, and with the lack of data on entanglement of marine mammals from mooring lines in floating windfarms, the potential risk of entanglement is considered to be low.

1260. With the existing literature suggesting that entanglement will not pose a significant risk to marine mammals, it is concluded that there is **no AEoI of the Cardigan Bay SAC in relation to the conservation objectives for bottlenose dolphin due to entanglement**.

7.2.4.2.8 Barrier Effects due to Physical Presence

1261. As the Project is constructed, there is the potential for a barrier effect to occur due to the physical presence of the Project's infrastructure. As for the risk of entanglement, the worst-case scenario for effects from the physical presence of the windfarm is during the operational and maintenance phase of the Project, due to the length of time the infrastructure would be in place. However, there is the potential for a short period of time within the construction period where some Project infrastructure being in place prior to the start of the operational period, and therefore a short period of time where there may be a risk of a barrier effect due to the physical presence of the Project. This is therefore a temporary effect. While the effect would continue into the operational phase, this assessment focuses solely on the construction phase.

1262. The worst-case maximum barrier effect due to the Project physical presence are explained further in **Section 7.2.2.3.9**, as the operational phase will see the worst-case potential effect for the Project, which concluded no AEoI.

1263. There would therefore be **no AEoI of the Cardigan Bay SAC in relation to the conservation objectives for bottlenose dolphin due to barrier effects due to the physical presence of the Project during construction**.

7.2.4.2.9 Electromagnetic Fields

1264. MFs occur as a result of electricity transmission through conductive objects, such as transmission cables, and the electromagnetic attributes of EMFs have the potential to disrupt organs used for navigation and foraging within a number of species, including marine mammals. See **Section 7.2.1.2.9** for a summary of the potential effect of EMF during construction.

1265. The worst-case maximum EMF effect to bottlenose dolphin is explained further in **Section 7.2.2.3.10**, as the operational phase will see the worst-case potential effect for the Project which concluded no AEoI.

1266. EMF is therefore not expected to affect bottlenose dolphin, and there would be **no AEoI of the Cardigan Bay SAC in relation to the conservation objectives for bottlenose dolphin from EMF effects during construction**.

7.2.4.2.10 Changes to Prey Availability

1267. The potential effects on prey species during construction can result from physical disturbance and loss of habitat; increased SSC and sediment deposition; and underwater noise (including barrier effects from underwater noise). **Chapter 11: Fish and Shellfish Ecology** of the Offshore ES, provides an assessment of these impact pathways on the relevant fish and shellfish species and concludes impacts of negligible to minor adverse significance in EIA terms. Any reductions in prey availability would be small scale, localised and temporary. It is considered highly unlikely that potential reductions in prey availability as a result of construction activities would result in detectable changes to bottlenose dolphin populations.

1268. Bottlenose dolphin are opportunistic feeders, feeding on wide range of prey species and have large foraging ranges (see **Chapter 12: Marine Mammal and Marine Turtle Ecology** of the Offshore ES).

1269. Any changes in prey availability, based on the worst-case for TTS SEL_{cum} for fish species with a swim bladder involved in hearing, using the fleeing response model is 24km^2. This is the largest potential impact range for prey (fish) species and has therefore been used to inform the below worst-case and precautionary assessment. This assessment assumes that all bottlenose dolphin within the largest impact area for fish (as noted above) would be at risk of a reduction in prey availability, due to the prey (fish) species themselves being potentially affected within that area.

1270. The number of bottlenose dolphin that could potentially be affected by any changes in prey availability is up to 1 individual (0.0087% of OCSW; **Table 7.62**). This means that, under the precautionary assumptions of this assessment, up to 1 bottlenose dolphin could be at risk of a reduced (or removed) potential to forage within that area. More realistically, however, the reduction of prey (fish) species availability would not be for all fish within that area, and bottlenose dolphin would be able to forage within that area still or would be able to travel outside of that area to forage, with no reduction or impact to the overall population anticipated.

1271. However, as previously outlined, the assessments for bottlenose dolphin have been based on a very precautionary approach, as there is currently no density estimate for the area in and around the survey area. In addition, bottlenose dolphin are more likely to be present close to shore, rather than the offshore areas. Therefore, any potential effects on bottlenose dolphin as a result of any changes to prey availability is likely to be a lot less than in the worst-case assessment.

1272. It is highly unlikely that there would be significant changes to prey over the entire area. It is more likely that effects would be restricted to an area around the working sites.

1273. Mitigation to reduce the potential impacts of underwater noise for marine mammals would also reduce the potential impacts on prey species.

1274. Therefore, there will be **no AEoI of the Cardigan Bay SAC in relation to the conservation objectives for bottlenose dolphin as a result of any changes to prey availability due to underwater noise during piling (which is the worst-case)**.

1275. No further mitigation is required or proposed in relation to any changes in prey availability.

7.2.4.2.11 Changes to Water Quality

1276. Sediment contamination levels across the offshore sites are not considered to be of significant concern and are low risk in terms of potential impacts on the marine environment (**Chapter 9: Marine Water and Sediment Quality** of the Offshore ES). Any potential changes to water quality during construction would be negligible.

1277. Therefore, there would be **no AEoI of the Cardigan Bay SAC in relation to the conservation objectives for bottlenose dolphin due to changes in water quality as a result of all construction activities**.

7.2.4.3 Potential Effects During Operation and Maintenance

The potential effects for marine mammals during operation and maintenance with the potential for LSE:

- Underwater noise
- Entanglement
- Interaction and Collision Risk with vessels Physical barrier effects
- Changes to water quality
- EMFs
- Changes to prey resources.

1278. Potential sources of underwater noise during the operation and maintenance phase include:

- Operational noise from WTGs and from movement of floating turbine moorings on the seabed
- Maintenance activities, such as cable re-burial and any additional rock placement
- operation and maintenance vessel activity.

7.2.4.3.1 Potential Effects of Underwater Noise from Operational Turbines

1279. The operational turbines will operate nearly continuously, except for occasional shutdowns for maintenance or severe weather. The Project's design life is 25 years. Therefore, there is concern that underwater noise from operational turbines could contribute a consistent, long duration of sound to the marine environment. Further information into the sound emitted during the operation phase can be found in **Section 7.2.1.3.1**.

1280. As outlined in **Appendix 12.A: Marine Mammal and Marine Turtle Underwater Noise Report** of the Offshore ES, noise measurements made at operational wind farms have demonstrated that the operational noise produced was at such a low level that it was difficult to measure relative to background noise at distances of a few hundred metres.

1281. However, the underwater noise levels emitted during the operation of the turbines are low and not expected to cause physiological injury to marine mammals but could cause behavioural reactions if the animals are in the immediate vicinity of the wind turbine (Tougaard *et al*., 2009a; Sigray and Andersson, 2011). Although, bottlenose dolphin are frequently observed in and around the Aberdeen OWF (European Offshore Wind Deployment Centre).

7.2.4.3.2 Potential for Auditory Injury Due to Operational Turbines

1282. The results of the underwater noise modelling (**Table 7.67**) indicate that bottlenose dolphin would have to be less than 10m (precautionary maximum range) for 24 hours in a 24 hour period, to be exposed to noise levels that could induce PTS based on the Southall *et al.* (2019) non-impulsive thresholds and criteria for SEL_{cum}. Therefore, PTS as a result of operational wind turbine noise, is highly unlikely.

Table 7.67 Predicted impact ranges (and areas) for TTS from cumulative exposure of operational turbines

Impact	Criteria and threshold (Southall *et al*., 2019)	Operational wind turbine
TTS	SEL_{cum} Weighted (178 dB re 1 µPa^{2}s) Non-impulsive	<0.01km (<0.0003km^2)

1283. Given the very localised effect area and that bottlenose dolphin would have to be within 10m of a WTG for 24 hours, it is considered highly unlikely that any individuals would be at risk of PTS, and there would be **no AEoI of the Cardigan Bay SAC in relation to the conservation objectives for bottlenose dolphin, due to PTS from operational WTGs**.

7.2.4.3.2.1 Potential for Disturbance Due to Operational Turbine Noise

1284. There is currently limited information for other marine mammal species, however, bottlenose dolphins are frequently observed in and around the Aberdeen OWF (European Offshore Wind Deployment Centre).

1285. Modelling of noise effects of operational offshore wind turbines suggest that bottlenose dolphins are not considered to be at risk of displacement by the operational wind farms (Marmo *et al*., 2013).

1286. The Windfarm Site lies outside the Cardigan Bay SAC and therefore there will be no direct effect on the spatial or seasonal components of the SAC due to disturbance from operational WTGs.

1287. As described above, studies have shown that there is no lasting disturbance or exclusion of bottlenose dolphin around windfarm sites during operation, and therefore it is not expected that there would be any disturbance of bottlenose dolphin. Therefore, any potential effects would not result in any significant population effects or any changes to the FCS.

1288. There would be **no AEoI of the Cardigan Bay SAC in relation to the conservation objectives for bottlenose dolphin due to underwater noise effects from operational turbines**.

1289. No additional mitigation is required or proposed.

7.2.4.3.3 Potential effects of underwater noise during maintenance activities, such as cable re-burial and any additional rock placement

1290. The requirements for any potential maintenance work, such as additional rock placement or cable re-burial, are currently unknown. However, the work required and associated impacts would be less than those during construction.

1291. The impacts from additional cable laying and protection are temporary in nature and will be limited to relatively short periods during the operation and maintenance phase. Disturbance responses are likely to occur at significantly shorter ranges than construction noise. Any disturbance is likely to be limited to the area in and around where the actual activity is taking place.

1292. The underwater noise from maintenance activities is considered to be the same or less than those assessed for underwater noise from other construction activities (including rock placement, trenching and cable laying). The potential effects that could result from underwater noise during operation and maintenance activities, including cable laying and protection would be temporary the same as the construction period.

1293. If the behavioural response is displacement from the area, it is predicted that bottlenose dolphin will return once the activity has been completed and any impacts from underwater noise as a result of operation and maintenance activities will be both localised and temporary. Therefore, there is unlikely to be the potential for any significant impact on bottlenose dolphin.

1294. Therefore, there would be **no AEoI of the Cardigan Bay SAC in relation to the conservation objectives for bottlenose dolphin due to underwater noise and disturbance effects from operation and maintenance activities**.

1295. No additional mitigation is required or proposed.

7.2.4.3.4 Potential effects of underwater noise during operation and maintenance vessel activity

1296. The requirements for any potential maintenance work are currently unknown. However, the work required, and impacts associated with underwater noise and disturbance from vessels during operation and maintenance would be less than those during construction.

1297. It is estimated that the maximum number of vessels that could be required on site at any one-time during operation and maintenance could be five, which is the same when considered with those that could be on site during construction. Therefore, as a precautionary approach the assessment for construction has been used for the operation and maintenance assessment, as a worst-case scenario (see **Section 1229** for further information). If the behavioural response is displacement from the area, it is predicted that bottlenose dolphin will return once the activity has been completed and any impacts from underwater noise as a result of construction vessels will be both localised and temporary. Therefore, there is unlikely to be the potential for any significant disturbance of bottlenose dolphin. Hence no AEoI of the Cardigan Bay SAC.

1298. The underwater noise from maintenance vessels is considered to be the same or less than those assessed for underwater noise from construction vessels. Therefore, there would be **no AEoI of the Cardigan Bay SAC in relation to the conservation objectives for bottlenose dolphin due to underwater noise and disturbance effects from operation and maintenance vessels**.

1299. No additional mitigation is required or proposed.

7.2.4.3.5 Interaction and Collision Risk with Vessels

1300. It is estimated that there would be approximately 40 vessel movements, to and from the Project, for each year of the operation and maintenance phase (or an average of 0.1 transits per day (one vessel movement every 10 days, or one return trip every 20 days) (**Table 7.3**). An assessment of the potential increase in risk to bottlenose dolphin as a result of the 40 vessel movements per year has been undertaken following the same approach as undertaken for the construction phase (**Section 7.2.1.2.6**).

1301. The number of individuals at risk of collision, per vessel, in UK waters has been calculated, and has been used to calculate the number of bottlenose dolphin at risk of collision from the 40 yearly vessel transits associated with the Project's operation and maintenance phase (**Table 7.68**). Up to 0.004 bottlenose dolphin (0.001% of the IS MU (for the SAC population); 0.00004% of the OCSW MU) may be at risk of vessel collision per year of operation, based on this assessment.

1302. This is a highly precautionary approach, as it is unlikely that bottlenose dolphin present in the Windfarm Site and Offshore Export Cable Corridor areas would be at increased collision risk with vessels during the operation and maintenance phase. A minimal number of additional vessels will be in the area due to the Windfarm Site, where these vessels would be stationary or very slow moving. In addition, based on the assumption that bottlenose dolphin would be disturbed as a result of the vessel noise and presence, there should be no potential for increased collision risk with construction vessels.

1303. All vessel movements, where possible, will be incorporated into recognised vessel routes and hence to areas where marine mammals are accustomed to vessels, in order to reduce any increased collision risk. All vessel movements will be kept to the minimum number that is required to reduce any potential collision risk. Additionally, vessel operators will use good practice to reduce any risk of collisions with marine mammals (see the **Appendix 12.C: Draft MMMP** of the Offshore ES). Taking into account the limited potential for increased collision risk with vessels during construction, there would be no AEoI of the Cardigan Bay SAC.

1304. Therefore, there would be **no AEoI of the Cardigan Bay SAC in relation to the conservation objectives for bottlenose dolphin due to increased collision risk from operation and maintenance vessels**.

7.2.4.3.6 Entanglement

1305. As previously outlined in **Section 1252**, entanglement is the potential risk of marine mammals getting caught within the WTG mooring lines, as a primary cause and the potential risk of marine mammals getting caught within fishing lines that have been caught themselves within the WTG mooring lines as a secondary cause. The worst-case scenario for entanglement is during the operation and maintenance phase of the project due to the length of time the structures will be in place, creating a higher probability of receptors to get caught within the WTG mooring lines.

Table 7.68 Predicted Number of Bottlenose Dolphin at Risk of Vessel Collision During Operation and Maintenance, Based on Current UK Collision Rates and Vessel Presence

Bottlenose dolphin Collision Risk Rate	Estimated Total Number of Individuals in UK Waters	Estimated Number of Individuals at Risk Within UK Waters (Collision Risk Rate x Total UK Population)	Annual Number of Vessel Transits in UK and RoI for 2015	Number of Marine Mammals at Risk of Collision per Vessel in UK Waters	Number Annual Vessel Transits Associated with Operation and Maintenance	Additional Marine Mammals at Risk Due to Increase in Vessel Number (Number of Vessels * Number at Risk per Vessel)
0.044*	7,545	334.7	3,852,030	0.00009	40	0.004

** using the collision risk rate of the species group as a worst-case*

1306. Although the operation and maintenance phase is the worst-case for entanglement, as the existing literature suggests that entanglement will not pose a significant risk to marine mammals. The Windfarm Site is not located on any known migration routes for bottlenose dolphin or within any known key foraging areas, and with the lack of data on entanglement of marine mammals from mooring lines in floating windfarms, the potential risk of entanglement is considered to be low.

1307. Therefore it is concluded that there is **no AEoI of the Cardigan Bay SAC in relation to the conservation objectives for bottlenose dolphin due to changes to entanglement**.

1308. However, The Applicant will consider the option for monitoring and reporting on this impact pathway as part of the MMMP. **Appendix 12.C: Draft MMMP** of the Offshore ES has been produced and included as part of the Section 36 application. Should monitoring suggest that the likelihood of this impact occurring is higher than expected, contingency measures will be put in place. The exact measures within the contingency plan are yet to be determined, and consultation and agreement with stakeholders will be sought. Measures could, for example, involve more regular monitoring of lines and cables to remove snagged gear/marine litter as quickly as possible to minimise the chance of entanglement.

7.2.4.3.7 Physical Barrier Effects

1309. The presence of a windfarm could be perceived as having the potential to create a physical barrier, preventing movement or seasonal migration of bottlenose dolphin between important feeding and / or breeding areas, or potentially increasing swimming distances if bottlenose dolphin avoids the site and go round it. The Windfarm Site is not located on any known important routes for bottlenose dolphin or within any known key foraging areas.

1310. As summarised in **Section 7.2.4.3.1**, bottlenose dolphin have been seen to be present within operational windfarm sites, indicating that there is no barrier to their movement.

1311. The indicative separation distance between turbines (inter-row) and between turbines in rows (in-row) would be a minimum of 1.1km (maximum of 2.62km). Therefore, there would be no overlap in the potential underwater noise impact ranges of less than 10m (<0.01km) around each turbine and there would be adequate room for marine mammals to move through the wind farm sites.

1312. The maximum footprint of turbine moorings is approximately 2,400m2 per WTG (based on total area for anchor length and width, maximum number of anchors per WTG (of six), the mooring chain width and the mooring line radius around each anchor; **Table 7.3**), and the footprint of the OSP would be 1,257m^2. This equates to a total footprint of 20,457m^2 (or 0.02km^2). Therefore, the physical footprint of structures that could present a physical barrier is a very small area (0.04%) of the total Windfarm Site area (49.35km^2).

1313. There is currently no information on the potential for the physical presence of a floating OWF site to cause a barrier to movement for marine mammal species, however, it is assumed to cause a similar level of effect to that of fixed foundation wind farms. It is therefore not expected that the locations of the turbines and infrastructure themselves will be positioned in a location to cause a barrier to movement, with room for bottlenose dolphin to transit through the Windfarm Site.

1314. There would be **no AEoI of the Cardigan Bay SAC in relation to the conservation objectives for bottlenose dolphin due to barrier effects from increased underwater noise during operation and maintenance**.

1315. No additional mitigation is required or proposed.

7.2.4.3.8 Electromagnetic Fields

1316. The effect of EMFs are assessed in **Section 7.2.4.3.8** and **Chapter 11: Fish and Shellfish Ecology** of the Offshore ES. This assessment noted that the areas potentially affected by EMF generated by the worst-case scenario for offshore cables are expected to be small and restricted to the immediate vicinity of the cables (i.e. within metres). EMFs are expected to attenuate rapidly in both horizontal and vertical planes with distance from the source.

1317. The effect of EMFs would be low and therefore there would be **no AEoI of the Cardigan Bay SAC in relation to the conservation objectives for bottlenose dolphin from EMF effects on prey species during the operation and maintenance phase**.

7.2.4.3.9 Changes to Prey Resources

1318. Any impact on prey species have the potential to affect bottlenose dolphin and as outlined in **Chapter 11: Fish and Shellfish Ecology** and **Chapter 12 Marine Mammal and Marine Turtle Ecology** of the Offshore ES, and in **Section 7.2.1.3.8**, the potential impacts on fish species during operation and maintenance can result from:

- Permanent habitat loss / Physical disturbance
- Temporary increased suspended sediment concentrations and deposition
- Underwater noise and vibration
- EMF

- Barrier effects
- Fish aggregation effects
- Ghost fishing.

1319. **Chapter 11: Fish and Shellfish Ecology** of the Offshore ES provides an assessment of these impact pathways on the relevant fish and shellfish species and concludes impacts of negligible to minor adverse significance in EIA terms. Therefore, there will be **no AEoI of the Cardigan Bay SAC in relation to the conservation objectives for bottlenose dolphin due to changes in prey availability during the operation and maintenance phase**.

7.2.4.3.10 Changes to Water Quality

1320. Throughout the operation and maintenance phase, due diligence and best practice techniques regarding the potential for pollution will be followed throughout the required activities. The PEMP will include the embedded mitigation measures regarding best practice techniques to avoid the accidental release of contaminants (**Table 7.1**). Any risk of accidental release of contaminants (e.g. through spillage) will be mitigated in line with the PEMP and any changes to water quality as a result of any accidental release of contaminants (e.g. through spillage or vessel collision) would be negligible.

1321. During operation and maintenance disturbance of seabed sediments will be localised to specific moorings or sections of cable and considerably less than that during the construction phase.

1322. Potential changes in water quality during operation and maintenance include (see **Chapter 9: Marine Water and Sediment Quality** of the Offshore ES for more information):

- Localised temporary increases in suspended sediments
- Remobilisation of existing contaminated sediments.

1323. Changes in water quality are considered to have a negligible effect on marine mammals. As assessed in **Chapter 9: Marine Water and Sediment Quality** of the Offshore ES, any potential changes in water quality during operation and maintenance would be negligible.

1324. Therefore, there would be **no AEoI of the Cardigan Bay SAC in relation to the conservation objectives for bottlenose dolphin as a result of any changes to water quality during operation and maintenance**.

1325. No additional mitigation is required or proposed, other than the embedded mitigation outlined in **Table 7.1**.

7.2.4.4 Potential Effects During Decommissioning

1326. Potential effects on bottlenose dolphin associated with decommissioning have not been assessed in detail as further assessments will be carried out ahead of any decommissioning works to be undertaken taking account of known information at that time, including relevant guidelines and requirements. A detailed decommissioning programme will be provided to the regulator prior to construction that will give details of the techniques to be employed and any relevant mitigation measures required.

1327. Decommissioning would most likely involve the removal of the accessible installed components comprising:

- all of the wind turbine components
- part of the mooring structures (those above sea bed level)
- the sections of the infield cables close to the offshore structures, as well as sections of the export cables.

1328. The process for removal of foundations is generally the reverse of the installation process. There would be no piling, and foundations may be cut to an appropriate level.

1329. It is not possible to provide details of the methods that will be used during decommissioning at this time. However, is it expected that the activity levels will be comparable to construction (with the exception of pile driving noise which would not occur).

1330. The potential effects on bottlenose dolphin during decommissioning would be the same or less than those assessed during construction, which concluded no AEoI for all potential effects. With mitigation measures adopted, there would be **no AEoI of the Cardigan Bay SAC in relation to the conservation objectives for bottlenose dolphin**.

7.2.4.5 Potential In-Combination Effects

1331. The in-combination assessment considers plans, projects and activities where the predicted effects have the potential to combine with the potential effects during construction of the Windfarm Site. The construction phase has been assessed as the worst-case for potential in-combination effects.

1332. The activities, plans and projects screened into the in-combination assessment for bottlenose dolphin are those that are located in the OCSW MU. Full information on the screening is provided in **Appendix 12.B Marine Mammals Cumulative Effects Assessment (CEA) Report** of the Offshore ES.

1333. The potential in-combination effects for bottlenose dolphin within the Cardigan Bay SAC has been identified as disturbance from underwater noise, increased collision risk, entanglement, and changes to prey availability. See **Appendix 12.B Marine Mammals CEA Screening Report** of the Offshore ES for further information.

1334. All other potential effects, including PTS from underwater noise, TTS from underwater noise, barrier effects, EMF, and changes to water quality have been screened out with no potential in-combination effects in relation to the Cardigan Bay SAC and bottlenose dolphin (see **Appendix 12.B Marine Mammals CEA Screening Report** of the Offshore ES).

1335. The commitment to the mitigation measures agreed through the MMMP (in accordance with the **Appendix 12.C: Draft MMMP** of the Offshore ES) for piling would reduce the risk of physical injury or permanent auditory injury (PTS) in bottlenose dolphin. In light of this, and taking account of the type, scale and extent of potential effects arising from the Project assessment, which concluded **no AEOI for bottlenose dolphin from physical injury or PTS from construction** (see **Section 7.2.1.2.1.1**).

1336. Other licenced projects or activities that may result in underwater noise that could cause physical injury or PTS will have similar controls in place. Taking this into account, there is considered to be no pathway for the Project or any of the other projects screened into the in-combination assessment (see **Appendix 12.B Marine Mammals CEA Screening Report** of the Offshore ES) to contribute to in-combination effects for physical injury or permanent auditory injury (PTS) from piling activities, and the potential for PTS has not been assessed in the following assessment.

1337. Other activities such as dredging, drilling, rock placement, vessel activity, operational wind farms, oil and gas installations or wave and tidal sites will emit broadband noise in lower frequencies and auditory injury (PTS) from these activities is very unlikely. Therefore, the potential risk of any auditory injury (PTS) is not included in the in-combination assessments. Thus, the following assessment only considers potential disturbance effects on bottlenose dolphin.

7.2.4.5.1 Assessment of Disturbance from Underwater Noise

1338. The potential sources of in-combination effects of underwater noise which could disturb bottlenose dolphin are:

- Piling at other OWFs (**Section 1.3.1** of **Appendix 12.B: Marine Mammals CEA Screening Report** of the Offshore ES)
- Other construction activities at OWFs (other than piling) including vessels, cable installation works, dredging, seabed preparation and rock placement (**Section 1.3.2** of **Appendix 12.B Marine Mammals CEA Screening Report** of the Offshore ES)
- Marine Renewable Energy (MRE) projects (wave and tidal) – construction phase only (**Section 1.3.3** of **Appendix 12.B Marine Mammals CEA Screening Report** of the Offshore ES)
- Aggregate extraction and dredging (**Section 1.3.4** of **Appendix 12.B: Marine Mammals CEA Screening Report** of the Offshore ES)
- Oil and gas installation projects (**Section 1.3.6** of **Appendix 12.B: Marine Mammals CEA Screening Report** of the Offshore ES)
- Oil and gas seismic surveys (**Section 1.3.1** of **Appendix 12.B: Marine Mammals CEA Screening Report** of the Offshore ES)
- Subsea cable and pipelines (**Section 1.3.7** of **Appendix 12.B: Marine Mammals CEA Screening Report** of the Offshore ES)
- Other marine projects (gas storage, offshore mines and carbon capture) (**Section 1.3.8** of **Appendix 12.B: Marine Mammals CEA Screening Report** of the Offshore ES)
- Geophysical surveys at OWFs (**Section 1.5.1** of **Appendix 12.B: Marine Mammals CEA Screening Report** of the Offshore ES)
- UXO clearance (Section 1.5.1 of Appendix 12.B: Marine Mammals CEA Screening Report of the Offshore ES).

1339. The approach to the assessment for in-combination disturbance from underwater noise has been based on the approach for the assessment of disturbance for those same activities as presented in **Section 7.2.1.5.** Further detail on the density estimates used in the in-combination assessment as well as the potential effect ranges are provided within **Section 12.10.3** of **Chapter 12 Marine Mammal and Marine Turtle Ecology** of the Offshore ES.

7.2.4.5.1.1 Assessment of Underwater Noise from Piling at Other Offshore Wind Farms

1340. Following the initial screening of UK and European OWFs (as presented in **Appendix 12.B: Marine Mammals CEA Screening Report** of the Offshore ES), the next stage of the screening exercise was undertaken on those projects that have been identified as having the potential for in-combination construction effects. This stage of the screening is based on known construction periods of UK and European OWF projects, including known piling and /or construction timings, in order to determine a more realistic, but still worst-case, list of UK and European OWF projects that may the potential for overlapping piling with the Project.

1341. Of the UK and European OWFs screened in for having a construction period that could potentially overlap with the construction of the Project, and that are within the OCSW MU, seven OWFs could be piling at the same time, which is estimated to take place in either 2026 or 2027:

- Dieppe - Le Treport
- Codling
- Dublin Array
- North Irish Sea Array
- South Irish Sea
- Awel y Môr OWF
- Morecambe.

1342. This more realistic short list of OWF projects that could be piling at the same time as the Project could change as projects develop, but this is the best available information at the time of writing, and more accurately reflects the limitations and constraints to project delivery. This is highly precautionary and of the shortlisted projects none are within 130km of Cardigan Bay SAC.

1343. The assessment of in-combination effects considers the potential disturbance of bottlenose dolphin during piling for the Project, with the piling at other OWF projects.

1344. The potential disturbance from underwater noise during piling for bottlenose dolphin has been estimated for each individual OWF screened in for assessment, based on the potential disturbance area during single pile installation, based on the impact area of 0.1km^2 (JNCC *et al.,* 2020).

1345. The approach to the in-combination assessment for piling at OWFs is based on the potential for single piling at each wind farm at the same time as single piling at the Project. This approach allows for some of the OWFs not to be piling at the same time, while others could be simultaneously piling. This is considered to be the most realistic worst-case scenario, as it is highly unlikely that all other wind farms would be simultaneously piling at exactly the same time as piling at the Project.

1346. It is important to note the actual duration for active piling time which could disturb marine mammals is only a very small proportion of the potential construction period, of up to approximately 6.5 days for the Project, based on the estimated maximum duration to install individual piles.

1347. The potential for disturbance to bottlenose dolphin within the OCSW MU, due to all other OWFs that could be piling at the same time, has been assessed in **Table 7.24**. Up to 0.06% of the OCSW MU bottlenose dolphin population may be at risk of disturbance due to piling at the Project at the same time as piling at other OWFs.

1348. In practice, the potential temporary effects would be less than those predicted in this assessment as there is likely to be a great deal of variation in timing, duration, and hammer energies used throughout the various offshore windfarm project construction periods. In addition, not all individuals would be displaced over the entire potential disturbance range (0.1km) used within the assessments (**Table 7.69**).

1349. There is no overlap with the Cardigan Bay SAC for the potential for significant disturbance of bottlenose dolphin from in-combination underwater noise during OWF piling. Therefore, the potential for disturbance to bottlenose dolphin is not expected to be significant, meaning there is **no AEoI of the Cardigan Bay SAC in relation to the conservation objectives for bottlenose dolphin due to the disturbance of OWF piling (in-combination)**.

Table 7.69 Quantified In-Combination Assessment for the Potential Disturbance of Bottlenose dolphin During Single Piling at other OWFs that Could be Piling at the Same Time as the Project Within the OCSW MU

Project	**Bottlenose dolphin Density (/km^2) (based on the relevant SCANS-III block)**	**Area of Effect (km^2)**	**Maximum Number of Individuals Potentially Disturbed During Single Piling**
White Cross	0.0605	0.1	0.006
Dieppe - Le Treport	0.0585	0.1	0.006
Codling	0.0082	0.1	0.001
Dublin Array	0.0082	0.1	0.001
North Irish Sea Array	0.0082	0.1	0.001
South Irish Sea	0.0082	0.1	0.001
Awel y Môr OWF	0.0082	0.1	0.0008
Morecambe	0.0082	0.1	0.0008
Total number of bottlenose dolphin *(without the Project)*			**0.017** *0.011*
Percentage of OSCW MU *(without the Project)*			**0.0002%** *0.0001%*

7.2.4.5.1.2 Assessment of Underwater Noise from Construction Activities (Other than Piling) at Other OWFs

1350. All OWFs with construction dates that have the potential to overlap with the construction dates for the Project have the potential for other construction activities (such as seabed preparation, dredging, trenching, cable installation, rock placement, drilling and vessels) to occur at the same time as other construction activities at the Project.

1351. OWFs screened in for other construction activities that could have in-combination effects with other construction activities at the Project are (as presented in **Appendix 12.B Marine Mammals CEA Screening Report** of the Offshore ES):

- Arklow Bank Phase 2
- Erebus
- North Channel Wind 1
- North Channel Wind 2.

1352. The potential effect area during all seven OWF construction activities other than piling, based on the maximum effect range and area for the worst-case modelled for the Project of 0.002km^2 for TTS / fleeing response as a proxy for disturbance.

1353. For bottlenose dolphin, based on all OWFs with the potential for overlapping construction periods with the Project, there is the potential for disturbance in up to 0.002% of the IS MU (for the SAC population; or up to 0.00006% for the OCSW MU) (**Table 7.70**). Therefore, there would be **no AEoI of the Cardigan Bay SAC in relation to the conservation objectives for bottlenose dolphin, due to disturbance from the construction of other OWFs in-combination with piling at the Project**.

Table 7.70 Quantified In-Combination Assessment for the Potential Disturbance of Bottlenose Dolphin During the Construction at Other OWFs at the Same Time as Construction at the Project

Project	Area of Effect for Dolphin Species (km^2)	Bottlenose Dolphin In-Combination Assessment	
		Bottlenose Dolphin Density (/km^2)	Maximum Number of Individuals Potentially Disturbed During Other OWF Construction
White Cross (the Project)	0.10	0.0605	0.00605
Arklow Bank Phase II	0.002	0.0082	0.00002
Erebus	0.002	0.0605	0.0001
North Channel Wind 1	0.002	0.0082	0.00002

Project	**Area of Effect for Dolphin Species (km^2)**	**Bottlenose Dolphin In-Combination Assessment**	
		Bottlenose Dolphin Density (/km^2)	**Maximum Number of Individuals Potentially Disturbed During Other OWF Construction**
North Channel Wind 2	0.002	0.0082	0.00002
Total Number of Individuals *(Without the Project)*			**0.006** *0.0002*
Percentage of Reference Population *(Without the Project)*			**0.002% of the IS MU; 0.00006% of the OCSW MU** *0.00007% of the IS MU; 0.000002% of the OCSW MU*

7.2.4.5.1.3 Assessment of Underwater Noise from Other Industries and Activities

1354. During the construction period for the Project, the other potential noise sources that could also disturb marine mammals are:

- Geophysical surveys for OWFs
- Aggregate extraction and dredging
- Subsea cables and pipelines
- Coastal works
- Oil and gas seismic surveys
- UXO clearance.

1355. Further information on the CEA screening is provided in **Appendix 12.B Marine Mammals CEA Screening Report** of the Offshore ES.

1356. **Table 7.71** provides an in-combination assessment for all other industries and activities that may be undertaking works at the same time as the Project is undergoing construction. The first of these scenarios is based on only those projects that are currently within (or are expected to be within) the planning application process (i.e. those projects that are currently at Tier 5 or less).

1357. The assessment indicates that 0.0002% or less of the IS MU (for the SAC population) or 0.00006% of the OCSW MU could be temporarily displaced during noisy activities (other than OWF), based on the worst-case scenario (**Table 7.28**). The temporary disturbance of 5% or less of the population would not result in any significant population effects or result in any changes to the FCS of harbour porpoise (JNCC *et al*., 2010).

Table 7.71 Quantitative Assessment for Bottlenose dolphin for all Noisy Activities (other than OWF) Occurring at the same time as the Construction of the Project (cells in grey present the unrealistic scenario)

Project / Industry	**Bottlenose dolphin density ($/km^2$) (based on relevant SCANS-III blocks)[36]**	**Area of Effect (km^2)**	**Maximum Number of Individuals Potentially Disturbed During All Other Offshore Industries and Activities**
White Cross	0.06	0.1	0.006
Geophysical surveys	*0.01*	*61.20*	*1.14*
Aggregates and dredging	0.01	0.001	0.006
Cable and pipelines [X-Links 1 & 2]	0.06	0.0006	0.006
Coastal works [Hinkley Point C]	0.06	0.0003	0.006
Seismic surveys	*0.01*	*380.13*	*7.04*
UXO clearance [high-order]	*0.01*	*3.8*	*0.07*
UXO clearance [low-order]	*0.01*	*0.14*	*0.003*
Scenario 1 – Total for all projects that are currently (or expected to be) in the planning process (realistic worst-case scenario)			
Total number of bottlenose dolphin (without the Project)			**0.006** *0.0001*
Percentage of IS MU (or OCSW MU) (without the Project)			**0.0002% (0.00006%)** *0.00003% (0.000001%)*
Scenario 2 – Total for all projects and activities that may take place (unrealistic scenario)			
Total number of bottlenose dolphin (without the Project)			**8.2** *8.2*
Percentage of IS MU (or OCSW MU) (without the Project)			**2.81% (0.08%)** *2.81% (0.08%)*

1358. Therefore, under these circumstances, there would be **no AEoI of the Cardigan Bay SAC in relation to the conservation objectives for bottlenose dolphin, due to disturbance from all other industries and activities in-combination with the Project**.

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[36] Or density of bottlenose dolphin within the wider area for activities with unknown locations. Detail on the density estimates used in the in-combination assessment are provided within **Section 12.10.3** of **Chapter 12 Marine Mammal and Marine Turtle Ecology** of the Offshore ES.

7.2.4.5.1.4 Overall In-Combination Underwater Noise Effects for all Offshore Industries and Activities

1359. **Table 7.72** provides a summary of the in-combination assessment for all noisy activities, against the MUs, as assessed in **Sections 7.2.1.5.1.1**, **7.2.1.5.1.2** and **7.2.1.5.1.3** above. This is a highly precautionary assessment based on worst-case scenarios, at every stage precaution and conservatism has been built into the assessment process. Only those activities that are currently expected to take place at the same time as works at the Project have been included, to provide a realistic but still worst-case assessment.

Table 7.72 Quantified In-Combination Assessment for the Potential Disturbance of Bottlenose Dolphin During the Construction at Other OWFs at the Same Time as Construction at the Project

Project	Maximum Number of Individuals Potentially Disturbed During Other OWF Construction
White Cross (the Project)	0.006
Piling at other OWFs	0.011
Construction activities at other OWFs	0.0002
Aggregates and dredging	0.00002
Cable and pipelines [X-Links 1 & 2]	0.00004
Coastal works [Hinkley Point C]	0.00002
Total Number of Individuals *(Without* the Project*)*	**0.017** *0.01*
Percentage of Reference Population *(Without* the Project*)*	**0.006% of the IS MU; 0.0002% of the OCSW MU** *0.004% of the IS MU; 0.0001% of the OCSW MU*

1360. The overall in-combination assessment for disturbance due to underwater noise shows that there would be **no AEoI of the Cardigan Bay SAC in relation to the conservation objectives for bottlenose dolphin, due to disturbance from all other industries and activities in-combination with the Project**.

7.2.4.5.2 Increased Collision Risk

7.2.4.5.2.1 Increased Collision Risk Due to Vessels

1361. The in-combination effects from an increase in the number of vessels and vessel movements can pose a potential collision risk for bottlenose.

1362. As outlined in **Sections 7.2.4.2.6** and **7.2.4.3.5,** the increased collision risk due to project vessels, even using a very precautionary approach, would result in less than one individual (0.009 bottlenose dolphin) being at risk of vessel collision per year (**Table 7.66**) for construction phase related vessel collision risk. Less than one

(0.004) bottlenose dolphin per year (**Table 7.68**) would be at risk for operation and maintenance phase related vessel collision risk).

1363. As outlined in the **CEMP**, vessel movements, where possible, will be incorporated into recognised vessel routes and hence to areas where bottlenose dolphin are accustomed to vessels, in order to reduce any collision risk. All vessel movements will be kept to the minimum number that is required to reduce any potential for collision risk, and with a vessel speed limit of 10 knots. Additionally, vessel operators will use good practice to reduce any risk of collisions with bottlenose dolphin. It is expected that other offshore projects and industries would follow similar measures in order to reduce the potential for collision risk of bottlenose dolphin with vessels.

1364. Vessels associated with aggregate extraction and dredging are large and typically slow moving, using established transit routes to and from ports. Therefore, the potential increased collision risk with vessels is considered to be extremely low.

1365. In addition, based on the assumption that individuals would be disturbed as a result of underwater noise from piling, other construction activities, operational and maintenance activities and vessels, there should be no potential for increased collision risk with vessels.

1366. Therefore, there would be **no AEoI of the Cardigan Bay SAC in relation to the conservation objectives for bottlenose dolphin due an increase in collision risk with vessels**.

7.2.4.5.2.2 Increase in Collision Risk from Wave and Tidal Projects

1367. **Appendix 12.B Marine Mammals CEA Screening Report** of the Offshore ES screens for the potential for wave and tidal projects to be operational at the same time as the Project is undergoing construction, or through its operational phase. Three wave or tidal projects have the potential to be operational prior to the construction of the Project, and therefore have the potential for a cumulate effect during both the construction and operation and maintenance phases of the Project. None of those projects are within the Cardigan Bay SAC, however, all are within the wider MU.

1368. For those projects where sufficient information is known, an assessment for the potential for collision risk is provided below (**Table 7.73**). This is based on the assessments undertaken for each of those projects.

Table 7.73 Potential for In-Combination Collision Risk from Vessels at the Project and Wave and Tidal Projects

Project with the Potential for Collision Risk	Project Phase	Summary of Assessments for Collision Risk from the Project and Wave and Tidal Energy Projects for Bottlenose Dolphin
White Cross	Construction	0.009 at risk of collision
	Operation and Maintenance	0.004 at risk of collision
Morlais[37]	Operation	0.7 at risk of collision
Marine Energy Test Area (META)[38]	Operation	Negligible adverse
Perpetuus Tidal Energy Centre (PTEC)[39]	Operation	Minor adverse
Total number of bottlenose dolphin at risk during construction of the Project (% of reference population)		**0.71 (0.006%)**
Total number of bottlenose dolphin at risk during operation and maintenance of the Project (% of reference population)		**0.70 (0.006%)**

1369. The assessment shows that up to one (0.71) bottlenose dolphin may be at risk of collision in-combination with other projects[40] (**Table 7.46**). It should be noted there is no specific data for META and PTEC, although these projects have been assessed as minor adverse. The majority of the collision risk is from the Morlais project (n=0.7). With mitigation and management measures which would be applied to wave and tidal projects, the overall potential for effect would be further reduced. **Therefore, there would be no AEoI of the Cardigan Bay SAC in relation to**

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[37] ORML1938 MDZ_A31.15 MMC366 MOR-RHDHV-APP-0022 (02) Vol III_Chapter 12.2 Marine Mammals [https://publicregister.naturalresources.wales/Search/Download?RecordId=43392]

[38] ORML1957v2 ES Addendum [https://publicregister.naturalresources.wales/Search/Download?RecordId=90526] & Environmental Statement, Chapter 9 META Marine Mammals , Basking Shark and Otter [https://publicregister.naturalresources.wales/Search/Download?RecordId=22891]

[39] PTEC Environmental Statement, Chapter 13 Marine Mammals [https://marinelicensing.marinemanagement.org.uk/mmofox5/download/parcel/77kt1hpovnuijca2o9nud7dvr36968vtn8vagjn73b9sph5pncp6k40tjkdt5opt2m1l5rr12j0pabhj3fcke8q2n0ng833k403s/df1c3fedc48e332d16470aa88ca31626/Volume+II+ES+Chapters+1+to+16.zip?]

[40] Note that a quantitative assessment was not undertaken for META or PTEC

the conservation objectives for bottlenose dolphin due to in-combination collision risk.

7.2.4.5.3 Entanglement

1370. For the potential for entanglement, as discussed in **Section 1252** and **7.2.4.5.3**, bottlenose dolphin are not expected to be at risk of entanglement with the dynamic cables and mooring lines associated with the Offshore Windfarm Project, due to either direct or secondary entanglement. The operation of the Project is not expected to cause any risk of entanglement in fishing gear, as it is likely that the presence of the wind farm infrastructure would provide individuals greater opportunity to detect (and avoid) any fishing gear that may be present in the area and caught on the cables associated with the Project.

1371. While there is the potential for a number of other floating OWFs to be developed in the Celtic and Irish Seas, it is expected that these projects would also not pose a risk of entanglement to bottlenose dolphin, in line with the reasons outlined above for the Project. In addition, it is expected that all floating wind farms and other marine renewable projects (such as wave and tidal projects) will be required to undertake monitoring to ensure that no fishing gear is caught on the infrastructure, and all Projects would need to undertake such monitoring for infrastructure integrity purposes as well as for management of entanglements, and therefore the risk for any bottlenose dolphin entanglement to occur is very low.

1372. Therefore, it is not expected that would be any potential for an in-combination entanglement risk, and there would be **no AEoI of the Cardigan Bay SAC in relation to the conservation objectives for bottlenose dolphin due to in-combination entanglement risk**.

7.2.4.5.4 Changes to Prey Availability

1373. Potential effects on prey species can result from increased SSCs and sediment re-deposition and underwater noise (leading to mortality, physical injury, auditory injury or behavioural responses); the potential effects on fish species during operation and maintenance can include physical disturbance and loss or changes to sea bed habitat, introduction of hard substrate, operational noise, and EMF. During decommissioning, potential effects on fish species can include physical disturbance, loss or changes to habitat, increased SSCs, re-mobilisation of contaminated sediments and underwater noise. Some of the effects could be adverse with fish species moving away or being lost from an area, while some effects could have an adverse or beneficial effect, such as possible changes in species composition, and other effects could result in a beneficial effect, such as the aggregation of prey around seabed structures.

1374. The potential effects on bottlenose dolphin as a result of any changes to prey availability can include changes in distribution, abundance and community structure, increased competition with other marine mammal species, increased susceptibility to disease and contaminants, and implications for reproductive success, which could potentially affect individuals throughout their range or at different times of the year. However, any changes to prey tend to be localised and temporary in nature. In addition, if prey species are disturbed from an area, it is highly likely that bottlenose dolphin will also be disturbed from the area over a potentially wider range than prey species.

1375. The in-combination assessment on potential changes to prey availability has assumed that any potential effects on bottlenose dolphin prey species from underwater noise, including piling, would be the same or less than those for bottlenose dolphin. Therefore, there would be no additional effects other than those assessed for bottlenose dolphin, i.e. if prey are disturbed from an area as a result of underwater noise, bottlenose dolphin will be disturbed from the same or greater area, therefore any changes to prey availability would not affect bottlenose dolphin as they would already be disturbed from the same area.

1376. Any effects on prey species are likely to be intermittent, temporary and highly localised, with potential for recovery following cessation of the disturbance activity. Any permanent loss or changes of prey habitat will typically represent a small percentage of the potential habitat in the surrounding area. Therefore, there would be **no adverse effect on the integrity of the Cardigan Bay SAC in relation to the conservation objectives for bottlenose dolphin arising due to changes in prey availability**.

7.2.4.6 Summary of Potential Effects on Site Integrity

1377. The assessment of the potential effects has been summarised in relation to the Cardigan Bay SAC conservation objectives for bottlenose dolphin (**Table 7.74**).

1378. There would be **no AEoI of the Cardigan Bay SAC in relation to the conservation objectives for bottlenose dolphin due to any potential effects mentioned in Sections 7.2.4.2 and 7.2.4.3 either alone or in-combination with other plans and projects**.

Table 7.74 Summary of the potential effects, including in-combination effects on the Cardigan Bay SAC in relation to the conservation objectives for bottlenose dolphin × = no potential for AEoI; ✓ = potential for AEoI)

Conservation Objectives	The Project effects							In-combination Effects			
	Auditory Injury and disturbance from underwater noise	**Barrier effects**	**Entanglement**	**Vessel interaction**	**Changes to water quality**	**EMFs**	**Changes to prey resources**	**Disturbance from underwater noise**	**Entanglement**	**Vessel interaction**	**Changes to prey resources**
Population of the species (including range of genetic types where relevant) as a viable component of the site	×		×	×	×	×	×	×			
Distribution of the species within site	×		×	×	×	×	×	×			
Distribution and extent of habitats supporting the species	×		×	×	×	×	×	×			
Structure, function and supporting processes of habitats supporting the species	×		×	×	×	×	×	×			
No significant disturbance of the species	×		×	×	×	×	×	×			

× = no potential for any AEoI of the site in relation to the conservation objectives

7.2.5 Other Designated Sites for Marine Mammals

7.2.5.1 West Wales Marine / The Gorllewin Cymru Forol SAC

1379. The West Wales Marine / The Gorllewin Cymru Forol SAC sites summer area covers an area of 7,377km^2 extending southwards from the western end of the Llyn Peninsula across Cardigan Bay to Pembrokeshire, with 76.7% Welsh inshore waters and 23.3% offshore waters. The water depths within the site range between the MLWT level and 100m, with the majority of the site being 40-50m in depth. The site contains a mixture of hard substrate and sediments, including rock, coarse sediment, sand and mud (EUSeaMap) (JNCC and NRW, 2017a).

1380. The West Wales Marine / The Gorllewin Cymru Forol SAC has been recognised as an area within the top 10% predicted persistent high densities of harbour porpoise. The area included within the site covers important summer habitat for porpoises, while a part of this site in Cardigan Bay was also identified as important during winter (JNCC *et al.*, 2019a).

1381. The qualifying feature of the site is the Habitats Directive Annex II species the harbour porpoise. The West Wales Marine / The Gorllewin Cymru Forol SAC has been designated because of its importance to harbour porpoises in the summer and winter months (JNCC *et al.*, 2019a).

1382. The Conservation Objectives for harbour porpoise at the West Wales Marine / The Gorllewin Cymru Forol SAC (JNCC and NRW, 2017a) are the same as those for the Bristol Channel Approaches SAC (**Section 7.2.1.1.4**) and to ensure that the integrity of the site is maintained and that it makes the best possible contribution to maintaining FCS for Harbour porpoise in UK waters in the context of natural change, this will be achieved by ensuring that:

- Harbour porpoise is a viable component of the site
- There is no significant disturbance of the species
- The condition of supporting habitats and processes, and the availability of prey is maintained.

1383. The current conservation status of the harbour porpoise, as assessed in the 3rd UK report on implementation of the Habitats Directive (submitted to the European Commission in 2019), is 'Unknown' (JNCC *et al.*, 2019a).

1384. The Offshore Windfarm Site is located 38km from the West Wales Marine / The Gorllewin Cymru Forol SAC (**Figure 7.1**). Therefore, there is no direct effect within the SAC area. However, there is the potential to affect harbour porpoise from the

West Wales Marine / The Gorllewin Cymru Forol SAC if they are foraging or moving through the Offshore Windfarm Site.

1385. As outlined in **Section 7.2.1**, harbour porpoise in UK waters are considered part of a wider European population and the highly mobile nature of this species means that the concept of a 'site population' is not considered an appropriate basis for expressing Conservation Objectives for this species. Therefore, the reference population for assessments is the MU population in which the SAC is situated (JNCC *et al.*, 2019a).

1386. The potential effects of the proposed project have been assessed for the CIS MU reference population for harbour porpoise (**Section 7.2.1.2** to **7.2.1.4**). This follows the current advice which states that, the reference population for assessments against Conservation Objectives is the MU population in which the SAC is situated (JNCC *et al.*, 2019a).

1387. As the Project is not located in the West Wales Marine / The Gorllewin Cymru Forol SAC, there is no potential disturbance effects in relation to the area of the SAC.

7.2.5.1.1 Assessment of Potential Effects

7.2.5.1.1.1 Assessment for the Project Alone

1388. It is estimated (based on the SCANS-II survey which took place in July 2005) that the site supports approximately 5,222 individuals (95% Confidence Interval: 1,419 – 4,484) for at least part of the year, as seasonal differences are likely to occur. This represents approximately 5.4% of the population within the UK part of the CIS MU.

1389. The assessment of the potential effects of the Project for the Bristol Channel Approaches SAC (**Section 7.2.1**) in relation to the CIS MU are the same for the potential effects on the West Wales Marine / The Gorllewin Cymru Forol SAC, as they are both located in the same MU for harbour porpoise.

1390. An assessment on the Bristol Channel Approaches SAC is considered the worst-case for harbour porpoise of the CIS MU, and therefore the potential effects would be higher than for other sites within that same MU but further away (such as the West Wales Marine / The Gorllewin Cymru Forol SAC).

1391. Therefore, there would be **no AEoI of the West Wales Marine / The Gorllewin Cymru Forol SAC in relation to the Conservation Objectives for harbour porpoise (i.e. the integrity of the site is maintained and that it makes the best possible contribution to maintaining FCS for harbour porpoise in UK waters)**.

7.2.5.1.1.2 Assessment for the Project In-Combination

1392. The assessment of the potential in-combination effects for the Bristol Channel Approaches SAC (**Section 7.2.1.5**) in relation to the CIS MU are the same for the potential effects on the West Wales Marine / The Gorllewin Cymru Forol SAC, as they are both located in the same MU for harbour porpoise.

1393. Therefore, there would be **no AEoI of the West Wales Marine / The Gorllewin Cymru Forol SAC in relation to the Conservation Objectives for harbour porpoise (i.e. the integrity of the site is maintained and that it makes the best possible contribution to maintaining FCS for harbour porpoise in UK waters)**.

7.2.5.2 North Anglesey Marine / Gogledd Môn Forol SAC

1394. The North Anglesey Marine / Gogledd Môn Forol SAC site covers an area of 3,249km^2, reaching north-west from Anglesey into the Irish Sea. It sits at the northern end of St George's Channel, extending approximately half-way across to the Republic of Ireland, skirting the national waters of the Isle of Man. The water depths within the site range between the Mean Low Water Tide (MLWT) level and 100m. Away from coastal areas, the depths largely fall within the range of between 40m and 50m. The site contains a mixture of hard substrate and sediments, including rock, coarse sediment, and mud (Joint Nature Conservation Committee (JNCC) and Natural Resources Wales (NRW), 2016a, 2017b).

1395. The North Anglesey Marine / Gogledd Môn Forol SAC has been recognised as an area with predicted persistent high densities of harbour porpoise. The area included within the site covers important summer habitat for porpoises, which was identified as part of the top 10% persistent high-density areas for the summer seasons within the UK (JNCC and NRW, 2016a, 2017b).

1396. The qualifying feature of the site is the Habitats Directive Annex II species the harbour porpoise. North Anglesey Marine / Gogledd Môn Forol SAC has been designated because of its importance to harbour porpoises in the summer months (April to September) (JNCC *et al.,* 2019a). The Project is located 235km away from the North Anglesey Marine / Gogledd Môn Forol SAC.

1397. The Conservation Objectives for harbour porpoise at the North Anglesey Marine / Gogledd Môn Forol SAC (JNCC *et al*., 2019a) are the same as those for the Bristol Channel Approaches SAC (**Section 7.2.1.1.4**).

1398. To ensure that the integrity of the site is maintained and that it makes the best possible contribution to maintaining Favourable Conservation Status (FCS) for Harbour Porpoise in UK waters in the context of natural change, this will be achieved by ensuring that:

- Harbour porpoise is a viable component of the site
- There is no significant disturbance of the species
- The condition of supporting habitats and processes, and the availability of prey is maintained.

1399. Harbour porpoise within the eastern North Atlantic are generally considered to be part of a continuous biological population that extends from the French coastline of the Bay of Biscay to northern Norway and Iceland (Tolley and Rosel, 2006; Fontaine *et al.*, 2007, 2014; IAMMWG, 2015). However, for conservation and management purposes, it is necessary to consider this population as smaller MUs.

1400. The North Anglesey Marine / Gogledd Môn Forol SAC is located in the CIS MU and has been selected primarily based on the long-term, relatively higher densities of porpoise in contrast to other areas of the CIS MU. The implication is that the SAC provides relatively good foraging habitat and may also be used for breeding and calving.

1401. As outlined in **Section 7.2.1.1.2.1** harbour porpoise in UK waters are considered part of a wider European population and the highly mobile nature of this species means that the concept of a 'site population' is not considered an appropriate basis for expressing Conservation Objectives for this species. Therefore, the reference population for assessments is the CIS MU population in which the SAC is situated (JNCC *et al.*, 2019a).

1402. As the Project is not located in the North Anglesey Marine / Gogledd Môn Forol SAC, there is no potential disturbance effects in relation to the area of the SAC.

1403. The current conservation status of the harbour porpoise, as assessed in the 3rd UK report on implementation of the Habitats Directive (submitted to the European Commission in 2019), is 'Unknown' (JNCC *et al.*, 2019a).

7.2.5.2.1 Assessment of Potential Effects

7.2.5.2.1.1 Assessment for the Project Alone

1404. It is estimated that the site supports approximately 1,088 harbour porpoise and represents approximately 2.4% of the population within the UK part of the CIS MU (NRW and JNCC, 2017).

1405. The assessment of the potential effects of the project alone for the Bristol Channel Approaches SAC (**Section 7.2.1.2**) in relation to the CIS MU are the same for the potential effects on the North Anglesey Marine / Gogledd Môn Forol SAC, as they are both located in the same MU for harbour porpoise.

1406. An assessment on the Bristol Channel Approaches SAC is considered the worst-case for harbour porpoise of the CIS MU, and therefore the potential effects would be higher than for other sites within that same MU but further away (such as the North Anglesey Marine / Gogledd Môn Forol SAC).

1407. Therefore, there would be **no AEoI of the North Anglesey Marine / Gogledd Môn Forol SAC in relation to the Conservation Objectives for harbour porpoise (i.e. the integrity of the site is maintained and that it makes the best possible contribution to maintaining FCS for harbour porpoise in UK waters)**.

7.2.5.2.1.2 Assessment for the Project In-Combination

1408. The assessment of the potential in-combination effects for the Bristol Channel Approaches SAC (**Section 7.2.1.5**) in relation to the CIS MU are the same for the potential effects on the North Anglesey Marine / Gogledd Môn Forol SAC, as they are both located in the same MU for harbour porpoise.

1409. Therefore, there would be **no AEoI of the North Anglesey Marine / Gogledd Môn Forol SAC in relation to the Conservation Objectives for harbour porpoise (i.e. the integrity of the site is maintained and that it makes the best possible contribution to maintaining FCS for harbour porpoise in UK waters)**.

7.2.5.3 North Channel SAC

1410. The North Channel SAC site covers an area of 1,604km^2, extending from the north-east coast of Northern Ireland from Island Magee to Cloughey towards the Isle of Man. The water depths within the site range between the Mean Low Water Tide (MLWT) level to 150m in the north and eastern parts of the site. Shallower areas occur near the coast with depths mostly between 10 and 40m. Beyond these shallower areas close to the coast, the water depth ranges between 50 and 130m. The site contains a mixture of coarse sediments and sand near the Irish coastline, with increasing amounts of moderate and high energy circalittoral rock in more offshore waters, with an area of mud towards the south-west of the site (Department of Agriculture, Environment and Rural Affairs (DAERA) and JNCC, 2017).

1411. The North Channel SAC has been recognised as an area within the top 10% predicted persistent high densities of harbour porpoise during the winter season (DAERA and JNCC, 2017).

1412. The qualifying feature of the site is the Habitats Directive Annex II species the harbour porpoise. The North Channel SAC has been designated because of its importance to harbour porpoises in the winter months (October to March) (DAERA and JNCC, 2017).

1413. The Conservation Objectives for harbour porpoise at the North Channel SAC (DAERA and JNCC, 2019) are the same as those for the Bristol Channel Approaches SAC (**Section 7.2.1.1.4**).

1414. To ensure that the integrity of the site is maintained and that it makes the best possible contribution to maintaining Favourable Conservation Status (FCS) for Harbour Porpoise in UK waters in the context of natural change, this will be achieved by ensuring that:

- Harbour porpoise is a viable component of the site
- There is no significant disturbance of the species
- The condition of supporting habitats and processes, and the availability of prey is maintained.

1415. The Project is located 98km from the North Channel SAC. Therefore, there is no direct effect within the SAC area. However, there is the potential to affect harbour porpoise from the North Channel SAC if they are foraging or moving through the Offshore Windfarm Site.

1416. As outlined in **Section 7.2.1.1.2.1**, harbour porpoise in UK waters are considered part of a wider European population and the highly mobile nature of this species means that the concept of a 'site population' is not considered an appropriate basis for expressing Conservation Objectives for this species. Therefore, the reference population for assessments is the CIS MU population in which the SAC is situated (DAERA and JNCC, 2019).

1417. As the Project is not located in the North Channel SAC, there is no potential disturbance effects in relation to the area of the SAC.

1418. The current conservation status of the harbour porpoise, as assessed in the 3rd UK report on implementation of the Habitats Directive (submitted to the European Commission in 2019), is 'Unknown' (JNCC *et al.*, 2019a).

7.2.5.3.1 Assessment of Potential Effects

7.2.5.3.1.1 Assessment for the Project Alone

1419. The assessment of the potential effects of the project alone for the Bristol Channel Approaches SAC (**Section 7.2.1.2**) in relation to the CIS MU are the same for the potential effects on the North Channel SAC, as they are both located in the same MU for harbour porpoise.

1420. An assessment on the Bristol Channel Approaches SAC is considered the worst-case for harbour porpoise of the CIS MU, and therefore the potential effects would be higher than for other sites within that same MU but further away (such as the North Channel SAC).

1421. Therefore, there would be **no AEoI of the North Channel SAC in relation to the Conservation Objectives for harbour porpoise (i.e. the integrity of the site is maintained and that it makes the best possible contribution to maintaining FCS for harbour porpoise in UK waters)**.

7.2.5.3.1.2 Assessment for the Project In-Combination

1422. The assessment of the potential in-combination effects for the Bristol Channel Approaches SAC (**Section 7.2.1.5**) in relation to the CIS MU are the same for the potential effects on the North Channel SAC, as they are both located in the same MU for harbour porpoise.

1423. Therefore, there would be **no AEoI of the North Channel SAC in relation to the Conservation Objectives for harbour porpoise (i.e. the integrity of the site is maintained and that it makes the best possible contribution to maintaining FCS for harbour porpoise in UK waters)**.

7.2.5.4 Saltee Islands SAC

1424. The Saltee Islands SAC is located on the south-east coast of the Republic of Ireland and the site covers an area of approximately 158km^2, comprising of the Saltee Islands and the surrounding marine areas. There are two main islands (Great and Little Saltee) and a number of small islets and rocky outcrops approximately 4- 5km off the Irish coastlines (NPWS, 2011).

1425. Annex I habitats listed as primary reasons for designation are tidal mud and sand flats, large shallow inlets and bays, reefs, vegetated sea cliffs and sea caves, as well as the Annex II species grey seal (NPWS, 2011).

1426. Great Saltee Island has a breeding colony of grey seal, estimated at 571-744 in 2005, and 246 in 2007 (estimated from a one-off moult count) (NPWS, 2011).

1427. The Conservation Objectives for grey seal at the Saltee Islands SAC (NPWS, 2011) are the same as those for the Lambay Island SAC (NPWS, 2013) to maintain the favourable conservation condition of grey seal in Saltee Islands SAC, which is defined by the following list of attributes and targets:

- Access to suitable habitat: species range within the site should not be restricted by artificial barriers to site use
- Breeding behaviour: The breeding sites should be maintained in a natural condition
- Moulting behaviour: The moult haul-out sites should be maintained in a natural condition
- Resting behaviour: The resting haul-out sites should be maintained in a natural condition
- Disturbance: human activities should occur at levels that do not adversely affect the grey seal population at the site.

1428. The Project is located 126km from the Saltee Islands SAC. Therefore, there is no direct effect within the SAC area. However, there is the potential to affect grey seal from the Saltee Islands SAC if they are foraging or moving through the Project.

1429. The Saltee Islands SAC is not located in the South and West England and the Wales MU, however, it is within the combined MU, and therefore the assessments as undertaken for both the Lundy Island SAC and the Pembrokeshire Marine SAC provide an assessment against the relevant wider population for grey seal associated with the Saltee Islands SAC.

7.2.5.4.1 Assessment of Potential Effects

1430. The assessment of the potential effects of the Project for the Lundy Island SAC (**Section 7.2.2.2.1**) or the Pembrokeshire Marine SAC (**Section 7.2.3**) are the same for the potential effects on the Saltee Islands SAC.

1431. Therefore, there would be **no AEoI of the Saltee Islands SAC in relation to the Conservation Objectives for grey seal**.

7.2.5.5 Other Marine Designated Sites for Harbour Porpoise

1432. Other European Designated Sites (SACs) in the CIS MU where harbour porpoise is a qualifying feature are all located within 448km from the Project and therefore were screened in for any potential connectivity and realistic pathway for a potential effect (**Section 5.2**). These sites are:

- Nord Bretagne DH (164km)
- Mers Celtiques -Talus du golfe de Gascogne (219km)

- Côte de Granit Rose-Sept-Iles SAC (220km)
- Tregor Goëlo SAC (228km)
- Rockabill to Dalkey Island SAC (231km)
- Baie de Morlaix (243km)
- Abers -Côte des legends (260km)
- Roaringwater Bay and Islands SAC (279km)
- Quessant-Molène (280km)
- Chaussée de Sein (336km)
- Blasket Islands SAC (361km).

1433. The assessment of the potential effects of the Project for the West Wales Marine / The Gorllewin Cymru Forol SAC (**Section 7.2.5.1**) in relation to the CIS MU are the same for the potential effects on these sites, as they are all located in the same MU for harbour porpoise.

1434. Therefore, there would be **no AEoI of the other European Designated Sites in relation to the Conservation Objectives for harbour porpoise (i.e. to maintain the favourable conservation status of harbour porpoise) for the Project alone or in-combination with other projects in CIS MU**.

7.2.5.6 Other European Designated Sites for Bottlenose Dolphin

1435. Other European Designated Sites (SACs) in the OCSW MU where bottlenose dolphin is a qualifying feature are all located less than 400km from the Project and therefore are screened in for any potential connectivity and realistic pathway for a potential effect. These sites are:

- Norde Bretagne DH (164km)
- Récifs et landes de la Hague (217km)
- Mers Celtiques -Talus du golfe de Gascogne (219km)
- Côte de Granit rose-Sept-Iles (220km)
- Anse de Vauville (222km)
- Tregor Goëlo (228km)
- Banc et récifs de Surtainville (237km)
- Récifs et marais arrière-littoraux du Cap Lévi à la Pointe de Saire (244km)
- Abers -Côte des legends (260km)
- Baie de Seine occidentale (270km)
- Quessant-Molène (280km)
- Chausey (282km)
- Côte de Cancale à Paramé (307km)
- Baie du Mont Saint-Michel (310km).

1436. The assessment of the potential effects of the Project for Cardigan Bay SAC (**Section 7.2.4.2**) in relation to the OCSW MU for bottlenose dolphin are the same for the potential effects on these sites, as they are all located in the same OCSW MU.

1437. Therefore, there would be **no AEoI of the other European Designated Sites in relation to the Conservation Objectives for bottlenose dolphin (i.e. to maintain the favourable conservation status of bottlenose dolphin) for the Project alone or in-combination with other projects in OCSW MU**.

7.2.5.7 Other European Designated Sites for Grey Seal

1438. Other European Designated Sites (SACs) in the SW MU where grey seal are a qualifying feature are all located less than 450km from the Project and therefore are screened in for any potential connectivity and realistic pathway for a potential effect. These sites are:

- Saltee Islands SAC (123km)
- Récifs et landes de la Hague (217km)
- Côte de Granit rose-Sept-Iles (220km)
- Anse de Vauville (222km)
- Tregor Goëlo (228km)
- Banc et récifs de Surtainville (237km)
- Baie de Morlaix (243km)
- Lambay Island SAC (257km)
- Abers -Côte des legends (260km)
- Roaringwater Bay and Islands SAC (279km)
- Quessant-Molène (280km)
- Chausey (282km)
- Côte de Cancale à Paramé (307km)
- Blasket Islands SAC (308km)
- Baie du Mont Saint-Michel (310km)
- Chaussée de Sein (336km)
- Blasket Islands SAC (361km).

1439. The assessment of the potential effects of the Project for the Lundy Island SAC (**Section 7.2.2.2.1**) in relation to the SW MU for grey seal are the same for the potential effects on these sites, as they are all located in the same SW MU for grey seal.

1440. Therefore, there would be **<u>no AEoI of the other European Designated Sites in relation to the Conservation Objectives for grey seal (i.e. to maintain the favourable conservation status of grey seal) for the Project alone or in-combination with other projects in SW and Wales MU</u>**.

8. Appropriate Assessment: Annex II Species - Ornithology

1441. This section provides information to determine whether the potential impacts of the Project will have an adverse effect on offshore ornithology qualifying features of designated sites (in this case SPAs or Ramsar Sites) screened into the Appropriate Assessment or compromise each site's conservation objectives and / or site integrity (**Table 5.4**).

1442. A summary of the Project design envelope is provided in **Section 3**, outlining the worst-case scenario and embedded mitigation for the offshore ornithology assessment.

1443. For each designated site screened into the Appropriate Assessment a site description is provided. Depending on the information available, this may include information taken from the citation for the site, its conservation objectives, supplementary advice on the conservation objectives, conservation advice, site condition monitoring or other baseline offshore ornithology resources.

1444. For each qualifying feature screened into the Appropriate Assessment, the following information is provided:

- The condition of the designated population, including any relevant data on population trends
- A summary of the ecology of the species as relevant to the assessment, and a review of the key evidence in support of functional linkage between the Project and the population
- An assessment of the potential effects of the Project on the qualifying feature
- An assessment of effects when considering the Project in-combination with other relevant projects.

1445. In order to reduce repetition of assessments, consideration of qualitative assessments are provided below for all designated sites and qualifying features screened in for assessment combined for all project phases, where considered appropriate. This includes consideration of entanglement with mooring lines, indirect impacts through effects on habitats and prey species and migratory collision risk. Similarly, for more distant sites, where the level of connectivity can be considered relatively weak, assessments have been presented for all relevant designated sites together for each receptor.

8.1 Updates since Application

1446. Since the original application on 13th March 2023, the Project have compiled the following supplementary information to further support and justify the conclusion made within the RIAA:

- In line with the request from Natural England to consider the potential impact of the Project upon migratory birds, the Applicant has also undertaken modelling of migratory CRM. Results of this modelling are presented in **Appendix 13.B: Migratory Birds Report**. A summarisation of the conclusions drawn from the additional modelling are provided within **Section 8.29**.
- The Applicant has undertaken revised collision risk modelling (CRM) using the updated recommended input parameters presented within Natural England's interim guidance on collision risk modelling avoidance rates (Natural England, 2023). The results of this updated CRM are presented within **Chapter 13 Offshore Ornithology Appendix 13.C: Revised Collision Risk Modelling** and includes summarisation of any implications the revised modelling has on the conclusions made within the RIAA.

8.2 Disturbance and Displacement

8.2.1 Overview

1447. The presence of WTGs has the potential to directly disturb and displace seabirds that would normally reside within and around the area of sea where the Project is proposed to be developed. This potentially reduces the area available to those seabirds to forage, loaf and/ or moult that currently occur within and around the Project area and may be susceptible to displacement from such a development. Displacement may contribute to individual birds experiencing fitness consequences, which at an extreme level could lead to the mortality of individuals.

1448. Seabird species vary in their response to the presence of operational infrastructure associated with OWFs, such as WTGs and shipping activity related to maintenance activities. OWFs are a new feature in the marine environment and as a result there is limited evidence as to the effects of disturbance and displacement by operational infrastructure in the long-term.

1449. Garthe and Hüppop (2004) developed a scoring system for such disturbance factors, which has been widely applied in OWF EIAs. Furness and Wade (2012) developed a similar system with disturbance ratings for particular species that was applied alongside scores for habitat flexibility and conservation importance to define an index value that highlights the sensitivity of each species to disturbance and displacement. Bradbury *et al.*, (2014) provided an update to the Furness and Wade (2012) paper to consider seabirds in English waters.

1450. Natural England and JNCC issued a Joint Interim Displacement Advice Note (Natural England and JNCC 2012), which provided recommendations for presenting information to enable the assessment of displacement effects in relation to OWF developments. This has been superseded more recently by a joint SNCB interim displacement advice note initially issued in 2017 and updated again in 2022 (SNCBs, 2022), which provides the latest advice for UK development applications on how to consider, assess and present information and potential consequences of seabird displacement from OWFs. These guidance notes, as recommended in Natural England's best practice guidance note (Parker *et al.*, 2022), have been used to infer the SNCB's assumed preferred approach to assessment provided below, in the absence of rates being recommended through stakeholder engagement.

1451. Some species are more susceptible than others to disturbance from OWF operation, which may lead to subsequent displacement. Dierschke *et al.*, (2016) noted both displacement and avoidance to varying degrees by some seabird species while others were attracted to OWFs. As presented within **Table 5.4**, a total of four species (guillemot, razorbill, Manx shearwater and gannet) were concluded as requiring quantitative assessments of disturbance and displacement from the Project.

1452. For each of the four species a review was undertaken of evidence from the literature on potential disturbance levels and displacement effects from OWFs and rates applied in assessments of displacement effects by other OWFs. These reviews have been used to inform the Applicant's approach. The main focus of assessments is based on this Applicant's approach, which is considered to represent a realistic, yet precautionary, assessment based on SNCBs guidance and additional evidence presented within this section. However, the standard SNCB's maximum displacement mortality rate of 10% is also provided for each assessment.

8.2.1.1 Auk species displacement rate evidence base

1453. Auk species (guillemot and razorbill in this instance) show a medium level of sensitivity to ship and helicopter traffic (Garthe and Hüppop, 2004; Furness and Wade, 2012; Langston, 2010; Bradbury *et al*., 2014). Dierschke *et al*. (2016). summarised evidence of auk displacement obtained from studies of thirteen different European OWF sites that compared changes in seabird abundance between baseline and post-construction. The review concluded that the mean outcome across all OWFs for auks was 'weak displacement' but highly variable. Since the publication of this review, there have been a number of additional OWF sites which have reported displacement effects on auks (APEM 2017; Webb *et al*. 2017; Vanermen *et al*. 2019; Peschko *et al*. 2020; MacArthur Green 2021). Furthermore, previously published datasets from two OWF sites have recently been re-analysed utilising a novel modelling approach, which has resulted in different displacement effects being concluded for both OWFs(R-INLA; Zuur 2018; Leopold *et al*. 2018).

1454. Since the Dierschke *et al*. (2016) review, a further study has been published using data from OWFs in the German North Sea indicating guillemot displacement rates are reduced during the breeding season compared to the non-breeding season by ~20% (Peschko *et al*, 2020). This is an important consideration as the mean displacement rates derived from the Dierschke *et al*. (2016) review were predominantly from data collected in the non-breeding season. Therefore, by applying a single displacement rate of 50% across all seasons within the Windfarm Site and out to a 2km buffer would ensure a precautionary rate is used for the assessment of displacement.

1455. Hornsea Four OWF (Orsted, 2021) has recently submitted a summary review of all current post consent-monitoring studies undertaken to date within the North Sea and UK Western Waters. This review was completed by APEM (APEM, 2022), and provides an extensive study and analysis of empirical data from multiple OWFs. The conclusion from this literature review suggested that a displacement rate of up to 50% for the Windfarm Site and 2km buffer would be the most applicable, whilst still being suitably precautionary for assessment.

1456. Furthermore, evidence that an auk displacement rate of 50% is precautionary comes from studies that indicate auk habituation to OWFs. This was demonstrated at Thanet OWF, where auk displacement was shown to be statistically significant, but only in the short term, with abundances increasing within the wind farm from year two post-construction suggesting some level of habituation after one year of operation. Indeed, year two and three displacement rates for auks fell from a range of 75% to 85% in the first year of operation to a low of 31% to 41% within year two and three of operations (Royal Haskoning, 2013). There is also further emerging evidence as additional post-construction monitoring of OWFs continues, with reports of auk numbers increasing and observations of foraging behaviour within the wind farm itself (Leopold & Verdaat 2018). This suggests that in some cases at least, displacement rates could diminish over the operational life of OWFs.

1457. Therefore, in conclusion, there is strong evidence to support an auk displacement rate of up to 50% within OWF sites and out to a 2km buffer, though it is likely that this level will actually overestimate displacement at many sites, so is still considered precautionary.

8.2.1.2 Effects of displacement on auk mortality

1458. Current evidence suggests that the response of seabirds to OWFs varies depending on the species and of life stage of the individual birds. The levels both spatially and temporally to which birds avoid OWFs are likely to be based on key factors such as competition levels within the wider area and relative prey abundance within the OWF versus the surrounding region. The consequence of such avoidance may result in a reduction in foraging areas available to individuals. The extent of any consequent mortalities are likely to correlate strongly with the quality of the area within the OWF that some individuals are displaced from, but conversely displacement of some individuals from the OWF may increase foraging efficiency for those still entering the OWF area. If the OWF area is considered to be a key foraging area and the area outside the OWF is close to carrying capacity, then higher mortality rates may occur (Busche and Garthe 2016; SNCBs, 2017). Conversely, if birds are being displaced into an area of optimal habitat and closer to breeding colonies, then this could result in a positive impact due to species having a reduction in energy expenditure foraging (Searle *et al.*, 2020).

1459. For auk species, SNCBs current guidance is to present and consider assessing displacement impacts using a mortality rate of up to 10% based on expert opinion, due to the lack of empirical evidence and to allow for precaution in assessments (SNCBs, 2017). As presented by Hornsea Four OWF (Orsted, 2021), since the initial interim guidance on displacement was published there have been two detailed modelling studies with updates to predict consequence of displaced seabirds, including auks, from OWFs (Searle *et al*. 2014 and 2018, and van Kooten *et al*. 2019), as well as anecdotal evidence of implied low additional mortality rates from auk colony stability on Helgoland, where OWFs have been in operation since 2014 and auk displacement rates have been reported to be between 44-63% (Peschko *et al*. 2020).

1460. Van Kooten *et al*. (2019) determined the cost of birds avoiding areas based on energy-budget models for two scenarios; using habitat utilization maps and a fixed 10% mortality rate. The results demonstrated that an additional 1% mortality for displaced auks is a more appropriate evidenced-based rate, in comparison to the overly precautionary 10% mortality rate.

1461. Searle *et al*. (2014; 2018) assessed the effects displacement and barrier effects on breeding seabirds. The study was based on time and energy budget models being created to estimate the displacement effects on the breeding population of seabirds, including auks during the chick rearing period. The models provided evidence that displacement has the potential to impact on future survival prospects of an auk due to changes in time and energy budgets. The simulations concluded however, that during the breeding and non-breeding season displacement effects are unlikely to exceed an increase in mortality of 0.5%.

1462. Further anecdotal evidence of low mortality rates as a consequence of displacement comes from the post monitoring of the Helgoland auk colony in the German North Sea. OWFs have been in operation in the area since 2014 and the displacement rate of auks is predicted to be between 44 - 63% (Peschko *et al*. 2020). The OWFs have therefore been in operation long enough for any correlations between colony demographics and operation of the OWF to be identified. The latest breeding population status on Helgoland shows a continued increase for both razorbill and guillemot over the latest five-year period, with rate of population increase unchanged compared to long-term data (Gerlach *et al*. 2019), inferring that high mortality rates due to displacement are not occurring at the colony.

1463. The detailed findings from the APEM study (APEM, 2022) into auk displacement mortality rates provide an extensive study and analysis to further inform the assessment process. Therefore, based on these studies the Applicant considers a mortality rate of 1% to be sufficiently precautionary for assessment of consequential displacement mortality for auks.

8.2.1.3 Manx shearwater

1464. Most previous studies have not identified Manx shearwater as being sensitive to disturbance. Dierschke *et al.* (2016) classified Manx shearwater as "weakly avoiding wind farms", although it is noted that evidence is lacking for this species. Bradbury *et al.*, (2014) classify Manx shearwater as having "very low" population vulnerability to displacement.

1465. Dierschke *et al*, (2016) do suggest that Manx shearwater are avoiding North Hoyle wind farm, stating that an obvious distribution gap was observed at the OWF. It is not clear exactly how the authors reached this conclusion beyond applying subjective expert opinion to the results of the North Hoyle post-consent monitoring and concluding that fewer Manx shearwater were recorded than would be expected. Dierschke *et al.* (2016) also note that Manx shearwater have been recorded within Robin Rigg OWF.

1466. Due to the limited evidence available for Manx shearwater as to suitable displacement and mortality rates, the Applicant has assessed in accordance with the Joint SNCB interim guidance note (Updated, 2022). Due to Manx Shearwater being classified as having low sensitivity to displacement and being known to have a large foraging range, the Joint SNCB guidance recommends a 10% displacement rate within the Windfarm Site plus 2km buffer and 1-10% mortality rate. Following further review of the advice and additional evidence on Manx shearwater behaviour the Applicant considers a 1% mortality rate to be the more likely impact based on expert judgement. Manx shearwaters are perceived to have low sensitivity to disturbance and displacement and have a large mean max (1,346.8km) and a maximum (2,890km) foraging range. This means that during the breeding season this species is less constrained than most other seabird species in terms of potential foraging areas. Therefore, should Manx shearwaters be displaced from the Project area the reduction in foraging potential would be extremely limited and is likely to have little impact when considering the overall foraging range and available foraging area for the species.

8.2.1.4 Gannet

1467. Gannets show a low level of sensitivity to ship and helicopter traffic (Garthe and Hüppop, 2004; Furness and Wade, 2012). A study by Krijgsveld *et al.*, (2011) using radar and visual observations to monitor the post-construction effects of the OWF Egmond aan Zee (OWEZ) established that 64% of gannets avoided entering the wind farm (macro-avoidance). The results of the post-consent monitoring surveys for Thanet OWF found that gannet densities reduced within the site in the third year, but the report did not quantify this (Royal Haskoning DHV, 2013). A more recent study by APEM (APEM, 2014) provided evidence that during their migration most gannets would avoid flying into areas with operational WTGs (macro-avoidance), with the estimated macro-avoidance being 95%. The position of the SNCBs following current guidance is that the level of displacement considered across all seasons is 70%.

1468. However, evidence from a recent review (APEM, 2022) which has collated and critically appraised studies from 25 OWFs, supports the application of seasonal displacement rates of 60 - 80% during the breeding and non-breeding seasons, although this is highly precautionary.

1469. A mortality rate of 1% was selected for this assessment, based on expert judgement supported by additional evidence. Such evidence suggests that gannet have a large mean max (315km) and maximum (709km) foraging range (Woodward *et al.*, 2019) and feed on a variety of different prey items that provide sufficient alternative foraging opportunities despite the potential reduced foraging activities within the Project area.

8.2.1.5 Site abundance and consequent displacement mortality

1470. For the four species screened in for displacement assessment, a summary of the predicted abundance for both flying and sitting birds for the Windfarm Site plus a 2km buffer is provided in **Table 8.1**. Information provided in **Table 8.1** is based on the mean peak abundance from the site-specific aerial digital surveys, as recommended for consideration of displacement effects in the Joint SNCB (Updated, 2022) guidance note. **Table 8.1** also provides a summary of the Applicant's operational and maintenance phase displacement and mortality rates for the four species based on the evidence detailed above. The recommended operational and maintenance phase displacement and mortality rate ranges recommended in the Joint SNCB (Updated, 2022) guidance note to capture the SNCB's assumed preferred approach is also presented.

1471. The main focus of disturbance and displacement effects is based on the Applicant's displacement and mortality rates, which is considered to represent a realistic, yet precautionary, assessment based on SNCBs guidance and additional evidence presented within this section. In addition, the predicted impacts are also presented and summarised considering the SNCB's assumed preferred approach to displacement rates. In line with the matrix approach to disturbance and displacement assessments, matrices are provided for the key assessments on an annual basis.

1472. With respect to construction and decommissioning phase disturbance and displacement rates, as actual rates of displacement during the construction phase are difficult to determine from the available studies, the following methodology has been applied to determine potential impact levels. Given that installation is limited both spatially and temporarily, any potential effects are unlikely to reach the same level as during the operation, especially given the level of site activity of floating WTGs compared to disturbance from fixed bottom WTGs construction activities. Therefore, for the purpose of providing a precautionary approach to assessing the potential impacts on species during the construction and decommissioning phase of the Project, the level used is half that of the operational phase assessments. This approach has previously been applied and agreed for Awel y Môr (RWE, 2022). This equates to the following rates being used for species assessed:

- For guillemot and razorbill, the Applicant's operational phase displacement rate of 50%, thus equates to a construction phase displacement rate of 25%. Whilst the SNCB's assumed operational phase displacement rate of 30-70%, thus equates to a construction phase displacement rate of 15-35%
- For Manx shearwater, the operational phase displacement rate of 10%, thus equates to a construction phase displacement rate of 5%
- For gannet, the operational phase displacement rate of 60-80%, thus equates to a construction phase displacement rate of 30-40%.

1473. A summary of the seasonal predicted abundance estimates and associated operational displacement impacts, prior to apportionment for qualifying features screened in for disturbance and displacement assessment, is provided in **Table 8.1**. An apportionment process has subsequently been applied to the EIA predicted impact values presented in **Table 8.1** following the apportionment process described in **Appendix 13.A: Offshore Ornithology Technical Report** and **Appendix 13.C: Revised Collision Risk Modelling** of the Offshore ES, to allow for assessment of potential impacts from the Project apportioned to each designated site screened in for assessment (**Table 5.4**).

Table 8.1 Predicted site abundance and consequent displacement and mortality rates considered for assessment during the operational phase

Species	**Season (Furness 2015)**	**Predicted seasonal abundance for the Windfarm Site plus 2km buffer (individuals)**	**Applicant's approach**			**SNCB's assumed approach**		
			Displacement rate	**Mortality rate**	**Consequent mortality (individuals per annum)**	**Displacement rate**	**Mortality rate**	**Consequent mortality (individuals per annum)**
Guillemot	Pre-breeding	N/A	50%	1%	N/A	30 – 70%	1 – 10%	N/A
	Breeding	3,304			16.52			9.91 – 231.28
	Post-breeding	N/A			N/A			N/A
	Non-breeding	1,059			5.30			3.18 – 74.13
Razorbill	Pre-breeding	345	50%	1%	1.73	30 – 70%	1 – 10%	1.04 – 24.15
	Breeding	40			0.20			0.12 – 2.80
	Post-breeding	40			0.20			0.12 – 2.80
	Non-breeding	N/A			N/A			N/A
Manx shearwater	Pre-breeding	33	10%	1%	0.03	10%	1 – 10%	0.33
	Breeding	12,126			12.13			121.26
	Post-breeding	22			0.02			0.22
	Non-breeding	N/A			N/A			N/A
Gannet	Pre-breeding	76	60 – 80%	1%	0.46 – 0.61	60 – 80%	1 – 10%	4.56 – 6.08
	Breeding	239			1.43 – 1.91			14.34 – 19.12
	Post-breeding	141			0.85 – 1.13			8.46 – 11.28
	Non-breeding	N/A			N/A			N/A

8.3 Collision Risk

8.3.1 Overview

1474. There is potential risk to birds from OWFs through collision with the rotating blades of WTGs resulting in injury or fatality. This may occur when birds fly through the Project area whilst foraging for food, commuting between breeding sites and foraging areas, or during migration.

1475. Collision Risk Modelling (CRM) has been carried out for the Project, with detailed methods and results presented in **Appendix 13.A: Offshore Ornithology Technical Report** and **Appendix 13.C: Revised Collision Risk Modelling** of the Offshore ES. These provide information for seabird species of interest identified as potentially at risk and of interest for impact assessment.

1476. CRM was undertaken using the sCRM (McGregor, 2018), using the recommended parameters within Natural England's best practice guidance note (Parker *et al*., 2022) for each seabird species, to determine the risk of collision when in flight.

1477. CRM accounts for several different species-specific behavioural aspects of the seabirds being assessed, including the height at which birds fly, their ability to avoid moving or static structures and how active they are diurnally and nocturnally. Details of these considerations are provided in **Appendix 13.C: Offshore Ornithology Collision Risk Modelling** of the Offshore ES.

1478. In order to provide a range of values to capture variability for each species, the applicant has run a variety of scenarios, the results of which can be found in the **Appendix 13.C: Offshore Ornithology Collision Risk Modelling** of the Offshore ES. A precautionary approach for this Appropriate Assessment means the worst-case scenario has been presented only, based on a 18MW turbine scenario with a range of nocturnal activity factors.

1479. All estimates are presented using Band Option 2 (BO2) following Natural England best practice guidance (Parker *et al*., 2022). Robustly estimating site-specific flight heights from aerial digital imagery requires a sufficient sample size of birds of each species from which flight height can be determined. Not all individuals are suitable for flight height estimation, as the method requires clear imagery of individuals in straight and level flight, with wings fully extended. Following completion of the full 24 months of site-specific baseline surveys, sample sizes were insufficient to accurately calculate site-specific flight heights for the four species selected for CRM, therefore Band Option 1 has not been modelled.

1480. BO2 applies a uniform distribution of bird flights between the lowest and the highest levels of the rotors. A unform distribution can be considered a precautionary approach to modelling, as it does not account for skewed vertical distribution of bird flight heights between the lowest and the highest levels of the rotors. The proportion of birds at Potential Collision Height (PCH) was determined from the results of the Strategic Ornithological Support Services SOSS-02 project (Cook *et al*., 2012) that analysed the flight height measurements taken from boat surveys conducted around the UK. The Project was updated following Johnston *et al*. (2014), and the revised published spreadsheet is used to determine the 'generic' percentage of flights at PCH for each species based on the Project's WTG parameters. This Band Option, BO2, has been considered for all four species for which the collision mortality effect pathway is screened in (see **Table 5.4**).

8.3.1.1 Precautionary nature to CRM

1481. It must be noted that a number of elements of additional precaution were included in the input parameters applied in the sCRM for this assessment, including considering a range of nocturnal activity factors and lower avoidance rates than that currently predicted from the latest scientific evidence. The nature of such precaution is evidenced through the findings of post consent monitoring studies. the Bird Collision Avoidance Study funded by ORJIP (Offshore Renewables Joint Industry Programme), undertook a study to understand seabird behaviour at sea around OWFs (Skov *et al*., 2018). The ORJIP project studied birds around Thanet OWF for a two-year period (between 2014 and 2016) recording over 12,000 bird movements throughout the day and night (Skov *et al*., 2018). The findings of this study presented updated values for both nocturnal activity, flight speeds and avoidance behaviour from an empirical data source, which is recommended for future incorporation in CRM to provide greater confidence in predicted impacts and reduce the current levels of uncertainty in assessments. It also reported that only six birds (all gull species) collided with WTGs from over 12,000 birds recorded during the two-year period, providing evidence of the current level of precautionary nature of collision risk modelling for all species of seabirds assessed for the Project.

1482. A review of the data from the ORJIP project was undertaken by Bowgen and Cook (2018), which analysed all the data collected across the two-year period to understand more about seabird behaviour and provide evidence to support updates to the previous avoidance rates from Cook *et al*. (2014). The findings from this study were that for gannet and kittiwake higher avoidance rates of 99.5% and 99.0%, respectively, were more appropriate. It concluded that even when applying these higher rates of avoidance, appropriate levels of precaution remained within the estimated number of collision mortality rates.

1483. The most recent empirical led study of collision risk to seabirds (AOWFL, 2023) was undertaken over two years off the coast of Aberdeen at an OWF site with 11 WTGs collecting data during the breeding and post-breeding season (covering the months of April to October 2020 and 2021). The results from this study and its overall conclusions were that it is now evident that seabirds are exposed to very low risks of collision with WTGs during daylight hours. This was also substantiated by the fact that no collisions or even narrow escapes were recorded in over 10,000 bird videos during the two years of monitoring. Despite this study not covering the period outside of the breeding / post-breeding season, when weather conditions may be more testing for birds and may influence flight behaviour more, it is evident that current annual collision risk modelling outputs are likely to overestimate the risk to seabirds. Therefore, it is considered that the collision mortality rates estimated for seabirds within this impact assessment are likely to be overestimates during the breeding and post-breeding months and therefore base impacts on a total annual risk level that is precautionary in nature.

1484. Another study on gannets by during the migratory period (APEM, 2014) found that overall avoidance of WTGs was certainly higher than the SNCBs recommended rate of 98.9%. This study found that all gannets avoided the WTGs within the Study Area, which can be considered a macro avoidance response, providing evidence that gannets may actually have an avoidance rate as high as 100% during migratory periods at least. However, the concluding recommendation from APEM's research suggested that if it was not appropriate to use a 100% avoidance rate, then a rate of 99.5% for the autumn migration would still offer suitable precaution in collision estimates. This indicates that when estimating gannet collision mortality rates, the use of an avoidance rate of 98.9% is understood to overestimate the risk to this species, as noted by Cook *et al.*, (2014), who acknowledged that precaution remained within the avoidance rates put forward for gannets and gull species.

1485. Therefore, it is considered that the CRM input parameters used in the assessment of collision risk to seabirds for the Project and those from other developments at the in-combination level incorporate a high degree of precaution.

8.3.1.2 Site predicted collision risk estimates

1486. A summary of the seasonal predicted EIA level collision estimates prior to apportionment for qualifying features screened in for collision risk assessment is provided in **Table 8.2**. An apportionment process has subsequently been applied to the EIA predicted impact values presented in **Table 8.2** following the apportionment process described in **Appendix 13.A: Offshore Ornithology Technical Report** and **Appendix 13.C: Revised Collision Risk Modelling** of the Offshore ES, to allow for assessment of potential impacts from the Project apportioned to each designated site screened in for assessment (**Table 5.4**).

Table 8.2 Predicted unapportioned collision risk estimates for key species

Species	Breeding season collision estimates (BO2)	Pre-breeding season collision estimates (BO2)	Post-breeding season collision estimates (BO2)	Non-breeding season collision estimates (BO2)
Kittiwake	5.24	13.48	2.75	N/A
Great black-backed gull	0.70	N/A	N/A	0.00
Herring gull	0.00	N/A	0.28	N/A
Lesser black-backed gull	0.30	0.00	0.00	N/A
Gannet	4.72	0.00	1.83	N/A

8.4 Combined displacement and collision risk

1487. Due to gannet being screened in for both displacement and collision risk assessment during the operation and maintenance phase, there is a potential for these two potential impacts to adversely affect gannet populations combined. Further consideration of both impacts acting together is therefore required. However, it is recognised that assessing these two potential impacts together amounts to double counting, as birds that are subject to displacement would not be subject to potential collision risk as they are already assumed to have not entered the Windfarm Site. Equally, birds estimated to be subject to collision risk mortality would not be able to be subjected to consequent displacement consequent mortality as well. Currently there is no refined method to consider displacement and collision together whilst reducing any double counting of impacts recommended by SNCBs. Therefore, a precautionary and highly unlikely approach of adding the impacts together is presented, where applicable.

8.5 Sgomer, Sgogwm a Moroedd Penfro / Skomer, Skokholm and the Seas off Pembrokeshire SPA

1488. The boundary of Sgomer, Sgogwm a Moroedd Penfro / Skomer, Skokholm and the Seas off Pembrokeshire SPA is located approximately 29km from the Project, while the seabird colony is located at a distance of approximately 67km. The Project, therefore, does not directly overlap with the SPA boundary or any cited areas with functional linkages.

8.5.1 Description of Designation

1489. Skomer, Skokholm and the Seas off Pembrokeshire SPA is located off the extreme south-west tip of Pembrokeshire in south-west Wales. This SPA extends beyond the 12 nautical mile boundary, lying partly in Welsh territorial waters and partly in UK offshore waters. The islands of Skomer and Skokholm support the largest concentration of breeding seabirds in England and Wales. They hold the largest breeding colony of Manx shearwater in the world, one of the largest colonies of lesser black-backed gull in Britain, as well as being important Welsh breeding sites for other seabird populations, such as razorbill, kittiwake, puffin and guillemot, supporting a breeding seabird assemblage of over 394,260 birds.

8.5.2 Conservation Objectives

1490. The overarching conservation objectives for the SPA are to ensure the conservation status of the qualifying features is 'favourable'. With respect to Skomer, Skokholm and the Seas off Pembrokeshire SPA, a qualifying feature's 'favourable' conservation status can be assessed against the following objectives presented within the Draft conservation objectives document (JNCC & NRW, 2015) (NB: bold text indicates those objectives that are relevant to this assessment, based on the proximity of the SPA and functional linkages described above in relation to the Project):

- Population dynamics data on the species indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats
- The natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future
- There is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

8.5.3 Appropriate Assessment

1491. Two qualifying features of this SPA were screened into the Appropriate Assessment (**Table 5.4**); Manx shearwater and Short-eared owl.

8.5.3.1 Manx Shearwater

8.5.3.1.1 Status

1492. The SPA population of Manx shearwater at classification was cited as 150,968 pairs in 1998. The most recent count (2018) is 455,156 apparently occupied sites (burrows or crevices), or 910,312 breeding adults (SMP, 2023).

1493. When considering a breeding adult baseline mortality rate of 0.13 (1-0.870, Horswill and Robinson (2015)) for Manx shearwater, 39,252 and 118,341 breeding adults from the SPA population would be subject to natural mortality per annum, in relation to the citation and latest count respectively.

8.5.3.1.2 Functional linkage and seasonal apportionment of potential effects

1494. The Project is within the mean max plus one SD foraging distance of 1,346+1,018.7km (Woodward *et al*. 2019). Accordingly, this species is assessed for the full breeding (April to August), post-breeding migration (September to October) and return migration (March) seasons based on Furness (2015), with the level of abundance apportioned for the Windfarm Site plus 2km buffer to Skomer, Skokholm and the Seas off Pembrokeshire SPA presented in **Table 8.3**.

Table 8.3 Manx shearwater level of abundance apportioned to Skomer, Skokholm and the Seas off Pembrokeshire SPA when considering the full breeding season

Season	Level of apportionment (%)	Apportioned Abundance (breeding adults)
Full Breeding (Apr-Aug)	60.32	7,314.1
Post-breeding migration (Sept-Oct)	44.28	9.7
Return migration (Mar)	44.28	14.6

1495. As detailed in **paragraph 1449**, for Manx shearwater a displacement distance of the WIndfarm Site plus 2km buffer has been selected and a displacement rate of 10% and a mortality rate of 1-10% for operational and maintenance phase impacts as recommended in the Joint SNCB interim guidance on displacement (Updated, 2022). The focus of assessment follows the Applicant's position of 10% displacement rate and a 1% mortality rate, which is considered to represent a realistic, yet precautionary, assessment based on SNCBs guidance and additional evidence presented within **paragraph 1449**. However, the standard SNCB's maximum displacement mortality rate of 10% is also provided for each assessment.

1496. As detailed within **Appendix 13.A: Offshore Ornithology Technical Report** and **Appendix 13.C: Revised Collision Risk Modelling** of the Offshore ES for Skomer, Skokholm and the Seas off Pembrokeshire SPA, an additional apportionment process has also been undertaken for the migration-free breeding (June to July), post-breeding migration (August to October) and return migration (March to May) seasons based on Furness (2015). The level of abundance apportioned for each season to the Windfarm Site plus 2km buffer to Skomer, Skokholm and the Seas off Pembrokeshire SPA presented in **Table 8.4**.

Table 8.4 Manx shearwater level of abundance apportioned to Skomer, Skokholm and the Seas off Pembrokeshire SPA when considering the migration-free breeding season

Season	Level of apportionment (%)	Apportioned Abundance (breeding adults)
Migration free breeding (Jun-Jul)	60.50	1,847.7
Post-breeding migration (Aug-Oct)	44.28	4,457.1
Return migration (Mar-May)	44.28	223.2

1497. Further detail of how the level of impact apportioned to each SPA is derived, is presented within **Appendix 13.A: Offshore Ornithology Technical Report** and **Appendix 13.C: Revised Collision Risk Modelling** of the Offshore ES.

8.5.3.1.3 Construction and decommissioning phase potential disturbance and displacement effects on the qualifying feature in isolation

1498. During the construction and decommissioning phase the potential level of impact apportioned to the SPA seasonally is summarised in **Table 8.5** when considering the full breeding season and in **Table 8.6** when considering the migration-free breeding season for both the Applicant's and SNCB's assumed preferred approach. Details on selection of appropriate displacement and mortality rates for construction and decommissioning phase assessments are provided in **paragraph 1449**.

1499. The potential impact of the loss of approximately four (3.7, see **Table 8.5**) additional breeding adults or three (3.3 breeding adults, see **Table 8.6**) additional breeding adults on an annual basis to the Skomer, Skokholm and the Seas off Pembrokeshire SPA (with a classified population of 301,936 breeding adults and an annual background mortality of 39,252 breeding adults), would represent a 0.009% or 0.008% increase in baseline mortality rate annually, respectively.

Table 8.5 Summary of Manx shearwater construction and decommissioning phase disturbance and displacement impacts apportioned to Skomer, Skokholm and the Seas off Pembrokeshire SPA when considering the full breeding season

Population Size (Breeding adults)	**Season**	**Applicant's approach disturbance and displacement impact**		**SNCBs assumed approach disturbance and displacement impact**	
		5% Disp; 1% Mort (Breeding adults per annum)	Increase in baseline mortality rate (%)	5% Disp; 1-10% Mort (Breeding adults per annum)	Increase in baseline mortality rate (%)
Citation (301,936)	Full breeding	3.7	0.009	3.7 - 36.6	0.009 - 0.093
	Post-breeding migration	0.0	0.000	0.0 - 0.1	0.000
	Return migration	0.0	0.000	0.0 - 0.1	0.000
	Annual	3.7	0.009	3.7 - 36.7	0.009 - 0.093
Latest Count (910,312)	Full breeding	3.7	0.003	3.7 - 36.6	0.003 - 0.031
	Post-breeding migration	0.0	0.000	0.0 - 0.1	0.000
	Return migration	0.0	0.000	0.0 - 0.1	0.000
	Annual	3.7	0.003	3.7 - 36.7	0.003 - 0.031

Table 8.6 Summary of Manx shearwater construction and decommissioning phase disturbance and displacement impacts apportioned to Skomer, Skokholm and the Seas off Pembrokeshire SPA when considering the migration-free breeding season

Population Size (Breeding adults)	Season	Applicant's approach disturbance and displacement impact		SNCBs assumed approach disturbance and displacement impact	
		5% Disp; 1% Mort (Breeding adults per annum)	Increase in baseline mortality rate (%)	5% Disp; 1-10% Mort (Breeding adults per annum)	Increase in baseline mortality rate (%)
Citation (301,936)	Migration-free breeding	0.9	0.002	0.9 - 9.2	0.002 - 0.024
	Post-breeding migration	0.1	0.000	0.1 - 1.1	0.000 - 0.003
	Return migration	2.2	0.006	2.2 - 22.3	0.006 - 0.057
	Annual	3.3	0.008	3.3 - 32.6	0.008 - 0.083
Latest Count (910,312)	Migration-free breeding	0.9	0.001	0.9 - 9.2	0.001 - 0.008
	Post-breeding migration	0.1	0.000	0.1 - 1.1	0.000 - 0.001
	Return migration	2.2	0.002	2.2 - 22.3	0.002 - 0.019
	Annual	3.3	0.003	3.3 - 32.6	0.003 - 0.028

1500. As the population of Manx shearwater has increased significantly since the citation population count the potential impact on the population is more reasonably assessed against the latest population count undertaken in 2018, which was 910,312 breeding adults. On this basis, when considering the potential impact of this loss to Skomer, Skokholm and the Seas off Pembrokeshire SPA (with an annual background mortality of 118,341 breeding adults) would represent a 0.003% increase in baseline mortality rate annually, respectively.

1501. The addition of up to four possible additional breeding adult mortalities per annum equates to a 0.009% increase in baseline mortality rate at most, when considering either the citation or the latest colony count. This level of impact would be indistinguishable from natural fluctuations in the population. The potential for an **AEoI to the conservation objectives of the Manx shearwater feature of the Skomer, Skokholm and the Seas off Pembrokeshire SPA in relation to disturbance and displacement effects in the construction and decommissioning phase from the Project alone can be ruled out**. Therefore, subject to natural change, Manx shearwater will be maintained as a feature in the long term.

8.5.3.1.4 Operational and maintenance phase potential disturbance and displacement effects on the qualifying feature in isolation

1502. During the operation and maintenance phase the potential level of impact apportioned to the SPA seasonally is summarised in **Table 8.7** when considering the full breeding season and in **Table 8.8** when considering the migration-free breeding season for both the Applicant's and SNCB's assumed preferred approach.

1503. Displacement matrices are also presented for the annual apportioned abundance for the Windfarm Site plus 2km buffer to Skomer, Skokholm and the Seas off Pembrokeshire SPA, when considering the full breeding season (**Table 8.9**) and the migration-free breeding season (**Table 8.10**).

1504. The potential impact of the loss of approximately seven (7.3 or 6.5, see **Table 8.7** or **Table 8.8**) additional breeding adults on an annual basis to the Skomer, Skokholm and the Seas off Pembrokeshire SPA (with a classified population of 301,936 breeding adults and an annual background mortality of 39,252 breeding adults) would represent a 0.019% or 0.017% increase in baseline mortality rate annually, respectively.

Table 8.7 Summary of Manx shearwater operation and maintenance phase disturbance and displacement impacts apportioned to Skomer, Skokholm and the Seas off Pembrokeshire SPA when considering the full breeding season

Population Size (Breeding adults)	Season	Applicant's approach disturbance and displacement impact		SNCBs assumed approach disturbance and displacement impact	
		10% Disp; 1% Mort (Breeding adults per annum)	Increase in baseline mortality rate (%)	10% Disp; 1-10% Mort (Breeding adults per annum)	Increase in baseline mortality rate (%)
Citation (301,936)	Full breeding	7.3	0.019	7.3 - 73.1	0.019 - 0.186
	Post-breeding migration	0.0	0.000	0 - 0.1	0.000
	Return migration	0.0	0.000	0 - 0.2	0.000
	Annual	7.3	0.019	7.3 - 73.4	0.019 - 0.187
Latest Count (910,312)	Full breeding	7.3	0.006	7.3 - 73.1	0.006 - 0.062
	Post-breeding migration	0.0	0.000	0 - 0.1	0.000
	Return migration	0.0	0.000	0 - 0.2	0.000
	Annual	7.3	0.006	7.3 - 73.4	0.006 - 0.062

Table 8.8 Summary of Manx shearwater operation and maintenance phase disturbance and displacement impacts apportioned to Skomer, Skokholm and the Seas off Pembrokeshire SPA when considering the migration-free breeding season

Population Size (Breeding adults)	**Season**	**Applicant's approach disturbance and displacement impact**		**SNCBs assumed approach disturbance and displacement impact**	
		10% Disp; 1% Mort (Breeding adults per annum)	Increase in baseline mortality rate (%)	10% Disp; 1-10% Mort (Breeding adults per annum)	Increase in baseline mortality rate (%)
Citation (301,936)	Migration-free breeding	1.9	0.005	1.9 - 18.5	0.005 - 0.047
	Post-breeding migration	0.2	0.001	0.2 - 2.2	0.001 - 0.006
	Return migration	4.5	0.011	4.5 - 44.6	0.011 - 0.114
	Annual	6.5	0.017	6.5 - 65.3	0.017 - 0.166
Latest Count (910,312)	Migration-free breeding	1.9	0.002	1.9 - 18.5	0.002 - 0.012
	Post-breeding migration	0.2	0.000	0.2 - 2.2	0.000 - 0.002
	Return migration	4.5	0.004	4.5 - 44.6	0.004 - 0.038
	Annual	6.5	0.006	6.5 - 65.3	0.006 - 0.055

Table 8.9 Manx shearwater operation and maintenance phase disturbance annual displacement matrix when considering the full breeding season for impacts apportioned to Skomer, Skokholm and the Seas off Pembrokeshire SPA

Displacement (%)	**Mortality rates (%)**															
	0	**1**	**2**	**3**	**4**	**5**	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	1	2	3	4	7	15	22	29	37	44	51	59	66	73
10	0	7	15	22	29	37	73	147	220	294	367	440	514	587	660	734
15	0	11	22	33	44	55	110	220	330	440	550	660	771	881	991	1,101
20	0	15	29	44	59	73	147	294	440	587	734	881	1,027	1,174	1,321	1,468
25	0	18	37	55	73	92	183	367	550	734	917	1,101	1,284	1,468	1,651	1,835
30	0	22	44	66	88	110	220	440	660	881	1,101	1,321	1,541	1,761	1,981	2,202
35	0	26	51	77	103	128	257	514	771	1,027	1,284	1,541	1,798	2,055	2,312	2,568
40	0	29	59	88	117	147	294	587	881	1,174	1,468	1,761	2,055	2,348	2,642	2,935
50	0	37	73	110	147	183	367	734	1,101	1,468	1,835	2,202	2,568	2,935	3,302	3,669
60	0	44	88	132	176	220	440	881	1,321	1,761	2,202	2,642	3,082	3,522	3,963	4,403
70	0	51	103	154	205	257	514	1,027	1,541	2,055	2,568	3,082	3,596	4,110	4,623	5,137
80	0	59	117	176	235	294	587	1,174	1,761	2,348	2,935	3,522	4,110	4,697	5,284	5,871
90	0	66	132	198	264	330	660	1,321	1,981	2,642	3,302	3,963	4,623	5,284	5,944	6,605
100	0	73	147	220	294	367	734	1,468	2,202	2,935	3,669	4,403	5,137	5,871	6,605	7,338
	🟩	<1% increase in baseline mortality				■	>1% baseline mortality threshold for latest population					□	>1% baseline mortality threshold for citation population			

Table 8.10 Manx shearwater operation and maintenance phase disturbance annual displacement matrix when considering the migration-free breeding season for impacts apportioned to Skomer, Skokholm and the Seas off Pembrokeshire SPA

Displacement (%)	**Mortality rates (%)**															
	0	**1**	**2**	**3**	**4**	**5**	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	1	2	3	3	7	13	20	26	33	39	46	52	59	65
10	0	7	13	20	26	33	65	131	196	261	326	392	457	522	588	653
15	0	10	20	29	39	49	98	196	294	392	490	588	685	783	881	979
20	0	13	26	39	52	65	131	261	392	522	653	783	914	1,044	1,175	1,306
25	0	16	33	49	65	82	163	326	490	653	816	979	1,142	1,306	1,469	1,632
30	0	20	39	59	78	98	196	392	588	783	979	1,175	1,371	1,567	1,763	1,958
35	0	23	46	69	91	114	228	457	685	914	1,142	1,371	1,599	1,828	2,056	2,285
40	0	26	52	78	104	131	261	522	783	1,044	1,306	1,567	1,828	2,089	2,350	2,611
50	0	33	65	98	131	163	326	653	979	1,306	1,632	1,958	2,285	2,611	2,938	3,264
60	0	39	78	118	157	196	392	783	1,175	1,567	1,958	2,350	2,742	3,133	3,525	3,917
70	0	46	91	137	183	228	457	914	1,371	1,828	2,285	2,742	3,199	3,656	4,113	4,570
80	0	52	104	157	209	261	522	1,044	1,567	2,089	2,611	3,133	3,656	4,178	4,700	5,222
90	0	59	118	176	235	294	588	1,175	1,763	2,350	2,938	3,525	4,113	4,700	5,288	5,875
100	0	65	131	196	261	326	653	1,306	1,958	2,611	3,264	3,917	4,570	5,222	5,875	6,528
	🟩	<1% increase in baseline mortality			■	>1% baseline mortality threshold for latest population						🟥	>1% baseline mortality threshold for citation population			

1505. However, as the population of Manx shearwater has increased significantly since the citation population count the potential impact on the population is more reasonably assessed against the latest population count undertaken in 2018, which was 910,312 breeding adults. On this basis, when considering the potential impact of this loss to Skomer, Skokholm and the Seas off Pembrokeshire SPA (with an annual background mortality of 118,341 breeding adults) then the prediction of seven breeding adults suffering displacement consequent mortality would represent a 0.006% increase in baseline mortality rate annually.

1506. The addition of up to seven possible additional breeding adult mortalities per annum equates to a 0.019% increase in the baseline mortality rate at most, when considering either the citation or the latest colony count. This level of impact would be indistinguishable from natural fluctuations in the population. The potential for an **AEoI to the conservation objectives of the Manx shearwater feature of the Skomer, Skokholm and the Seas off Pembrokeshire SPA in relation to disturbance and displacement effects in the operation and maintenance phase from the Project alone can be ruled out**. Therefore, subject to natural change, Manx shearwater will be maintained as a feature in the long term.

8.5.3.1.5 Consideration of entanglement with mooring lines

1507. Consideration of the potential impact of entanglement with mooring lines on the ornithology qualifying features of SPAs screened in for assessment is provided in **Section 8.27**. As presented within **Section 8.27**, the potential for an **AEoI to the conservation objectives of the Manx shearwater feature of Skomer, Skokholm and the Seas off Pembrokeshire SPA in relation to entanglement of mooring lines from the Project can be ruled out**. Therefore, subject to natural change, Manx shearwater will be maintained as a feature in the long term.

8.5.3.1.6 Indirect impacts due to effects on habitats and prey species

1508. Consideration of the potential indirect impacts due to effects on habitats and prey species on the ornithology qualifying features of SPAs screened in for assessment is provided in **Section 8.28**. As presented within **Section 8.28**, the potential for **an AEoI to the conservation objectives of the Manx shearwater feature of Skomer, Skokholm and the Seas off Pembrokeshire SPA in relation to indirect impacts from the Project can be ruled out**. Therefore, subject to natural change, Manx shearwater will be maintained as a feature in the long term.

8.5.3.1.7 Potential effects on the qualifying feature in-combination with other plans and projects

Construction and decommissioning phase

1509. When considering the construction and decommissioning phase, as detailed above, the potential level of impact for the Project alone on Manx shearwater was concluded as trivial and inconsequential. As this level of effect would be well within the error margins of the assessment there is no potential for any contribution for an in-combination effect to occur within the construction and decommissioning phase.

Operation and maintenance phase – disturbance and displacement

1510. Manx shearwater has been screened into the assessment of the operational and maintenance phase due to potential impacts from disturbance and displacement from the Project in-combination with other projects.

1511. The in-combination totals are presented in **Table 8.11** and **Table 8.12** for all consented and planned projects with potential connectivity to the Manx shearwater feature of the Skomer, Skokholm and the Seas off Pembrokeshire SPA. Due to the age of developments in the UK Western Waters region of sea which have the potential to contribute to an in-combination impact upon qualifying features, few have comparable datasets upon which to base an assessment. Many of the operational and consented development's impact assessments also did not address alone or in-combination effects as fully as is now required and some proposed developments have not yet released their data or impact assessments into the public domain. Therefore, currently there are limited data sources for inclusion in in-combination assessments for this SPA population. As such the in-combination assessment is carried out with the fullest dataset available, whilst acknowledging that further contributory effects may occur from existing operational, consented or proposed developments but for which the required data are not available.

1512. The in-combination abundance totals for the Windfarm Site plus 2km buffer presented within **Table 8.11** and **Table 8.12** are derived from the project totals presented within Awel y Môr (RWE, 2022) RIAAs, respectively.

1513. With respect to Erebus apportioned project totals, the values presented are based on the final consented project abundance totals advocated by NRW (pers comms).

1514. A summary of the predicted seasonal impacts and resulting increase in baseline mortality rate following the Applicant's and SNCB's assumed approach with respect to displacement and mortality rates are provided in **Table 8.13** for the Manx shearwater feature of Skomer, Skokholm and the Seas off Pembrokeshire SPA with respect to the full-breeding season. A summary using the migration-free breeding approach can be found in **Table 8.14**. The focus of this in-combination assessment is based on the Applicant's position of 10% displacement rate and a 1% mortality rate, which is considered to represent a more realistic, yet precautionary, assessment based on SNCBs guidance and additional evidence presented within **Section 1449**.

1515. In-combination displacement matrices are presented in **Table 8.15** and **Table 8.16** when considering the totals presented in **Table 8.11** and **Table 8.12**.

1516. The total predicted in-combination impact apportioned to Skomer, Skokholm and the Seas off Pembrokeshire SPA for all projects equates to 10 (9.5) or nine (8.7) breeding adults per annum (see **Table 8.13** and **Table 8.14**), respectively.

1517. The potential impact of the loss of 10 or nine additional breeding adults on an annual basis to the Skomer, Skokholm and the Seas off Pembrokeshire SPA (with a classified population of 301,936 breeding adults and an annual background mortality of 39,252 breeding adults) would represent a 0.025% or 0.022% increase in baseline mortality rate per annum, respectively.

1518. However, as the population of Manx shearwater has increased significantly since the citation population count the potential impact on the population is more reasonably assessed against the latest population count undertaken in 2018, which was 910,312 breeding adults. On this basis, when considering the potential impact of this loss to Skomer, Skokholm and the Seas off Pembrokeshire SPA (with an annual background mortality of 118,341) then the displacement consequent mortality in-combination with other projects would represent a 0.008% or 0.007% increase in baseline mortality rate per annum, respectively.

1519. The impact of up to ten possible additional breeding adult mortalities per annum equates to a 0.025% increase in baseline mortality rate at most, when considering either the citation or the latest colony count. This level of impact would be indistinguishable from natural fluctuations in the population. The potential for **an AEoI to the conservation objectives of the Manx shearwater feature of the Skomer, Skokholm and the Seas off Pembrokeshire SPA in relation to in-combination disturbance and displacement effects in the operation and maintenance phase from the Project can be ruled out**. Therefore, subject to natural change, Manx shearwater will be maintained as a feature in the long term.

Table 8.11 In-combination abundance totals for Manx shearwater to the Skomer, Skokholm and the Seas off Pembrokeshire SPA using the full breeding season

Project	Return-migration season	Breeding season	Post-breeding migration	Annual	Tier
Arklow	0	-	0	0	1
Burbo Bank Extension	-	-	-	-	1
Barrow	0	-	0	0	1
Burbo Bank	0	-	0	0	1
Gwynt y Môr	0	-	0	0	1
North Hoyle	0	-	0	0	1
Ormonde	0	-	0	0	1
Rampion 1	-	-	-	-	1
Rhyl Flats	0	-	0	0	1
Robin Rigg	0	-	0	0	1
Walney Phase 1	0	-	0	0	1
Walney Phase 2	0	-	0	0	1
Walney Extension	-	-	-	-	1
West of Duddon Sands	0	-	0	0	1
TwinHub	-	-	-	-	3
Erebus	13	1,532	392	1,937	3
Total (Consented)	**13**	**1532**	**392**	**1937**	
White Cross	15	7,314	10	7,338	4
Total consented + White Cross	**28**	**8,846**	**402**	**9,275**	
AyM	78	13	95	186	4
Rampion II (PIER)	-	-	-	-	5
Morcombe OWF	-	-	-	-	5
Morgan OWF	-	-	-	-	5
Mona OWF	-	-	-	-	5
Total All Projects	**106**	**8,859**	**497**	**9,462**	

Table 8.12 In-combination abundance totals for Manx shearwater to the Skomer, Skokholm and the Seas off Pembrokeshire SPA using the migration-free breeding season

Project	Return-migration season	Breeding season	Post-breeding migration	Annual	Tier
Arklow	0	-	0	0	1
Burbo Bank Extension	-	-	-	-	1
Barrow	0	-	0	0	1
Burbo Bank	0	-	0	0	1
Gwynt y Môr	0	-	0	0	1
North Hoyle	0	-	0	0	1
Ormonde	0	-	0	0	1
Rampion 1	-	-	-	-	1
Rhyl Flats	0	-	0	0	1
Robin Rigg	0	-	0	0	1
Walney Phase 1	0	-	0	0	1
Walney Phase 2	0	-	0	0	1
Walney Extension	-	-	-	-	1
West of Duddon Sands	0	-	0	0	1
TwinHub	-	-	-	0	3
Erebus	13	1,532	392	1,937	3
Total (Consented)	**13**	**1,532**	**392**	**1,937**	
White Cross	4,457	1,848	223	6,528	4
Total consented + White Cross	**4,470**	**3,380**	**615**	**8,465**	
AyM	78	13	95	186	4
Rampion II (PIER)	-	-	-	-	5
Morcombe OWF	-	-	-	-	5
Morgan OWF	-	-	-	-	5
Mona OWF	-	-	-	-	5
Total All Projects	**4,548**	**3,393**	**710**	**8,651**	

Table 8.13 Summary of predicted disturbance and displacement consequential mortality apportioned to the Manx shearwater feature of Skomer, Skokholm and the Seas off Pembrokeshire SPA for the Project in-combination using the full breeding season

Population Size (Breeding adults)	**Season**	**Applicant's approach disturbance and displacement impact**		**SNCBs assumed approach disturbance and displacement impact**	
		10% Disp; 1% Mort (Breeding adults per annum)	Increase in baseline mortality rate (%)	10% Disp; 1-10% Mort (Breeding adults per annum)	Increase in baseline mortality rate (%)
Citation (301,936)	Full Breeding	8.9	0.023	8.9 - 88.6	0.023 - 0.226
	Post-breeding migration	0.5	0.001	0.5 – 5.0	0.002 - 0.013
	Return migration	0.1	0.000	0.1 - 1.1	0.000 – 0.003
	Annual	9.5	0.024	9.5 – 94.6	0.024 – 0.241
Latest Count (910,312)	Full Breeding	8.9	0.007	8.9 – 88.6	0.007 – 0.075
	Post-breeding migration	0.5	0.000	0.5 – 65.0	0.000 – 0.004
	Return migration	0.1	0.000	0.1 – 1.1	0.000 - 0.001
	Annual	9.5	0.008	9.5 - 94.6	0.008 - 0.080

Table 8.14 Summary of predicted disturbance and displacement consequential mortality apportioned to the Manx shearwater feature of Skomer, Skokholm and the Seas off Pembrokeshire SPA for the Project in-combination using the migration-free breeding season

Population Size (Breeding adults)	**Season**	**Applicant's approach disturbance and displacement impact**		**SNCBs approach disturbance and displacement impact**	
		10% Disp; 1% Mort (Breeding adults per annum)	Increase in baseline mortality rate (%)	10% Disp; 1-10% Mort (Breeding adults per annum)	Increase in baseline mortality rate (%)
Citation (301,936)	Migration-free Breeding	3.4	0.009	3.4 - 33.9	0.009 - 0.086
	Post-breeding migration	0.7	0.002	0.7 – 7.1	0.002 - 0.018
	Return migration	4.5	0.012	4.5 - 45.5	0.012 - 0.116
	Annual	8.8	0.022	8.8 - 88.2	0.022 - 0.220
Latest Count (910,312)	Migration-free Breeding	3.4	0.003	3.4 - 33.9	0.003 - 0.029
	Post-breeding migration	0.9	0.001	0.9 - 8.7	0.001 - 0.006
	Return migration	4.5	0.004	4.5 - 45.5	0.004 - 0.038
	Annual	8.8	0.007	8.8 - 88.2	0.007 - 0.073

Table 8.15 Annual in-combination displacement matrix for Manx shearwater for Skomer, Skokholm and the Seas off Pembrokeshire SPA using the full breeding season

Displacement (%)	**Mortality rates (%)**															
	0	**1**	**2**	**3**	**4**	**5**	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	2	3	4	5	9	19	28	38	47	57	66	76	85	95
10	0	9	19	28	38	47	95	189	284	378	473	568	662	757	852	946
15	0	14	28	43	57	71	142	284	426	568	710	852	993	1,135	1,277	1,419
20	0	19	38	57	76	95	189	378	568	757	946	1,135	1,325	1,514	1,703	1,892
25	0	24	47	71	95	118	237	473	710	946	1,183	1,419	1,656	1,892	2,129	2,365
30	0	28	57	85	114	142	284	568	852	1,135	1,419	1,703	1,987	2,271	2,555	2,838
35	0	33	66	99	132	166	331	662	993	1,325	1,656	1,987	2,318	2,649	2,980	3,312
40	0	38	76	114	151	189	378	757	1,135	1,514	1,892	2,271	2,649	3,028	3,406	3,785
50	0	47	95	142	189	237	473	946	1,419	1,892	2,365	2,838	3,312	3,785	4,258	4,731
60	0	57	114	170	227	284	568	1,135	1,703	2,271	2,838	3,406	3,974	4,542	5,109	5,677
70	0	66	132	199	265	331	662	1,325	1,987	2,649	3,312	3,974	4,636	5,298	5,961	6,623
80	0	76	151	227	303	378	757	1,514	2,271	3,028	3,785	4,542	5,298	6,055	6,812	7,569
90	0	85	170	255	341	426	852	1,703	2,555	3,406	4,258	5,109	5,961	6,812	7,664	8,515
100	0	95	189	284	378	473	946	1,892	2,838	3,785	4,731	5,677	6,623	7,569	8,515	9,462

🟩 <1% increase in baseline mortality

🟩 >1% baseline mortality threshold for latest population

🟥 >1% baseline mortality threshold for citation population

Table 8.16 Annual in-combination displacement matrix for Manx shearwater for Skomer, Skokholm and the Seas off Pembrokeshire SPA using the migration-free breeding season

Displacement (%)	**Mortality rates (%)**															
	0	**1**	**2**	**3**	**4**	**5**	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	2	3	3	4	9	17	26	35	43	52	61	69	78	87
10	0	9	17	26	35	43	87	173	260	346	433	519	606	692	779	865
15	0	13	26	39	52	65	130	260	389	519	649	779	908	1,038	1,168	1,298
20	0	17	35	52	69	87	173	346	519	692	865	1,038	1,211	1,384	1,557	1,730
25	0	22	43	65	87	108	216	433	649	865	1,081	1,298	1,514	1,730	1,946	2,163
30	0	26	52	78	104	130	260	519	779	1,038	1,298	1,557	1,817	2,076	2,336	2,595
35	0	30	61	91	121	151	303	606	908	1,211	1,514	1,817	2,120	2,422	2,725	3,028
40	0	35	69	104	138	173	346	692	1,038	1,384	1,730	2,076	2,422	2,768	3,114	3,460
50	0	43	87	130	173	216	433	865	1,298	1,730	2,163	2,595	3,028	3,460	3,893	4,326
60	0	52	104	156	208	260	519	1,038	1,557	2,076	2,595	3,114	3,633	4,153	4,672	5,191
70	0	61	121	182	242	303	606	1,211	1,817	2,422	3,028	3,633	4,239	4,845	5,450	6,056
80	0	69	138	208	277	346	692	1,384	2,076	2,768	3,460	4,153	4,845	5,537	6,229	6,921
90	0	78	156	234	311	389	779	1,557	2,336	3,114	3,893	4,672	5,450	6,229	7,007	7,786
100	0	87	173	260	346	433	865	1,730	2,595	3,460	4,326	5,191	6,056	6,921	7,786	8,651
	░		<1% increase in baseline mortality			🟩	>1% baseline mortality threshold for latest population						🟥	>1% baseline mortality threshold for citation population		

8.5.3.2 Short-eared owl

8.5.3.2.1 Status

1521. The SPA population at classification was cited as six pairs in 1998 (Furness, 2015, Stroud *et al.*, 2016. The most recent count (2021) is three occupied territories on Skomer Island with these birds also seen on Skokholm Island (Pembrokeshire Bird Report, 2021).

8.5.3.2.2 Functional linkage and seasonal apportionment of potential effects

1522. Potential connectivity to the Short-eared owl feature of the SPA is limited to migration only. Short-eared owl migration is nomadic and so fluctuates depending on food availability and the sites available (Wright *et al*, 2012). When migrating, they can be found throughout UK waters as movements to the UK from overseas populations are evident in this species. Migration patterns of short-eared owls are relatively unknown, making impact assessment for the species difficult. In addition, although no short-eared owls were recorded within the site-specific surveys for the Project this does not mean that the species does not pass through the area. Due to limitations in detecting whether short-eared owls from this SPA that may fly through the Project area by day or night during migration periods, a precautionary approach is taken and connectivity is considered based on literature data sources of potential migratory flight lines (Wright *et al*, 2012).

8.5.3.2.3 Potential migratory collision risk effects of the qualifying feature in isolation

1523. Consideration of the potential migratory collision risk on qualifying features of SPAs screened in for assessment is provided in **Section 8.29**. As concluded within **Section 8.29**, the potential for **an AEoI to the conservation objectives of the short-eared owl feature of Skomer, Skokholm and the Seas off Pembrokeshire SPA in relation to collision risk from the Project can be ruled out**. Therefore, subject to natural change, short-eared owl will be maintained as a feature in the long term.

8.5.3.2.4 Potential effects on the qualifying feature in-combination with other projects

1524. Based on the migration corridors identified by Wright *et al* (2012) and the species migratory behaviour, it is assumed that there is no potential for migratory flights from the SPA to mainland Wales or England to intersect the Project and any other operational or proposed OWFs. **An AeoI to the conservation objectives of the short-eared owl feature of the Skomer, Skokholm and the Seas off Pembrokeshire SPA in relation to in-combination effects can therefore be ruled out**.

8.5.3.3 Seabird assemblage

8.5.3.3.1 Status

1525. The SPA population at classification was cited as regularly supporting 67,278 individual seabirds, including razorbill, guillemot, kittiwake, puffin, lesser black-backed gull, Manx shearwater and European storm-petrel.

8.5.3.3.2 Potential effects on the seabird assemblage

1526. Species-specific assessments were carried out for all qualifying features of the seabird assemblage screened in for assessment, as detailed above. For all qualifying features assessed it was concluded that there was **no potential for an AeoI from the Project alone or in-combination with other projects**. In relation to all other features of the seabird assemblage, no LSE was concluded at screening stage. Therefore, **an AEoI can confidently be ruled out for the seabird assemblage feature from the Project alone and in-combination with other projects** and, subject to natural change, the seabird assemblage feature will be maintained in the long term.

8.6 Grassholm SPA

1527. The Grassholm SPA boundary is located approximately 57km from the Project, while the seabird colony is located approximately 68km distant. The Project therefore does not directly overlap with the SPA boundary or any known cited of functional linkages.

8.6.1 Description of designation

1528. Grassholm Island is situated 10 miles off the Pembrokeshire coast. Grassholm SPA is the only colony of gannets in Wales and is the third largest gannetry in Britain and Ireland. It holds 8.6% of the Northeast Atlantic population and supports approximately 7% of the world population (Murray, 2015). Grassholm SPA was first classified in 1986. In 2014 the site was extended to include adjacent sea areas that are used by birds from within the existing SPA for behaviours that are directly linked to their use of the breeding site.

8.6.2 Conservation Objectives

The overarching conservation objectives for the gannet feature of the SPA is to ensure the conservation status of the qualifying feature is 'favourable'. With respect to the gannet feature of Grassholm SPA, it's 'favourable' conservation status can be assessed against the following objectives (NB: bold text indicates those objectives that are relevant to this assessment, based on the proximity of the SPA and functional linkages described above in relation to the Project.):

- Population dynamics data on the species indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats
- The natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future
- There is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

8.6.3 Appropriate Assessment

1529. One qualifying feature of this SPA is screened into the Appropriate Assessment (**Table 5.4**); gannet.

8.6.3.1 Gannet

8.6.3.1.1 Status

1530. The SPA population at classification was cited as 33,000 pairs in 1994/5 (Furness, 2015, Stroud *et al.*, 2016). The most recent count (2015) is 36,011 apparently occupied sites or 72,022 breeding adults (SMP, 2023).

1531. When considering a breeding adult baseline mortality rate of 0.081 (1-0.919, Horswill and Robinson (2015)), 5,346 and 5,834 breeding adults from the SPA population would be subject to natural mortality per annum, in relation to the citation and latest count respectively.

8.6.3.1.2 Functional linkage and seasonal apportionment of potential effects

1532. The Project is within the mean max plus one SD foraging distance of 315.2+194.2km (Woodward *et al*. 2019). Accordingly, this species is assessed for the full breeding (March to September), post-breeding migration (October to November) and return migration (December to February) seasons based on Furness (2015).

1533. As detailed in **Section 1449**, for gannet displacement is assessed based on the birds within the Windfarm Site plus 2km buffer with a displacement rate of 60-80% and a mortality rate of 1-10% for operational and maintenance phase impacts as recommended in the Joint SNCB interim guidance on displacement (Updated, 2022). The focus of this assessment is on the Applicant's position of a 1% mortality rate, which is considered to represent a realistic, yet precautionary, assessment based on SNCBs guidance and additional evidence presented within **Section 1449**. However, the standard SNCB's maximum displacement mortality rate of 10% is also provided for each assessment. The level of abundance apportioned is presented in **Table 8.17**.

1534. For collision risk, impacts have apportioned for the worst-case scenario design as detailed in **Section 8.3** and presented in **Table 8.17**.

1535. Further detail of how the level of impact apportioned to each SPA is derived, is presented within **Appendix 13.A: Offshore Ornithology Technical Report** and **Appendix 13.C: Revised Collision Risk Modelling** of the Offshore ES.

Table 8.17 Gannet level of abundance and collision risk apportioned to Grassholm SPA seasonally

Season	Level of apportionment (%)	Apportioned Abundance (breeding adults)	Apportioned collision risk (breeding adults)
Full Breeding (Mar-Sep)	52.08	124.5	2.0
Post-breeding migration (Oct-Nov)	14.39	20.3	0.2
Return migration (Dec-Feb)	11.87	9.0	0.1

8.6.3.1.3 Construction and decommissioning phase potential disturbance and displacement effects on the qualifying feature in isolation

1536. During the construction and decommissioning phase, the potential level of impact apportioned to the SPA seasonally is summarised in **Table 8.18** for both the Applicant's and SNCB's assumed preferred approach. Details on selection of appropriate displacement and mortality rates for construction and decommissioning phase assessments is provided in **Section 1449**.

1537. The potential impact of the loss of less than a single (0.5 - 0.6, see **Table 8.18**) additional breeding adult on an annual basis to the Grassholm SPA (with a classified population of 66,000 breeding adults and an annual background mortality of 5,346 breeding adults) would represent a 0.009 – 0.012% increase in baseline mortality rate annually.

1538. However, as the population of gannets has increased since the citation population count the potential impact on the population is more reasonably assessed against the latest population count undertaken in 2015, which was 72,022 breeding adults. On this basis, when considering the potential impact of this loss to Grassholm SPA (with an annual background mortality of 5,834 breeding adults) then the prediction of less than a single breeding adult suffering displacement consequent mortality would represent a 0.008 – 0.011% increase in baseline mortality rate annually.

Table 8.18 Summary of gannet construction and decommissioning phase disturbance and displacement impacts apportioned to Grassholm SPA

Population Size (Breeding adults)	**Season**	**Applicant's / SNCB's assumed minimum approach disturbance and displacement impact**		**SNCBs assumed maximum approach disturbance and displacement impact**	
		30-40% Disp; 1% Mort (Breeding adults per annum)	Increase in baseline mortality rate (%)	30-40% Disp; 10% Mort (Breeding adults per annum)	Increase in baseline mortality rate (%)
Citation (66,000)	Full breeding	0.4 – 0.5	0.007 – 0.009	3.7 – 5.0	0.070 – 0.093
	Post-breeding migration	0.1 – 0.1	0.001 – 0.002	0.6 – 0.8	0.011 – 0.015
	Return migration	0.0 – 0.0	0.001 – 0.001	0.3 – 0.4	0.005 – 0.007
	Annual	0.5 – 0.6	0.009 – 0.012	4.6 – 6.2	0.086 – 0.115
Latest Count (72,022)	Full breeding	0.4 – 0.5	0.006 – 0.009	3.7 – 5.0	0.064 – 0.085
	Post-breeding migration	0.1 – 0.1	0.001 – 0.001	0.6 – 0.8	0.010 – 0.014
	Return migration	0.0 – 0.0	0.000 – 0.001	0.3 – 0.4	0.005 – 0.006
	Annual	0.5 – 0.6	0.008 – 0.011	4.6 – 6.2	0.079 – 0.105

1539. The addition of less than a single possible additional breeding adult mortality per annum equates to a 0.012% increase in baseline mortality rate at most, when considering either the citation or the latest colony count. This level of impact would be indistinguishable from natural fluctuations in the population. The potential for **an AEoI to the conservation objectives of the gannet feature of Grassholm SPA in relation to disturbance and displacement effects in the construction and decommissioning phase from the Project alone can be ruled out**. Therefore, subject to natural change, gannet will be maintained as a feature in the long term.

8.6.3.1.4 Operational and maintenance phase potential disturbance and displacement effects on the qualifying feature in isolation

1540. During the operation and maintenance phase the potential level of impact apportioned to the SPA seasonally is summarised in **Table 8.19** for both the Applicant's and SNCB's assumed preferred approach. A displacement matrix (**Table 8.20**) is also presented for the annual apportioned abundance for the Windfarm Site plus 2km buffer to Grassholm SPA.

1541. The potential impact of the loss of approximately a single (0.9 - 1.2, see **Table 8.19**) additional breeding adult on an annual basis to the Grassholm SPA (with a classified population of 66,000 breeding adults and an annual background mortality of 5,346 breeding adults) would represent a 0.017 – 0.023% increase in baseline mortality rate annually.

1542. However, as the population of gannets has increased since the citation population count the potential impact on the population is more reasonably assessed against the latest population count undertaken in 2015, which was 72,022 breeding adults. On this basis, when considering the potential impact of this loss to Grassholm SPA (with an annual background mortality of 5,834 breeding adults) then the prediction of one breeding adult suffering displacement consequent mortality would represent a 0.016 – 0.021% increase in baseline mortality rate annually.

1543. The addition of up to one possible additional breeding adult mortalities per annum equates to a 0.023% increase in baseline mortality rate at most, when considering either the citation or the latest colony count. This level of impact would be indistinguishable from natural fluctuations in the population. The potential for **an AEoI to the conservation objectives of the gannet feature of Grassholm SPA in relation to disturbance and displacement effects in the operation and maintenance phase from the Project alone can be ruled out**. Therefore, subject to natural change, gannet will be maintained as a feature in the long term.

8.6.3.1.5 Operational and maintenance phase potential collision risk impacts on the qualifying feature in isolation

1544. As detailed in **Table 8.21** the annual predicted gannet collision resultant mortality due to the operation of the Project is two (2.3) breeding adults per annum. This represents an increase of 0.043% when considering the 66,000 citation population (with an annual background mortality of 5,346) or an increase of 0.040% when considering the recent 2015 colony count (72,022 breeding adults with an annual background mortality of 5,834) annually.

1545. If a macro-avoidance rate of 70% is considered for gannet, the annual predicted collision resultant mortality as a result of the operation of the Project is less than a single (0.7) breeding adult per annum (**Table 8.21**). This represents a baseline mortality rate increase of 0.013% when considering the citation population or an increase of 0.012% when considering the recent 2015 colony count annually.

1546. The addition of two possible additional breeding adult mortalities per annum equates to 0.043% increase in baseline mortality rate at most, when considering either the citation or the latest colony count. This level of impact would be indistinguishable from the natural fluctuations in the population. The potential for **an AEoI to the conservation objectives of the gannet feature of Grassholm SPA in relation to collision risk in the operation and maintenance phase from the Project alone can be ruled out**. Therefore, subject to natural change, gannet will be maintained as a feature in the long term.

8.6.3.1.6 Operational and maintenance phase potential combined displacement and collision risk impacts on the qualifying feature in isolation

1547. As presented within **Table 8.19** and **Table 8.21** the combined displacement and collision risk impacts apportioned to the gannet feature of Grassholm SPA, equates to approximately three (3.2 – 3.5) additional breeding adult mortalities on an annual basis (when considering a displacement rate of 60-80% and a mortality rate of 1%). This represents a baseline mortality rate increase of 0.060-0.066% when considering the citation population or an increase of 0.055-0.061% when considering the recent 2015 colony count annually.

1548. If macro avoidance is considered, the combined displacement and collision risk impacts apportioned to the gannet feature of Grassholm SPA, is reduced to approximately two (1.6 – 1.9) additional breeding adult mortalities on an annual basis (when considering a displacement rate of 60-80% and a mortality rate of 1%). This represents a baseline mortality rate increase of 0.030-0.036% when considering the citation population or an increase of 0.028-0.033% when considering the recent 2015 colony count annually.

Table 8.19 Summary of gannet operation and maintenance phase disturbance and displacement impacts apportioned to Grassholm SPA

Population Size (Breeding adults)	Season	Applicant's / SNCB's assumed minimum approach disturbance and displacement impact		SNCBs assumed maximum approach disturbance and displacement impact	
		60-80% Disp; 1% Mort (Breeding adults per annum)	Increase in baseline mortality rate (%)	60-80% Disp; 10% Mort (Breeding adults per annum)	Increase in baseline mortality rate (%)
Citation (66,000)	Full breeding	0.8 – 1.0	0.014 – 0.019	7.5 – 10.0	0.140 – 0.186
	Post-breeding migration	0.1 – 0.2	0.002 – 0.003	1.2 – 1.6	0.023 – 0.030
	Return migration	0.1 – 0.1	0.001 – 0.001	0.5 – 0.7	0.010 – 0.014
	Annual	0.9 – 1.2	0.017 – 0.023	9.2 – 12.2	0.173 – 0.230
Latest Count (72,022)	Full breeding	0.8 – 1.0	0.013 – 0.017	7.5 – 10.0	0.128 – 0.171
	Post-breeding migration	0.1 – 0.2	0.002 – 0.003	1.2 – 1.6	0.021 – 0.028
	Return migration	0.1 – 0.1	0.001 – 0.001	0.5 – 0.7	0.009 – 0.012
	Annual	0.9 – 1.2	0.016 – 0.021	9.2 – 12.2	0.158 – 0.211

Table 8.20 Gannet operation and maintenance phase disturbance annual displacement matrix for impacts apportioned to Grassholm SPA

Displacement (%)	**Mortality rates (%)**															
	0	**1**	**2**	**3**	**4**	**5**	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	2
10	0	0	0	0	1	1	2	3	5	6	8	9	11	12	14	15
15	0	0	0	1	1	1	2	5	7	9	12	14	16	18	21	23
20	0	0	1	1	1	2	3	6	9	12	15	18	22	25	28	31
25	0	0	1	1	2	2	4	8	12	15	19	23	27	31	35	38
30	0	0	1	1	2	2	5	9	14	18	23	28	32	37	42	46
35	0	1	1	2	2	3	5	11	16	22	27	32	38	43	48	54
40	0	1	1	2	2	3	6	12	18	25	31	37	43	49	55	62
50	0	1	2	2	3	4	8	15	23	31	38	46	54	62	69	77
60	0	1	2	3	4	5	9	18	28	37	46	55	65	74	83	92
70	0	1	2	3	4	5	11	22	32	43	54	65	75	86	97	108
80	0	1	2	4	5	6	12	25	37	49	62	74	86	98	111	123
90	0	1	3	4	6	7	14	28	42	55	69	83	97	111	125	138
100	0	2	3	5	6	8	15	31	46	62	77	92	108	123	138	154

	🟩	<1% increase in baseline mortality	■	>1% baseline mortality threshold for latest population	☐	>1% baseline mortality threshold for citation population

Table 8.21 Summary of gannet operation and maintenance phase collision risk impacts apportioned to Grassholm SPA

Population Size (Breeding adults)	**Season**	**Collision risk impact**		**Collision risk impact using a 70% macro-avoidance rate**	
		Breeding adults per annum	Increase in baseline mortality rate (%)	Breeding adults per annum	Increase in baseline mortality rate (%)
Citation (66,000)	Full breeding	2.0	0.037	0.6	0.011
	Post-breeding migration	0.2	0.002	0.1	0.001
	Return migration	0.1	0.002	0.0	0.001
	Annual	2.3	0.043	0.7	0.013
Latest Count (72,022)	Full breeding	2.0	0.034	0.6	0.010
	Post-breeding migration	0.2	0.002	0.1	0.000
	Return migration	0.1	0.002	0.0	0.000
	Annual	2.3	0.043	0.7	0.012

1549. The addition of two to three possible additional breeding adult mortalities per annum equates to 0.066% increase in baseline mortality rate at most, when considering either the citation or the latest colony count. This level of impact would be indistinguishable from the natural fluctuations in the population. The potential for **an AEoI to the conservation objectives of the gannet feature of Grassholm SPA in relation to combined displacement and collision risk in the operation and maintenance phase from the Project alone can be ruled out**. Therefore, subject to natural change, gannet will be maintained as a feature in the long term.

8.6.3.1.7 Consideration of entanglement with mooring lines

1550. Consideration of the potential impact of entanglement with mooring lines on the ornithology qualifying features of SPAs screened in for assessment is provided in **Section 8.27**. As presented within **Section 8.27**, the potential for **an AEoI to the conservation objectives of the gannet feature of Grassholm SPA in relation to entanglement of mooring from the Project can be ruled out**. Therefore, subject to natural change, gannet will be maintained as a feature in the long term.

8.6.3.1.8 Potential effects on the qualifying feature in-combination with other projects

1551. The in-combination assessment totals with respect to displacement and collision risk are presented in **Table 8.22** and **Table 8.25** for all consented and planned projects with potential connectivity to the gannet feature of Grassholm SPA. Due to the age of developments in the Western Waters region of sea which have the potential to have an in-combination impact upon qualifying features, few have comparable datasets upon which to base an assessment. Many of the older developments did not address in-combination effects as fully as is required presently, also those developments which are still in planning have not released their data into the public domain to be included within impact assessments. As such the in-combination assessment is carried out with the fullest dataset available whilst acknowledging that further in-combination effects may occur from existing or planned developments.

Construction and decommissioning phase - disturbance and displacement

1552. When considering the construction and decommissioning phase, as detailed above, the potential level of impact for the Project alone on gannet was concluded as trivial and inconsequential. As this level of effect would be well within the error margins of the assessment there is no potential for any contribution for an in-combination effect to occur within the construction and decommissioning phase.

Operation and maintenance phase – disturbance and displacement

1553. Gannet has been screened into the assessment of the operational and maintenance phase due to potential impacts from disturbance and displacement from the Project in-combination with other projects.

1554. The in-combination totals are presented in **Table 8.11** for all consented and planned projects with potential connectivity to the gannet feature of Grassholm SPA. Due to the age of developments in the Western Waters region of sea which have the potential to have an in-combination impact upon qualifying features, few have comparable datasets upon which to base an assessment. Many of the older developments did not address in-combination effects as fully as is required presently, also those developments which are still in planning have not released their data into the public domain to be included within impact assessments. As such the in-combination assessment is carried out with the fullest dataset available whilst acknowledging that further in-combination effects may occur from existing or planned developments.

1555. The in-combination totals presented within **Table 8.22** are primarily derived from the project totals presented Awel y Môr (RWE, 2022) RIAA. With respect to Erebus apportioned project totals, the values presented are based on the final consented project abundance totals advocated by NRW (pers comms).

1556. An in-combination displacement matrix for the annual impacts for the gannet feature of Grassholm SPA is presented in **Table 8.24**.

1557. The annual in-combination total predicted impact apportioned to Grassholm SPA for all projects equates to three to four (3.2 – 4.3) breeding adults per annum (when applying a 60 - 80 % displacement rate and 1% mortality rate, see **Section 1449** for rationale).

1558. When considering the potential impact of the loss of three to four additional breeding adults (see **Table 8.23)** on an annual basis to the Grassholm SPA (with a classified population of 66,000 breeding adults and an annual background mortality of 5,346 breeding adults) would represent a 0.060 – 0.080% increase in baseline mortality rate annually.

1559. However, as the population of gannet has increased since the citation population count the potential impact on the population is more reasonably assessed against the latest population count undertaken in 2015, which was 72,022 breeding adults. On this basis, when considering the potential impact of this loss to Grassholm SPA (with an annual background mortality of 5,834) then the prediction of three to four breeding adults suffering in-combination displacement consequent mortality would represent a 0.055 – 0.073% increase in baseline mortality rate annually.

1560. The addition of up to four possible additional breeding adult mortalities per annum equates to a 0.080% increase in baseline mortality rate at most, when considering either the citation or the latest colony count. This level of impact would be indistinguishable from natural fluctuations in the population. The potential for **an AEoI to the conservation objectives of the gannet feature of Grassholm SPA in relation to in-combination disturbance and displacement effects in the operation and maintenance phase from the Project can be ruled out**. Therefore, subject to natural change, gannet will be maintained as a feature in the long term.

1561. A summary of the predicted seasonal impacts and resulting increase in baseline mortality rate following the Applicant's and SNCBs approach with respect to displacement and mortality rates if provided in **Table 8.23** for the gannet feature of Grassholm SPA.

Operation and maintenance phase – collision risk

1562. Gannet has been screened into the assessment of the operational and maintenance phase due to potential impacts from collision risk from the Project in-combination with other projects.

1563. The in-combination totals presented within **Table 8.25** are primarily derived from the project totals presented within Awel y Môr (RWE, 2022) RIAA, based on BO2 values for all projects included. With respect to Erebus apportioned project totals, the values presented are based on the final consented project collision totals advocated by NRW (pers comms).

1564. The annual in-combination total predicted additional mortalities apportioned to Grassholm SPA for all projects equates to 12 (11.9) breeding adults per annum.

1565. When considering the potential impact of the loss of 12 additional breeding adults when considering the impacts summarised in **Table 8.26** on an annual basis to the Grassholm SPA (classified gannet population of 66,000 breeding adults, with an annual background mortality of 5,346 breeding adults), would represent a 0.222% increase in baseline mortality rate annually.

Table 8.22 In-combination abundance totals for gannet to the Grassholm SPA

Project	**Return-migration season**	**Breeding season**	**Post-breeding migration**	**Annual**	**Tier**
Arklow	-	-	-	-	1
Barrow	-	-	-	-	1
Burbo Bank	-	-	-	-	1
Burbo Bank Extension	-	-	-	-	1
Gwynt y Môr	-	-	-	-	1
North Hoyle	-	-	-	-	1
Ormonde	-	-	-	-	1
Rhyl Flats	-	-	-	-	1
Robin Rigg	-	-	-	-	1
Walney Phase 1	-	-	-	-	1
Walney Phase 2	-	-	-	-	1
Walney Extension	-	-	-	-	1
West of Duddon Sands	-	-	-	-	1
Morlais Demonstration Zone Phase One	-	-	-	-	2
TwinHub	-	-	-	-	3
Erebus	12	223	49	284	3
Total (consented)	**12**	**223**	**49**	**284**	
White Cross	9	125	20	154	4
Total consented + White Cross	**21**	**348**	**69**	**438**	
AyM	0	65	29	94	4
Morgan OWF	-	-	-	-	5
Mona OWF	-	-	-	-	5
Morecombe OWF	-	-	-	-	5
Total all projects	**21**	**412**	**98**	**531**	

Table 8.23 Summary of predicted disturbance and displacement consequential mortality apportioned to the gannet feature of Grassholm SPA for the Project in-combination

Population Size (Breeding adults)	Season	Applicant's / SNCB's assumed minimum approach disturbance and displacement impact		SNCBs assumed maximum approach disturbance and displacement impact	
		60 - 80% Disp; 1% Mort (Breeding adults per annum)	Increase in baseline mortality rate (%)	60 - 80% Disp; 10% Mort (Breeding adults per annum)	Increase in baseline mortality rate (%)
Citation (66,000)	Breeding	2.5 – 3.3	0.046 – 0.062	24.7 – 33.0	0.463 – 0.617
	Post-breeding migration	0.6 – 0.8	0.011 – 0.015	5.9 – 7.9	0.110 – 0.147
	Return migration	0.1 – 0.2	0.002 – 0.003	1.3 – 1.7	0.024 – 0.031
	Annual	3.2 – 4.3	0.060 – 0.080	31.9 – 42.5	0.596 – 0.795
Latest Count (72,022)	Breeding	2.5 – 3.3	0.042 – 0.057	24.7 – 33.0	0.424 – 0.565
	Post-breeding migration	0.6 – 0.8	0.010 – 0.013	5.9 – 7.9	0.101 – 0.135
	Return migration	0.1 – 0.2	0.002 – 0.003	1.3 – 1.7	0.022 – 0.029
	Annual	3.2 – 4.3	0.055 – 0.073	31.9 – 42.5	0.546 – 0.729

Table 8.24 Annual in-combination displacement matrix for gannet for Grassholm SPA

Displacement (%)	**Mortality rates (%)**															
	0	**1**	**2**	**3**	**4**	**5**	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	1	1	2	2	3	3	4	4	5	5
10	0	1	1	2	2	3	5	11	16	21	27	32	37	43	48	53
15	0	1	2	2	3	4	8	16	24	32	40	48	56	64	72	80
20	0	1	2	3	4	5	11	21	32	43	53	64	74	85	96	106
25	0	1	3	4	5	7	13	27	40	53	66	80	93	106	120	133
30	0	2	3	5	6	8	16	32	48	64	80	96	112	128	143	159
35	0	2	4	6	7	9	19	37	56	74	93	112	130	149	167	186
40	0	2	4	6	9	11	21	43	64	85	106	128	149	170	191	213
50	0	3	5	8	11	13	27	53	80	106	133	159	186	213	239	266
60	0	3	6	10	13	16	32	64	96	128	159	191	223	255	287	319
70	0	4	7	11	15	19	37	74	112	149	186	223	260	298	335	372
80	0	4	9	13	17	21	43	85	128	170	213	255	298	340	383	425
90	0	5	10	14	19	24	48	96	143	191	239	287	335	383	430	478
100	0	5	11	16	21	27	53	106	159	213	266	319	372	425	478	531

▢	<1% increase in baseline mortality	■	>1% baseline mortality threshold for latest population	🟥	>1% baseline mortality threshold for citation population

Table 8.25 In-combination predicted collision mortality totals for gannet to the Grassholm SPA

Project	Return-migration season	Breeding season	Post-breeding migration	Annual	Tier
Arklow	-	-	-	-	1
Barrow	-	-	-	-	1
Burbo Bank	-	-	-	-	1
Burbo Bank Extension	-	-	-	-	1
Gwynt y Môr	-	-	-	-	1
North Hoyle	-	-	-	-	1
Ormonde	-	-	-	-	1
Rhyl Flats	-	-	-	-	1
Robin Rigg	-	-	-	-	1
Walney Phase 1	-	-	-	-	1
Walney Phase 2	-	-	-	-	1
Walney Extension	-	-	-	-	1
West of Duddon Sands	-	-	-	-	1
Morlais Demonstration Zone Phase One	-	-	-	-	2
TwinHub	-	-	-	-	3
Erebus	0.1	5.1	0.1	5.4	3
Total (consented)	**0.1**	**5.1**	**0.1**	**5.4**	
White Cross	0.1	2	0.2	2.3	4
Total consented + White Cross	**0.2**	**7.12**	**0.33**	**7.66**	
AyM	-	4.2	-	4.2	4
Morgan OWF	-	-	-	-	5
Mona OWF	-	-	-	-	5
Morecombe OWF	-	-	-	-	5
Total all projects	**0.2**	**11.3**	**0.3**	**11.9**	

Table 8.26 Summary of predicted collision consequential mortality apportioned to the gannet feature of Grassholm SPA for the Project in-combination

Population Size (Breeding adults)	**Season**	**Collision risk impact**	
		Breeding adults per annum	Increase in baseline mortality rate (%)
Citation (66,000)	Breeding	11.3	0.212
	Post-breeding migration	0.3	0.006
	Return migration	0.2	0.004
	Annual	11.9	0.222
Latest Count (72,022)	Breeding	11.3	0.194
	Post-breeding migration	0.3	0.006
	Return migration	0.2	0.004
	Annual	11.9	0.203

1567. As the population of gannet has changed significantly since the citation population count the potential impact on the population is more reasonably assessed against the latest population count undertaken in 2015, which was 72,022 breeding adults. On this basis, when considering the potential impact of this loss to Grassholm SPA (with an annual background mortality of 5,834), would represent a 0.203% increase in baseline mortality rate annually.

1568. The addition of up to 12 possible additional breeding adult mortalities per annum equates to a 0.222% increase in baseline mortality rate at most, when considering either the citation or the latest colony count. This level of impact would be indistinguishable from natural fluctuations in the population. The potential for **an AEoI to the conservation objectives of the gannet feature of Grassholm SPA in relation to in-combination collision risk in the operation and maintenance phase from the Project can be ruled out**. Therefore, subject to natural change, gannet will be maintained as a feature in the long term.

1569. A summary of the predicted seasonal impacts and resulting increase in baseline mortality rate with respect to collision risk and mortality rates is provided in **Table 8.26** for the gannet feature of Grassholm SPA.

Operation and maintenance phase – Combined displacement and collision

1570. As presented within **Table 8.23** and **Table 8.26** the combined displacement and collision risk in-combination impacts apportioned to the gannet feature of Grassholm SPA, equates to approximately 15 to 16 (15.0 – 16.1) additional breeding adult mortalities on an annual basis (when considering a displacement rate of 60-80% and a mortality rate of 1%). This represents a baseline mortality rate increase of 0.281-0.301% when considering the citation population or an increase of 258-0.276% when considering the recent 2015 colony count annually.

1571. The addition of 15 to 16 possible additional breeding adult mortalities per annum equates to 0.301% increase in baseline mortality rate at most, when considering either the citation or the latest colony count. This level of impact would be indistinguishable from the natural fluctuations in the population. The potential for **an AEoI to the conservation objectives of the gannet feature of Grassholm SPA in relation to combined displacement and collision risk in the operation and maintenance phase from the Project in-combination can be ruled** out. Therefore, subject to natural change, gannet will be maintained as a feature in the long term.

8.7 Burry Inlet SPA and Ramsar Site

1572. The Bury Inlet SPA boundary is located approximately 85km from the Project, while the seabird colony within the SPA is located approximately 88km from the Project. The Project, therefore, does not directly overlap with the SPA boundary or any cited areas with functional linkages.

8.7.1 Description of designation

1573. The Burry Inlet is a large estuarine complex; it includes extensive areas of intertidal sand- and mudflats, together with large sand dune systems at the mouth of the estuary. The site contains the largest continuous area of saltmarsh in Wales (2,200ha). The estuary experiences wide tidal fluctuations (about 8m), which has the consequence of exposing a large extent of intertidal sediments on a regular basis. These are mostly sandy, but muddy substrates are to be found in more sheltered areas. In places, the extensive mud and sandflats support substantial populations of marine invertebrate species, which provide an important food source for the large numbers of overwintering waterfowl. It is the most important wholly Welsh estuary for overwintering waterfowl and is particularly significant for oystercatcher.

8.7.2 Conservation Objectives

1574. The overarching conservation objectives for the qualifying feature of the SPA is to ensure the conservation status of the qualifying features is 'favourable'. With respect to Burry Inlet SPA, a species 'favourable' conservation status can be assessed against the following objectives (NB: bold text indicates those objectives that are relevant to this assessment, based on the proximity of the SPA and functional linkages described above in relation to the Project):

- population dynamics data on the species indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats
- The natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future
- There is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

8.7.3 Appropriate Assessment

8.7.3.1 Status

1575. The status of each qualifying feature screened in for Appropriate Assessment for this site is presented in **Table 8.27**. This consists of the site population at designation, latest five-year peak mean count (Frost *et al.*, 2020) and national population in 2012 (Wright *et al.*, 2012).

Table 8.27 Information to inform appropriate assessment for Burry Inlet SPA and Ramsar site, along with conclusions for AEoI

Qualifying Feature	GB Population (Wright *et al.*, 2012)	SPA Population (Citation/standard data form)	Ramsar Site Population (Citation)	Five Year Peak Mean; 2015/16-2019/20
Curlew (nb)	140,000	1,500		1,457
Dunlin (nb)	350,000	8,200		4,486
Grey plover (nb)	43,000	660		151
Knot (nb)	320,000	4,300		4,897
Oystercatcher (nb)	320,000	16,900	14,861	14,784
Pintail (nb)	29,000	1,900	2,687	958
Redshank (nb)	120,000	1,200		643
Shelduck (nb)	61,000	1,500		801
Shoveler (nb)	18,000	230	(467)	92
Teal (nb)	210,000	1,000		330
Turnstone (nb)	48,000	470		17
Wigeon (nb)	61,000	6,200		956

8.7.3.1.1 Potential migratory collision risk effects in isolation

1576. Consideration of the potential migratory collision risk on qualifying features of SPAs screened in for assessment is provided in **Section 8.29**. As concluded within **Section 8.29**, the potential for **an AEoI to the conservation objectives of the qualifying features of Burry Inlet SPA in relation to collision risk from the Project can be ruled out**. Therefore, subject to natural change, all qualifying features assessed will be maintained as a feature in the long term.

8.7.3.1.2 Potential effects on the qualifying feature in-combination with other projects

1577. The migration corridors identified by Wright *et al* (2012) are widespread across all UK waters for the waterbird species screened in. Therefore, it is presumed that migration activity of all waterbird species screened in for this SPA is low across any given OWF. As such it is assumed that limited collision risk is predicted for any specific OWF and when added together, the very small number of birds potentially colliding with WTGs at each OWF is still likely to be very low. The number predicted to be associated with the Project area is considered smaller still given its limited size and the number of WTGs being at most eight. It is considered that this level of effect would not be detectable for any waterbird species screened in and assessed for this SPA. Therefore, **no AEoI is concluded for in-combination migratory collision mortality for all waterbird species from this SPA** considered by this assessment.

8.8 Tamar Estuaries Complex SPA

1578. The Tamar Estuaries Complex SPA boundary is located approximately 97km from the Project. The Project therefore does not directly overlap with the SPA boundary or any cited areas of functional linkages.

8.8.1 Description of designation

1579. The Tamar Estuaries Complex SPA includes estuaries bordering Devon and Cornwall on the south coast of England, comprising the rivers Tamar, Lynher and Tavy. The Tamar River and its tributaries provide the main input of fresh water into the estuary complex and form a ria (drowned river valley) with Plymouth lying on the eastern shore. Intertidal sand, mudflats, and areas of saltmarsh support nationally important numbers of wintering and passage waterfowl.

8.8.2 Conservation Objectives

1580. The SPA's conservation objectives are to ensure that, subject to natural change, the integrity of the site is maintained or restored as appropriate, and that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring (NB: bold text indicates those objectives that are relevant to this assessment, based on the proximity of the SPA and functional linkages described above in relation to the Project):

- The extent and distribution of the habitats of the qualifying features
- The structure and function of the habitats of the qualifying features
- The supporting processes on which the habitats of the qualifying features rely
- The populations of each of the qualifying features
- The distribution of qualifying features within the site.

8.8.3 Appropriate Assessment

1581. The qualifying features of this SPA site screened into the Appropriate Assessment are listed in **Table 8.28**. This consists of the site population at designation and national population in 2012 (Wright *et al.*, 2012).

Table 8.28 Information to inform appropriate assessment for Tamar Estuaries Complex SPA, along with conclusions for AEoI

Qualifying Feature	GB Population (Wright *et al*., 2012)	SPA Population (Citation/standard data form)
Avocet (nb)	7,500	194
Little egret (nb)	4,500	102

8.8.3.1.1 Potential migratory collision risk effects in isolation

1582. Consideration of the potential migratory collision risk on qualifying features of SPAs screened in for assessment is provided in **Section 8.29**. As concluded within **Section 8.29**, the potential for **an AEoI to the conservation objectives of the qualifying features of Tamar Estuaries Complex SPA in relation to collision risk from the Project can be ruled out**. Therefore, subject to natural change, all qualifying features assessed will be maintained as a feature in the long term.

8.8.3.1.2 Potential effects on the qualifying feature in-combination with other projects

1583. The migration corridors identified by Wright *et al* (2012) are widespread across all UK waters for the waterbird species screened in. Therefore, it is presumed that migration activity of all waterbird species screened in for this SPA is low across any given OWF. As such it is assumed that limited collision risk is predicted for any specific OWF and when added together, the very small number of birds potentially colliding with WTGs at each OWF is still likely to be very low. The number predicted to be associated with the Project area is considered smaller still given its limited size and the number of WTGs being at most eight. It is considered that this level of effect would not be detectable for any waterbird species screened in and assessed for this SPA. Therefore, **no AEoI is concluded for in-combination migratory collision mortality for all waterbird species from this SPA** considered by this assessment.

8.9 Glannau Aberdaron ac Ynys Enlli / Aberdaron Coast and Bardsey Island SPA

1584. The Glannau Aberdaron ac Ynys Enlli / Aberdaron Coast and Bardsey Island SPA boundary is located approximately 165km from the Project, while the seabird colony is located approximately 170km from the Project. The Project therefore does not directly overlap with the SPA boundary or any cited areas of functional linkages.

8.9.1 Description of designation

1585. Aberdaron Coast and Bardsey Island is located at the very tip of the Llŷn Peninsula in north-west Wales. The site consists of Ynys Enlli / Bardsey Island and a length of adjacent coastline together with two small islands Ynysoedd y Gwylanod/ Gwylan Islands, in addition to an area of sea extending approximately 9km out from Bardsey. The coastline is rocky, with many crags and low cliffs, heather-covered hills and grassy valleys in a distinctive landscape of small fields and "cloddiau" (stone-faced banks). The site supports a population of chough which depend on the low intensity pastoral management of this mix of habitats. Bardsey Island holds a large breeding colony of Manx shearwaters which forage widely across the ocean and also loaf on adjacent areas of the sea for a number of essential activities, such as preening, bathing and displaying, before attempting their hazardous approach to the nest site after nightfall.

8.9.2 Conservation Objectives

1586. The overarching conservation objectives for the qualifying feature of the SPA is to ensure the conservation status of the qualifying feature is 'favourable'. With respect to Aberdaron Coast and Bardsey Island SPA, a species 'favourable' conservation status can be assessed against the following objectives (NB: bold text indicates those objectives that are relevant to this assessment, based on the proximity of the SPA and functional linkages described above in relation to the Project):

- population dynamics data on the species indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats
- The natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future
- There is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

8.9.3 Appropriate Assessment

1587. One qualifying feature of this SPA site is screened into the Appropriate Assessment (**Table 5.4**); Manx shearwater.

8.9.3.1 Manx shearwater

8.9.3.1.1 Status

1588. The SPA population is cited as 6,930, in 1996. The most recent count (2001) is 16,183 apparently occupied sites (burrows or crevices), or 32,366 breeding adults (SMP, 2023).

1589. Based on the cited SPA population of breeding adults, and an annual breeding adult baseline mortality rate of 0.13 (1-0.870, Horswill and Robinson (2015)), 1,802 breeding adults from the SPA population would be subject to natural mortality per annum.

1590. Based on the most recent SPA population of breeding adults, and an annual breeding adult baseline mortality rate of 0.13 (1-0.870, Horswill and Robinson (2015)), 4,208 breeding adults from the SPA population would be subject to natural mortality per annum.

8.9.3.1.2 Functional linkage and seasonal apportionment of potential effects

1591. The Project is within the mean max plus one SD foraging distance of 1,346+1,018.7km (Woodward *et al*. 2019). Accordingly, this species is assessed for the full breeding (April to August), post-breeding migration (September to October) and return migration (March) seasons based on Furness (2015), with the level of abundance apportioned for the Windfarm Site plus 2km buffer to Aberdaron Coast and Bardsey Island SPA presented in **Table 8.29**.

1592. As detailed in **Section 1449**, for Manx shearwater a displacement distance of the Windfarm Site plus a 2km buffer has been assessed as recommended in the Joint SNCB interim guidance on displacement (Updated, 2022). The focus of assessments is based on the Applicant's position of a 10% displacement rate and a 1% mortality rate, which is considered to represent a realistic, yet precautionary, assessment based on SNCBs guidance and additional evidence presented within **Section 1449**. However, the standard SNCB's maximum displacement mortality rate of 10% is also provided for each assessment.

Table 8.29 Manx shearwater level of abundance apportioned to Aberdaron Coast and Bardsey Island SPA when considering the full breeding season

Season	Level of apportionment (%)	Apportioned Abundance (breeding adults)
Full Breeding (Apr-Aug)	0.28	34.3
Post-breeding migration (Sept-Oct)	2.05	0.5
Return migration (Mar)	2.05	0.7

1593. As detailed within **Appendix 13.A: Offshore Ornithology Technical Report** and **Appendix 13.C: Revised Collision Risk Modelling** of the Offshore ES for Aberdaron Coast and Bardsey Island SPA, an additional apportionment process has also been undertaken for the migration-free breeding (June to July), post-breeding migration (August to October) and return migration (March to May) seasons based on Furness (2015). The level of abundance apportioned for the Windfarm Site plus 2km buffer to Aberdaron Coast and Bardsey Island SPA presented in **Table 8.30**.

Table 8.30 Manx shearwater level of abundance apportioned to Aberdaron Coast and Bardsey Island SPA when considering the migration-free breeding season

Season	Level of apportionment (%)	Apportioned Abundance (breeding adults)
Migration free breeding (Jun-Jul)	0.33	10.1
Post-breeding migration (Aug-Oct)	2.05	10.3
Return migration (Mar-May)	2.05	206.1

1594. Further detail of how the level of impact apportioned to each SPA is derived, is presented within **Appendix 13.A: Offshore Ornithology Technical Report** and **Appendix 13.C: Revised Collision Risk Modelling** of the Offshore ES.

8.9.3.1.3 Construction and decommissioning phase potential disturbance and displacement effects on the qualifying feature in isolation

1595. During the construction and decommissioning phase, the potential level of impact apportioned to the SPA seasonally is summarised in **Table 8.31** when considering the full breeding season and in **Table 8.32** when considering the migration-free breeding season for both the Applicant's and SNCB's assumed preferred approach. Details on selection of appropriate displacement and mortality rates for construction and decommissioning phase assessments is provided in **Section 1449**.

1596. The potential impact of the loss of less than a single (<0.1 or 0.1, see **Table 8.31** or **Table 8.32**) additional breeding adult on an annual basis to the Aberdaron Coast and Bardsey Island SPA (with a classified population of 13,860 breeding adults and an annual background mortality of 1,802 breeding adults), would represent a 0.001% or 0.006% increase in baseline mortality rate annually, respectively.

1597. However, as the population of Manx shearwater has increased significantly since the citation population count the potential impact on the population is more reasonably assessed against the latest population count undertaken in 2001, which was 32,366 breeding adults. On this basis, when considering the potential impact of this loss to Aberdaron Coast and Bardsey Island SPA (with an annual background mortality of 4,208 breeding adults) then the prediction of less than a single breeding adult suffering displacement consequent mortality would represent a 0.000% or 0.003% increase in baseline mortality rate annually, respectively.

Table 8.31 Summary of Manx shearwater construction and decommissioning phase disturbance and displacement impacts apportioned to Aberdaron Coast and Bardsey Island SPA when considering the full breeding season

Population Size (Breeding adults)	**Season**	**Applicant's approach disturbance and displacement impact**		**SNCBs assumed approach disturbance and displacement impact**	
		5% Disp; 1% Mort (Breeding adults per annum)	Increase in baseline mortality rate (%)	5% Disp; 1-10% Mort (Breeding adults per annum)	Increase in baseline mortality rate (%)
Citation (13,860)	Full breeding	0.0	0.001	0.0 - 0.2	0.001 - 0.010
	Post-breeding migration	0.0	0.000	0.0 - 0.0	0.000
	Return migration	0.0	0.000	0.0 - 0.0	0.000
	Annual	0.0	0.001	0.0 - 0.2	0.001 - 0.010
Latest Count (32,366)	Full breeding	0.0	0.000	0.0 - 0.2	0.000 - 0.004
	Post-breeding migration	0.0	0.000	0.0 - 0.0	0.000 - 0.000
	Return migration	0.0	0.000	0.0 - 0.0	0.000 - 0.000
	Annual	0.0	0.000	0.0 - 0.2	0.000 - 0.004

Table 8.32 Summary of Manx shearwater construction and decommissioning phase disturbance and displacement impacts apportioned to Aberdaron Coast and Bardsey Island SPA when considering the migration-free breeding season

Population Size (Breeding adults)	**Season**	**Applicant's approach disturbance and displacement impact**		**SNCBs assumed approach disturbance and displacement impact**	
		5% Disp; 1% Mort (Breeding adults per annum)	Increase in baseline mortality rate (%)	5% Disp; 1-10% Mort (Breeding adults per annum)	Increase in baseline mortality rate (%)
Citation (13,860)	Migration-free breeding	0.0	0.000	0.0 - 0.1	0.000 - 0.003
	Post-breeding migration	0.0	0.000	0.0 - 0.1	0.000 - 0.003
	Return migration	0.1	0.006	0.1 - 1.0	0.006 - 0.057
	Annual	0.1	0.006	0.1 - 1.1	0.006 - 0.063
Latest Count (32,366)	Migration-free breeding	0.0	0.000	0.0 - 0.1	0.000 - 0.001
	Post-breeding migration	0.0	0.000	0.0 - 0.1	0.000 - 0.001
	Return migration	0.1	0.002	0.1 - 1.0	0.002 - 0.024
	Annual	0.1	0.003	0.1 - 1.1	0.003 - 0.027

1598. The addition of less than a single possible additional breeding adult mortality per annum equates to a 0.006% increase in baseline mortality rate at most, when considering either the citation or the latest colony count. This level of impact would be indistinguishable from natural fluctuations in the population. The potential for **an AEoI to the conservation objectives of the Manx shearwater feature of the Aberdaron Coast and Bardsey Island SPA in relation to disturbance and displacement effects in the construction and decommissioning phase from the Project alone can be ruled out**. Therefore, subject to natural change, Manx shearwater will be maintained as a feature in the long term.

8.9.3.1.4 Operational and maintenance phase potential disturbance and displacement effects on the qualifying feature in isolation

1599. During the operation and maintenance phase the potential level of impact apportioned to the SPA seasonally is summarised in **Table 8.33** when considering the full breeding season and in **Table 8.34** when considering the migration-free breeding season for both the Applicant's and SNCB's assumed preferred approach.

1600. Displacement matrices are also presented for the annual apportioned abundance for the Windfarm Site plus 2km buffer to Aberdaron Coast and Bardsey Island SPA, when considering the full breeding season (**Table 8.35**) and the migration-free breeding season (**Table 8.36**).

1601. The potential impact of the loss of less than a single additional breeding adult (<0.1 or 0.2, see **Table 8.33** or **Table 8.34**) on an annual basis to the Aberdaron Coast and Bardsey Island SPA (with a classified population of 13,860 breeding adults, with an annual background mortality of 1,802 breeding adults) would represent a 0.002% or 0.013% increase in baseline mortality rate annually, respectively.

1602. However, as the population of Manx shearwater has increased significantly since the citation population count the potential impact on the population is more reasonably assessed against the latest population count undertaken in 2001, which was 32,366 breeding adults. On this basis, when considering the potential impact of this loss to Aberdaron Coast and Bardsey Island SPA (with an annual background mortality of 4,208 breeding adults) then the prediction of less than a single breeding adult suffering displacement consequent mortality would represent a 0.001% or 0.005% increase in baseline mortality rate annually, respectively.

Table 8.33 Summary of Manx shearwater operation and maintenance phase disturbance and displacement impacts apportioned to Aberdaron Coast and Bardsey Island SPA when considering the full breeding season

Population Size (Breeding adults)	Season	Applicant's approach disturbance and displacement impact		SNCBs assumed approach disturbance and displacement impact	
		10% Disp; 1% Mort (Breeding adults per annum)	Increase in baseline mortality rate (%)	10% Disp; 10% Mort (Breeding adults per annum)	Increase in baseline mortality rate (%)
Citation (13,860)	Full breeding	0.0	0.002	0.0 – 0.3	0.002 – 0.019
	Post-breeding migration	0.0	0.000	0.0	0.000
	Return migration	0.0	0.000	0.0	0.000
	Annual	0.0	0.002	0.0 – 0.4	0.002 – 0.020
Latest Count (32,366)	Full breeding	0.0	0.001	0.0 – 0.3	0.001 – 0.008
	Post-breeding migration	0.0	0.000	0.0	0.000
	Return migration	0.0	0.000	0.0	0.000
	Annual	0.0	0.001	0.0 – 0.4	0.001 – 0.008

Table 8.34 Summary of Manx shearwater operation and maintenance phase disturbance and displacement impacts apportioned to Aberdaron Coast and Bardsey Island SPA when considering the migration-free breeding season.

Population Size (Breeding adults)	**Season**	**Applicant's approach disturbance and displacement impact**		**SNCBs assumed approach disturbance and displacement impact**	
		10% Disp; 1% Mort (Breeding adults per annum)	Increase in baseline mortality rate (%)	10% Disp; 1-10% Mort (Breeding adults per annum)	Increase in baseline mortality rate (%)
Citation (13,860)	Full breeding	0.0	0.001	0.0 – 0.1	0.001 – 0.006
	Post-breeding migration	0.0	0.001	0.0 – 0.1	0.001 – 0.006
	Return migration	0.2	0.011	0.2 – 2.1	0.011 – 0.114
	Annual	0.2	0.013	0.2 – 2.3	0.126
Latest Count (32,366)	Full breeding	0.0	0.000	0.0 – 0.1	0.000 – 0.002
	Post-breeding migration	0.0	0.000	0.0 – 0.1	0.000 – 0.002
	Return migration	0.2	0.005	0.2 – 2.1	0.005 – 0.049
	Annual	0.2	0.005	0.2 – 2.3	0.005 – 0.054

Table 8.35 Manx shearwater operation and maintenance phase disturbance annual displacement matrix when considering the full breeding season for impacts apportioned to Aberdaron Coast and Bardsey Island SPA

Displacement (%)	**Mortality rates (%)**															
	0	**1**	**2**	**3**	**4**	**5**	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	1	1	1	2	2	2	3	3	4
15	0	0	0	0	0	0	1	1	2	2	3	3	4	4	5	5
20	0	0	0	0	0	0	1	1	2	3	4	4	5	6	6	7
25	0	0	0	0	0	0	1	2	3	4	4	5	6	7	8	9
30	0	0	0	0	0	1	1	2	3	4	5	6	7	8	10	11
35	0	0	0	0	0	1	1	2	4	5	6	7	9	10	11	12
40	0	0	0	0	1	1	1	3	4	6	7	8	10	11	13	14
50	0	0	0	1	1	1	2	4	5	7	9	11	12	14	16	18
60	0	0	0	1	1	1	2	4	6	8	11	13	15	17	19	21
70	0	0	0	1	1	1	2	5	7	10	12	15	17	20	22	25
80	0	0	1	1	1	1	3	6	8	11	14	17	20	23	25	28
90	0	0	1	1	1	2	3	6	10	13	16	19	22	25	29	32
100	0	0	1	1	1	2	4	7	11	14	18	21	25	28	32	35

🟩	<1% increase in baseline mortality	🟩	>1% baseline mortality threshold for latest population	🟥	>1% baseline mortality threshold for citation population

Table 8.36 Manx shearwater operation and maintenance phase disturbance annual displacement matrix when considering the migration-free breeding season for impacts apportioned to Aberdaron Coast and Bardsey Island SPA

Displacement (%)	**Mortality rates (%)**															
	0	**1**	**2**	**3**	**4**	**5**	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	1	1	1	1	2	2	2	2
10	0	0	0	1	1	1	2	5	7	9	11	14	16	18	20	23
15	0	0	1	1	1	2	3	7	10	14	17	20	24	27	31	34
20	0	0	1	1	2	2	5	9	14	18	23	27	32	36	41	45
25	0	1	1	2	2	3	6	11	17	23	28	34	40	45	51	57
30	0	1	1	2	3	3	7	14	20	27	34	41	48	54	61	68
35	0	1	2	2	3	4	8	16	24	32	40	48	55	63	71	79
40	0	1	2	3	4	5	9	18	27	36	45	54	63	72	82	91
50	0	1	2	3	5	6	11	23	34	45	57	68	79	91	102	113
60	0	1	3	4	5	7	14	27	41	54	68	82	95	109	122	136
70	0	2	3	5	6	8	16	32	48	63	79	95	111	127	143	159
80	0	2	4	5	7	9	18	36	54	72	91	109	127	145	163	181
90	0	2	4	6	8	10	20	41	61	82	102	122	143	163	183	204
100	0	2	5	7	9	11	23	45	68	91	113	136	159	181	204	226

	🟩	<1% increase in baseline mortality	■	>1% baseline mortality threshold for latest population	□	>1% baseline mortality threshold for citation population

1603. The addition of less than a single possible additional breeding adult mortality per annum equates to a 0.013% increase in baseline mortality rate at most, when considering either the citation or the latest colony count. This level of impact would be indistinguishable from natural fluctuations in the population. The potential for **an AEoI to the conservation objectives of the Manx shearwater feature of the Aberdaron Coast and Bardsey Island SPA in relation to disturbance and displacement effects in the operation and maintenance phase from the Project alone can be ruled out**. Therefore, subject to natural change, Manx shearwater will be maintained as a feature in the long term.

8.9.3.1.5 Consideration of entanglement with mooring lines

1604. Consideration of the potential impact of entanglement with mooring lines on the ornithology qualifying features of SPAs screened in for assessment is provided in **Section 8.27**. As presented within **Section 8.27**, the potential for **an AEoI to the conservation objectives of the Manx shearwater feature of Aberdaron Coast and Bardsey Island SPA in relation to entanglement of mooring from the Project can be ruled out**. Therefore, subject to natural change, Manx shearwater will be maintained as a feature in the long term.

8.9.3.1.6 Indirect impacts due to effects on habitats and prey species

1605. Consideration of the potential indirect impacts due to effects on habitats and prey species on the ornithology qualifying features of SPAs screened in for assessment is provided in **Section 8.28**. As presented within **Section 8.28**, the potential for **an AEoI to the conservation objectives of the Manx shearwater feature of Aberdaron Coast and Bardsey Island SPA in relation to indirect impacts from the Project can be ruled out**. Therefore, subject to natural change, Manx shearwater will be maintained as a feature in the long term.

8.9.3.1.7 Potential effects on the qualifying feature in-combination with other projects

Construction and decommissioning phase

1606. When considering the construction and decommissioning phase, as detailed above, the potential level of impact for the Project alone on Manx shearwater was concluded as trivial and inconsequential. As this level of effect would be well within the error margins of the assessment there is no potential for any contribution for an in-combination effect to occur within the construction and decommissioning phase.

Operation and maintenance phase

1607. When considering the operation and maintenance phase, as detailed above, the potential level of impact for the Project alone was concluded as trivial and inconsequential as it is well under one breeding adult per annum. As this level of effect would be well within the error margins of the assessment there is no potential for any contribution for an in-combination effect to occur within the operation and maintenance phase.

8.10 Strangford Lough SPA

1608. The Strangford Lough SPA boundary is located approximately 345km from the Project, while the seabird colony is located approximately 350km from the Project. The Project therefore does not directly overlap with the SPA boundary or any cited areas of functional linkages.

8.10.1 Description of designation

1609. Strangford Lough is a large (150km^2) marine inlet on the east coast of County Down, Northern Ireland, of which about 50km^2 lies between high water mark mean tide (HWMMT) and low water mark mean tide (LWMMT). It is connected to the open sea by the Strangford Narrows, an 8km long channel with a minimum width of 0.5km. The Lough is 30km long from head to mouth and up to 8km wide. The tidal flats of Strangford Lough form extensive areas around the northern and north-eastern shorelines. The Lough supports an impressive range of marine habitats and communities with over 2,000 recorded species. It is important for marine invertebrates, algae and saltmarsh plants, for a range of wintering and breeding waterbirds, and for marine mammals.

8.10.2 Conservation Objectives

1610. The conservation objectives for the SPA features focus on maintaining the populations of qualifying species at internationally and nationally important numbers. Achieving these objectives requires that action is taken to avoid significant disturbance and that the condition of habitats used by the qualifying species is maintained.

1611. Favourable condition of each of the populations will be informed by the condition of the following attributes (NB: bold text indicates those attributes that are relevant to this assessment, based on the proximity of the SPA and functional linkages described above in relation to the Project):

- Population size
- Habitat suitability
- Number of species in the overwintering population age structure (brent geese only)
- Habitat availability
- Habitat quality.

8.10.3 Appropriate Assessment

1612. One qualifying feature of this SPA site is screened into the Appropriate Assessment (**Table 5.4**); Sandwich tern.

8.10.3.1 Sandwich tern

8.10.3.1.1 Status

1613. The SPA population is cited as 593 pairs, covering the period 1992-1997 (Furness, 2015, Stroud *et al*., 2016). Furness (2015) gives the breeding population of 771 pairs in 2012. The most recent count (2020) is 252 apparently occupied nests, or 504 breeding adults (SMP, 2023).

1614. Based on the most recent SPA population of breeding adults, and an annual breeding adult baseline mortality rate of 0.102 (1-0.898, Horswill and Robinson (2015)), 51 breeding adults from the SPA population would be subject to natural mortality per annum.

8.10.3.1.2 Functional linkage and seasonal apportionment of potential effects

1615. Sandwich terns disperse around the UK coastline after breeding, heading across the North Sea and then towards West Africa to over-winter (Wright *et al*, 2012). The return of the species sees a more direct route to the UK breeding sites. Although no Sandwich terns were recorded within the site-specific surveys for the Project this does not mean that the species weren't present due to the snapshot nature of digital aerial surveys. Therefore, connectivity is considered based on literature data sources of potential migratory flight lines (Wright *et al*, 2012).

8.10.3.1.3 Potential migratory collision risk effects on the qualifying feature in isolation

1616. Consideration of the potential migratory collision risk on qualifying features of SPAs screened in for assessment is provided in **Section 8.29**. As concluded within **Section 8.29**, the potential for **an AEoI to the conservation objectives of the Sandwich tern feature of Strangford Lough SPA in relation to collision risk from the Project can be ruled out**. Therefore, subject to natural change, all qualifying features assessed will be maintained as a feature in the long term.

8.10.3.1.4 Potential effects on the qualifying feature in-combination with other projects

1617. The migration corridors identified by Wright *et al* (2012) are widespread across all UK waters for the waterbird species screened in. Therefore, it is presumed that migration activity of all tern species screened in for this SPA is low across any given OWF. As such it is assumed that limited collision risk is predicted for any specific OWF and when added together, the very small number of birds potentially colliding with WTGs at each OWF is still likely to be very low. The number predicted to be associated with the Project area is considered smaller still given its distance from shore, limited size and the number of WTGs being at most eight. It is considered that this level of effect would not be detectable for any waterbird species screened in and assessed for this SPA. Therefore, **no AEoI is concluded for in-combination migratory collision mortality for all waterbird species from this SPA** considered by this assessment.

8.11 Copeland Islands SPA

1618. The Copeland Islands SPA boundary is located approximately 385km from the Project, while the seabird colony is approximately 391km distant. The Project therefore does not directly overlap with the SPA boundary or any cited areas of functional linkages.

8.11.1 Description of designation

1619. The site is composed of three islands, Big Copeland, Light House Island and Mew Island, lying off the north-east coast of County Down and close to the entrance of Belfast Lough. The islands are sites for breeding seabirds, with Big Copeland and Lighthouse Island being home to the main colonies. Important breeding and wintering populations of eider occur. Notable breeding populations of wader species also occur on Big Copeland.

8.11.2 Conservation Objectives

1620. The overarching conservation objectives for the qualifying feature of the SPA is to ensure the conservation status of the qualifying features is 'favourable condition'. With respect to Copeland Islands SPA, a species 'favourable' condition can be assessed against the following objectives (NB: bold text indicates those attributes that are relevant to this assessment, based on the proximity of the SPA and functional linkages described above in relation to the Project):

- To maintain or enhance the population of the qualifying species
- Fledging success sufficient to maintain or enhance population
- To maintain or enhance the range of habitats utilised by the qualifying species
- To ensure that the integrity of the site is maintained
- To ensure there is no significant disturbance of the species
- To ensure that the following are maintained in the long term:
    - **Population of the species as a viable component of the site**
    - Distribution of the species within site
    - Distribution and extent of habitats supporting the species
    - Structure, function and supporting processes of habitats supporting the species.

8.11.3 Appropriate Assessment

1621. One qualifying feature of this SPA is screened into the Appropriate Assessment (**Table 5.4**); Manx shearwater.

8.11.3.1 Manx shearwater

8.11.3.1.1 Status

1622. The SPA population at classification was cited as 4,800 pairs for the period 2000-02 (NIEA, 2010). The most recent count (2007) is 4,850 apparently occupied sites (burrows or crevices), or 9,700 breeding adults (SMP, 2023).

1623. Based on the cited SPA population of breeding adults, and an annual breeding adult baseline mortality rate of 0.13 (1-0.870, Horswill and Robinson (2015)), 1,248 breeding adults from the SPA population would be subject to natural mortality per annum.

1624. Based on the most recent SPA population of breeding adults, and an annual breeding adult baseline mortality rate of 0.13 (1-0.870, Horswill and Robinson (2015)), 1,261 breeding adults from the SPA population would be subject to natural mortality per annum.

8.11.3.1.2 Functional linkage and seasonal apportionment of potential effects

1625. The Project is within the mean max plus one SD foraging distance of 1,346+1,018.7km (Woodward *et al*. 2019). Accordingly, this species is assessed for the full breeding (April to August), post-breeding migration (September to October) and return migration (March) seasons based on Furness (2015), with the level of abundance apportioned for the Windfarm Site plus 2km buffer to Copeland Islands SPA presented in **Table 8.37**.

Table 8.37 Manx shearwater level of abundance apportioned to Copeland Islands SPA seasonally

Season	Level of apportionment (%)	Apportioned Abundance (breeding adults)
Full Breeding (Apr - Aug)	0.02	2.1
Post-breeding migration (Sep - Oct)	0.03	0.0
Return migration (Mar)	0.03	0.0

1626. As detailed in **Section 1449**, for Manx shearwater a displacement distance of the Windfarm Site plus 2km buffer has been selected. A displacement rate of 10% and a mortality rate of 1-10% for operational and maintenance phase impacts are used, as recommended in the Joint SNCB interim guidance on displacement (Updated, 2022). The focus of the assessment is on the Applicant's position of 10% displacement rate and a 1% mortality rate. This is considered to represent a realistic, yet precautionary, assessment based on SNCBs guidance and additional evidence presented within **Section 1449**. However, the standard SNCB's maximum displacement mortality rate of 10% is also provided for each assessment.

1627. Further detail of how the level of impact apportioned to each SPA is derived, is presented within **Appendix 13.A: Offshore Ornithology Technical Report** and **Appendix 13.C: Revised Collision Risk Modelling** of the Offshore ES.

8.11.3.1.3 Construction and decommissioning phase potential disturbance and displacement effects on the qualifying feature in isolation

1628. During the construction and decommissioning phase, the potential level of impact apportioned to the SPA seasonally is summarised in **Table 8.38** for both the Applicant's and SNCB's assumed preferred approach. Details on selection of appropriate displacement and mortality rates for construction and decommissioning phase assessments is provided in **Section 1449**.

1629. The potential impact of significantly less than a single additional breeding adult (<0.1 see **Table 8.38**) on an annual basis to the Copeland Islands SPA (with a classified population of 9,600 breeding adults and an annual background mortality of 1,248 breeding adults), would represent a <0.001% increase in baseline mortality rate annually, respectively.

1630. However, as the population of Manx shearwaters has increased since the citation population count the potential impact on the population is more reasonably assessed against the latest population count undertaken in 2007, which was 9,700 breeding adults. On this basis, when considering the potential impact of this loss to Copeland Islands SPA (with an annual background mortality of 1,261 breeding adults) then the prediction of significantly less than a single breeding adult suffering displacement consequent mortality would represent a <0.001% increase in baseline mortality rate annually.

Table 8.38 Summary of Manx shearwater construction and decommissioning phase disturbance and displacement impacts apportioned to Copeland Islands SPA

Population Size (Breeding adults)	**Season**	**Applicant's approach disturbance and displacement impact**		**SNCBs assumed approach disturbance and displacement impact**	
		5% Disp; 1% Mort (Breeding adults per annum)	Increase in baseline mortality rate (%)	5% Disp; 1-10% Mort (Breeding adults per annum)	Increase in baseline mortality rate (%)
Citation (9,600)	Full breeding	0.0	0.000	0.0	0.000 - 0.001
	Post-breeding migration	0.0	0.000	0.0	0.000
	Return migration	0.0	0.000	0.0	0.000
	Annual	0.0	0.000	0.0	0.000 - 0.001
Latest Count (9,700)	Full breeding	0.0	0.000	0.0	0.000 - 0.001
	Post-breeding migration	0.0	0.000	0.0	0.000
	Return migration	0.0	0.000	0.0	0.000
	Annual	0.0	0.000	0.0	0.000 - 0.001

1631. The addition of significantly less than a single additional breeding adult mortality per annum equates to a <0.001% increase in baseline mortality rate at most, when considering either the citation or the latest colony count. This level of impact would be indistinguishable from natural fluctuations in the population. The potential for **an AEoI to the conservation objectives of the Manx shearwater feature of the Copeland Islands SPA in relation to disturbance and displacement effects in the construction and decommissioning phase from the Project alone can be ruled out**. Therefore, subject to natural change, Manx shearwater will be maintained as a feature in the long term.

8.11.3.1.4 Operational and maintenance phase potential disturbance and displacement effects on the qualifying feature in isolation

1632. During the operation and maintenance phase the potential level of impact apportioned to the SPA seasonally is summarised in **Table 8.39** for both the Applicant's and SNCB's assumed preferred approach.

1633. A displacement matrix is also presented for the annual apportioned abundance for the Windfarm Site plus 2km buffer to Copeland Islands SPA as presented in **Table 8.40**.

1634. The potential impact of the loss of significantly less than a single additional breeding adult (<0.1 , see **Table 8.39**) on an annual basis to the Copeland Islands SPA (with a classified population of 9,600 breeding adults and an annual background mortality of 1,248 breeding adults) would represent a <0.001% increase in baseline mortality rate annually, respectively.

1635. However, as the population of Manx shearwaters has increased since the citation population count the potential impact on the population is more reasonably assessed against the latest population count undertaken in 2007, which was 9,700 breeding adults. On this basis, when considering the potential impact of this loss to Copeland Islands SPA (with an annual background mortality of 1,261 breeding adults) then the prediction of significantly less than a single breeding adult suffering displacement consequent mortality would represent a <0.001% increase in baseline mortality rate annually.

Table 8.39 Summary of Manx shearwater operation and maintenance phase disturbance and displacement impacts apportioned to Copeland Islands SPA.

Population Size (Breeding adults)	**Season**	**Applicant's approach disturbance and displacement impact**		**SNCBs assumed approach disturbance and displacement impact**	
		10% Disp; 1% Mort (Breeding adults per annum)	Increase in baseline mortality rate (%)	10% Disp; 1-10% Mort (Breeding adults per annum)	Increase in baseline mortality rate (%)
Citation (9,600)	Full breeding	0.0	0.000	0.0	0.000 - 0.002
	Post-breeding migration	0.0	0.000	0.0	0.000
	Return migration	0.0	0.000	0.0	0.000
	Annual	0.0	0.000	0.0	0.000 - 0.002
Latest Count (9,700)	Full breeding	0.0	0.000	0.0	0.000 - 0.002
	Post-breeding migration	0.0	0.000	0.0	0.000
	Return migration	0.0	0.000	0.0	0.000
	Annual	0.0	0.000	0.0	0.000 - 0.002

Table 8.40 Manx shearwater operation and maintenance phase disturbance annual displacement matrix for impacts apportioned to Copeland Islands SPA

Displacement (%)	Mortality rates (%)															
	0	1	2	3	4	5	10	20	30	40	50	60	70	80	90	100
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
30	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
35	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1
40	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1
50	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
60	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1
70	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1
80	0	0	0	0	0	0	0	0	1	1	1	1	1	1	2	2
90	0	0	0	0	0	0	0	0	1	1	1	1	1	2	2	2
100	0	0	0	0	0	0	0	0	1	1	1	1	1	2	2	2

🟩	<1% increase in baseline mortality	▩	>1% baseline mortality threshold for latest population	🟦	>1% baseline mortality threshold for citation population

1636. The addition of significantly less than a single additional breeding adult mortality per annum equates to a <0.001% increase in baseline mortality rate at most, when considering either the citation or the latest colony count. This level of impact would be indistinguishable from natural fluctuations in the population. The potential for **an AEoI to the conservation objectives of the Manx shearwater feature of the Copeland Islands SPA in relation to disturbance and displacement effects in the operation and maintenance phase from the Project alone can be ruled out**. Therefore, subject to natural change, Manx shearwater will be maintained as a feature in the long term.

8.11.3.1.5 Consideration of entanglement with mooring lines

1637. Consideration of the potential impact of entanglement with mooring lines on the ornithology qualifying features of SPAs screened in for assessment is provided in **Section 8.27**. As presented within **Section 8.27**, the potential for **an AEoI to the conservation objectives of the Manx shearwater feature of Copeland Islands SPA in relation to entanglement of mooring from the Project can be ruled out**. Therefore, subject to natural change, Manx shearwater will be maintained as a feature in the long term.

8.11.3.1.6 Indirect impacts due to effects on habitats and prey species

1638. Consideration of the potential indirect impacts due to effects on habitats and prey species on the ornithology qualifying features of SPAs screened in for assessment is provided in **Section 8.28**. As presented within **Section 8.28**, the potential for **an AEoI to the conservation objectives of the Manx shearwater feature of Copeland Islands SPA in relation to indirect impacts from the Project can be ruled out**. Therefore, subject to natural change, Manx shearwater will be maintained as a feature in the long term.

8.11.3.1.7 Potential effects on the qualifying feature in-combination with other projects

Construction and decommissioning phase

1639. When considering the construction and decommissioning phase, as detailed above, the potential level of impact for the Project alone on Manx shearwater was concluded as trivial and inconsequential. As this level of effect would be well within the error margins of the assessment there is no potential for any contribution for an in-combination effect to occur within the construction and decommissioning phase.

Operation and maintenance phase

1640. When considering the operation and maintenance phase, as detailed above, the potential level of impact for the Project alone was concluded as trivial and inconsequential as it is well under one breeding adult per annum. That level of impact would be well within the error margins of the assessment. Such a trivial impact would have no potential for any contribution for an in-combination effect to occur within the operation and maintenance phase.

8.12 Larne Lough SPA and Ramsar Site

1641. The Larne Lough SPA and Ramsar Site boundary is located approximately 398km from the Project, while the seabird colony is located approximately 403km distant. The Project therefore does not directly overlap with the SPA boundary or any cited areas of functional linkages.

8.12.1 Description of designation

1642. Lame Lough is situated on the County Antrim coast in the east of Northern Ireland. The SPA covers the inter-tidal area and all islands within the Lame Lough estuary south of the harbour area. Breeding seabirds occur on both the natural island known as Swan Island and the artificial island known as Blue Circle Island. The site boundary is entirely coincident with that of the Lame Lough Area of Special Scientific Interest. The SPA boundary is also entirely coincident with that of the Lame Lough Ramsar Site.

8.12.2 Conservation Objectives

1643. The overarching conservation objectives for the qualifying feature of the SPA is to ensure the conservation status of the qualifying features is 'favourable condition'. With respect to Larne Lough SPA, a species 'favourable' condition can be assessed against the following objectives (NB: bold text indicates those attributes that are relevant to this assessment, based on the proximity of the SPA and functional linkages described above in relation to the Project):

- To maintain or enhance the population of the qualifying species
- Fledging success sufficient to maintain or enhance population
- To maintain or enhance the range of habitats utilised by the qualifying species
- To ensure that the integrity of the site is maintained
- To ensure there is no significant disturbance of the species
- To ensure that the following are maintained in the long term:
    - **Population of the species as a viable component of the site**
    - Distribution of the species within site
    - Distribution and extent of habitats supporting the species
    - Structure, function and supporting processes of habitats supporting the species.

8.12.3 Appropriate Assessment

1644. One qualifying features of this SPA is screened into the Appropriate Assessment (**Table 5.4**); Sandwich tern.

8.12.3.1 Sandwich tern

8.12.3.1.1 Status

1645. The SPA population is cited as 192 pairs, covering the period 1993-1997 (NIEA, 1998). Furness (2015) gives the breeding population of 257 pairs in 2013. The most recent count (2021) is 1,113 apparently occupied nests, or 2,226 breeding adults (SMP, 2023).

1646. Based on the most recent SPA population of breeding adults, and an annual breeding adult baseline mortality rate of 0.102 (1-0.898, Horswill and Robinson (2015)), 227 breeding adults from the SPA population would be subject to natural mortality per annum.

8.12.3.1.2 Functional linkage and seasonal apportionment of potential effects

1647. Sandwich terns disperse around the UK coastline after breeding, heading across the North Sea and then towards West Africa to over-winter (Wright *et al*, 2012). The return of the species sees a more direct route to the UK breeding sites. Although no Sandwich terns were recorded within the site-specific surveys for the Project this does not mean that the species weren't present due to the snapshot nature of digital aerial surveys. Therefore, connectivity is considered based on literature data sources of potential migratory flight lines (Wright *et al*, 2012).

8.12.3.1.3 Potential migratory collision risk effects on the qualifying feature in isolation

1648. Consideration of the potential migratory collision risk on qualifying features of SPAs screened in for assessment is provided in **Section 8.29**. As concluded within **Section 8.29**, the potential for **an AEoI to the conservation objectives of the Sandwich tern feature of Larne Lough SPA and Ramsar site in relation to collision risk from the Project can be ruled out**. Therefore, subject to natural change, all qualifying features assessed will be maintained as a feature in the long term.

8.12.3.1.4 Potential effects on the qualifying feature in-combination with other projects

1649. The migration corridors identified by Wright *et al* (2012) are widespread across all UK waters for the waterbird species screened in. Therefore, it is presumed that migration activity of all tern species screened in for this SPA is low across any given OWF. As such it is assumed that limited collision risk is predicted for any specific OWF and when added together, the very small number of birds potentially colliding with WTGs at each OWF is still likely to be very low. The number predicted to be associated with the Project area is considered smaller still given its distance from shore, limited size and the number of WTGs being at most eight. It is considered that this level of effect would not be detectable for any waterbird species screened in and assessed for this SPA. Therefore, **no AEoI is concluded for in-combination migratory collision mortality for all waterbird species from this SPA** considered by this assessment.

8.13 Ailsa Craig SPA

1650. The Ailsa Craig SPA boundary is located approximately 448km from the Project, while the seabird colony is located approximately 454km distant. The Project therefore does not directly overlap with the SPA boundary or any cited areas of functional linkages.

8.13.1 Description of designation

1651. Ailsa Craig SPA is an island rising to 338 metres, situated in the outer part of the Firth of Clyde. Cliffs up to 100m encircle the island and provide nesting sites for a variety of seabirds, notably one of the largest Northern gannet colonies in the world. The boundary of Ailsa Craig SPA is coincident with Ailsa Craig SSSI. The seaward extension extends approximately 2km into the marine environment to include the seabed, water column and surface.

8.13.2 Conservation Objectives

1652. The overarching conservation objectives of the site are (NB: bold text indicates those attributes that are relevant to this assessment, based on the proximity of the SPA and functional linkages described above in relation to the Project):

- To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained
- To ensure for the qualifying species that the following are maintained in the long term:

    - **Population of the species as a viable component of the site**
    - Distribution of the species within site
    - Distribution and extent of habitats supporting the species
    - Structure, function and supporting processes of habitats supporting the species
    - No significant disturbance of the species.

8.13.3 Appropriate Assessment

1653. Two qualifying features of this SPA are screened into the Appropriate Assessment (**Table 5.4**); gannet and guillemot.

8.13.3.1 Gannet

8.13.3.1.1 Status

1654. The SPA population at classification was cited as 23,000 pairs. The most recent count (2014) is 33,226 apparently occupied sites, or 66,452 breeding adults (SMP, 2023).

1655. Based on the cited SPA population of breeding adults, and an annual breeding adult baseline mortality rate of 0.081 (1-0.919, Horswill and Robinson (2015)), 3,726 breeding adults from the SPA population would be subject to natural mortality per annum.

1656. Based on the most recent SPA population of breeding adults, and an annual breeding adult baseline mortality rate of 0.081 (1-0.919, Horswill and Robinson (2015)), 5,383 breeding adults from the SPA population would be subject to natural mortality per annum.

8.13.3.1.2 Functional linkage and seasonal apportionment of potential effects

1657. The Project is within the mean max plus one SD foraging distance of 315.2+194.2km (Woodward *et al*. 2019). Accordingly, this species is assessed for the full breeding (March to September), post-breeding migration (October to November) and return migration (December to February) seasons based on Furness (2015). It should be noted however, given that gannets are known to show space partitioning with adjacent colonies (Wakefield *et al*., 2013), breeding season connectivity for more distant colonies such as Saltee Islands SPA is likely to be limited.

1658. As detailed in **Section 1449**, for gannet a displacement distance of the Windfarm Site plus 2km buffer has been selected. A displacement rate of 60-80% and a mortality rate of 1-10% for operational and maintenance phase impacts are applied, as recommended in the Joint SNCB interim guidance on displacement (Updated, 2022). The focus of the assessment being on the Applicant's position of 60-80% displacement rate and a 1% mortality rate, which is considered to represent a realistic, yet precautionary, assessment based on SNCBs guidance and additional evidence presented within **Section 1449**. However, the standard SNCB's maximum displacement mortality rate of 10% is also provided for each assessment. The level of abundance apportioned is presented in **Table 8.41.**

Table 8.41 Gannet level of abundance and collision risk apportioned to Ailsa Craig SPA seasonally

Season	Level of apportionment (%)	Apportioned Abundance (breeding adults)	Apportioned collision risk (breeding adults)
Full Breeding (Mar-Sep)	1.12	2.7	0.0
Post-breeding migration (Oct-Nov)	9.94	14.0	0.2
Return migration (Dec-Feb)	8.20	6.2	0.1

1659. For collision risk, impacts have been apportioned for the worst-case scenario design as detailed in **Section 8.3** and presented in **Table 8.41.**

1660. Further detail of how the level of impact apportioned to each SPA is derived is presented within **Appendix 13.A: Offshore Ornithology Technical Report** and **Appendix 13.C: Revised Collision Risk Modelling** of the Offshore ES.

8.13.3.1.3 Construction and decommissioning phase potential disturbance and displacement effects on the qualifying feature in isolation

1661. During the construction and decommissioning phase, the potential level of impact apportioned to the SPA seasonally is summarised in **Table 8.42** for both the Applicant's and SNCB's assumed preferred approach. Details on selection of appropriate displacement and mortality rates for construction and decommissioning phase assessments is provided in **Section 8.4**.

1662. The potential impact of the loss of less than a single additional breeding adult (0.1, see **Table 8.42**) on an annual basis to the Ailsa Craig SPA (with a classified population of 46,000 breeding adults and an annual background mortality of 3,726 breeding adults) would represent a 0.002% increase in baseline mortality rate annually.

1663. However, as the population of gannets has increased significantly since the citation population count the potential impact on the population is more reasonably assessed against the latest population count undertaken in 2014, which was 66,452 breeding adults. On this basis, when considering the potential impact of this loss to Ailsa Craig SPA (with an annual background mortality of 5,383 breeding adults) then the prediction of less than a single breeding adult suffering displacement consequent mortality would represent a 0.001% increase in baseline mortality rate annually.

Table 8.42 Summary of gannet construction and decommissioning phase disturbance and displacement impacts apportioned to Ailsa Craig SPA

Population Size (Breeding adults)	**Season**	**Applicant's / SNCB's assumed minimum approach disturbance and displacement impact**		**SNCBs assumed maximum approach disturbance and displacement impact**	
		30-40% Disp; 1% Mort (Breeding adults per annum)	Increase in baseline mortality rate (%)	30-40% Disp; 10% Mort (Breeding adults per annum)	Increase in baseline mortality rate (%)
Citation (46,000)	Full breeding	0.0 – 0.0	0.000 – 0.000	0.1 – 0.1	0.002 – 0.003
	Post-breeding migration	0.0 – 0.1	0.001 – 0.002	0.4 – 0.6	0.011 – 0.015
	Return migration	0.0 – 0.0	0.001 – 0.001	0.2 – 0.3	0.005 – 0.007
	Annual	0.1 – 0.1	0.002 – 0.002	0.7 – 0.9	0.018 – 0.025
Latest Count (66,452)	Full breeding	0.0 – 0.0	0.000 – 0.000	0.1 – 0.1	0.001 – 0.002
	Post-breeding migration	0.0 – 0.1	0.001 – 0.001	0.4 – 0.6	0.008 – 0.010
	Return migration	0.0 – 0.0	0.000 – 0.000	0.2 – 0.3	0.003 – 0.005
	Annual	0.1 – 0.1	0.001 – 0.002	0.7 – 0.9	0.013 – 0.017

1664. The addition of less than a single possible additional breeding adult mortality per annum equates to a 0.002% increase in baseline mortality rate at most, when considering either the citation or the latest colony count. This level of impact would be indistinguishable from natural fluctuations in the population. The potential for **an AEoI to the conservation objectives of the gannet feature of Ailsa Craig SPA in relation to disturbance and displacement effects in the construction and decommissioning phase from the Project alone can be ruled out**. Therefore, subject to natural change, gannet will be maintained as a feature in the long term.

8.13.3.1.4 Operational and maintenance phase potential disturbance and displacement effects on the qualifying feature in isolation

1665. During the operation and maintenance phase the potential level of impact apportioned to the SPA seasonally is summarised in **Table 8.43** for both the Applicant's and SNCB's assumed preferred approach.

1666. A displacement matrix is also presented for the annual apportioned abundance for the Windfarm Site plus 2km buffer to Ailsa Craig SPA is presented in **Table 8.44**.

1667. The potential impact of the loss of less than a single additional breeding adult (0.1-0.2, see **Table 8.43**) on an annual basis to the Ailsa Craig SPA (with a classified population of 46,000 breeding adults and an annual background mortality of 3,726 breeding adults) would represent a 0.004 – 0.005% increase in baseline mortality rate annually, respectively.

1668. However, as the population of gannets has increased significantly since the citation population count the potential impact on the population is more reasonably assessed against the latest population count undertaken in 2014, which was 66,452 breeding adults. On this basis, when considering the potential impact of this loss to Ailsa Craig SPA (with an annual background mortality of 5,383 breeding adults) then the prediction of less than a single breeding adult suffering displacement consequent mortality would represent a 0.003 – 0.004% increase in baseline mortality rate annually, respectively.

Table 8.43 Summary of gannet operation and maintenance phase disturbance and displacement impacts apportioned to Ailsa Craig SPA

Population Size (Breeding adults)	**Season**	**Applicant's / SNCB's assumed minimum approach disturbance and displacement impact**		**SNCBs assumed maximum approach disturbance and displacement impact**	
		60-80% Disp; 1% Mort (Breeding adults per annum)	Increase in baseline mortality rate (%)	60-80% Disp; 10% Mort (Breeding adults per annum)	Increase in baseline mortality rate (%)
Citation (46,000)	Full breeding	0.0 – 0.0	0.000 – 0.001	0.2 – 0.2	0.004 – 0.006
	Post-breeding migration	0.1 – 0.1	0.002 – 0.003	0.8 – 1.1	0.023 – 0.030
	Return migration	0.0 – 0.1	0.001 – 0.001	0.4 – 0.5	0.010 – 0.013
	Annual	0.1 – 0.2	0.004 – 0.005	1.4 – 1.8	0.037 – 0.049
Latest Count (66,452)	Full breeding	0.0 – 0.0	0.000 – 0.000	0.2 – 0.2	0.003 – 0.004
	Post-breeding migration	0.1 – 0.1	0.002 – 0.002	0.8 – 1.1	0.016 – 0.021
	Return migration	0.0 – 0.1	0.001 – 0.001	0.4 – 0.5	0.007 – 0.009
	Annual	0.1 – 0.2	0.003 – 0.004	1.4 – 1.8	0.026 – 0.034

Table 8.44 Gannet operation and maintenance phase disturbance annual displacement matrix for impacts apportioned to Ailsa Craig SPA

Displacement (%)	**Mortality rates (%)**															
	0	**1**	**2**	**3**	**4**	**5**	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	1	1	1	1	2	2	2	2
15	0	0	0	0	0	0	0	1	1	1	2	2	2	3	3	3
20	0	0	0	0	0	0	0	1	1	2	2	3	3	4	4	5
25	0	0	0	0	0	0	1	1	2	2	3	3	4	5	5	6
30	0	0	0	0	0	0	1	1	2	3	3	4	5	6	6	7
35	0	0	0	0	0	0	1	2	2	3	4	5	6	6	7	8
40	0	0	0	0	0	0	1	2	3	4	5	6	6	7	8	9
50	0	0	0	0	0	1	1	2	3	5	6	7	8	9	10	11
60	0	0	0	0	1	1	1	3	4	6	7	8	10	11	12	14
70	0	0	0	0	1	1	2	3	5	6	8	10	11	13	14	16
80	0	0	0	1	1	1	2	4	6	7	9	11	13	15	17	18
90	0	0	0	1	1	1	2	4	6	8	10	12	14	17	19	21
100	0	0	0	1	1	1	2	5	7	9	11	14	16	18	21	23

	🟩	<1% increase in baseline mortality	🟩	>1% baseline mortality threshold for latest population	🟦	>1% baseline mortality threshold for citation population

1669. The addition of less than a single additional breeding adult mortality per annum equates to a 0.005% increase in baseline mortality rate at most, when considering either the citation or the latest colony count. This level of impact would be indistinguishable from natural fluctuations in the population. The potential for **an AEoI to the conservation objectives of the gannet feature of Ailsa Craig SPA in relation to disturbance and displacement effects in the operation and maintenance phase from the Project alone can be ruled out**. Therefore, subject to natural change, gannet will be maintained as a feature in the long term.

8.13.3.1.5 Operational and maintenance phase potential collision risk impacts on the qualifying feature in isolation

1670. As detailed in **Table 8.45** the annual predicted gannet collision resultant mortality as a result of the operation of the Project is less than a single (0.4) breeding adult per annum. This represents an increase of 0.010% when considering the citation population of 46,000 adults (with an annual background mortality of 3,726) or an increase of 0.007% when considering the recent 2014 colony count (66,452 breeding adults with an annual background mortality of 5,383) across all seasons.

1671. If macro-avoidance is considered for gannet, the annual predicted collision resultant mortality as a result of the operation of the Project is less than a single (0.1) breeding adults per annum (**Table 8.45**). This represents an increase of 0.003% when considering the citation population or an increase of 0.002% when considering the latest colony count.

1672. The addition of less than a single additional breeding adult mortality per annum equates to 0.010% increase in baseline mortality rate at most, when considering either the citation or the latest colony count. This level of impact would be indistinguishable from the natural fluctuations in the population. The potential for **an AEoI to the conservation objectives of the gannet feature of Ailsa Craig SPA in relation to collision risk in the operation and maintenance phase from the Project alone can be ruled out**. Therefore, subject to natural change, gannet will be maintained as a feature in the long term.

Table 8.45 Summary of gannet operation and maintenance phase collision risk impacts apportioned to Ailsa Craig SPA

Population Size (Breeding adults)	**Season**	**Collision risk impact**		**Collision risk impact using macro-avoidance**	
		Breeding adults per annum	Increase in baseline mortality rate (%)	Breeding adults per annum	Increase in baseline mortality rate (%)
Citation (46,000)	Full breeding	0.0	0.001	0.0	0.000
	Post-breeding migration	0.2	0.003	0.1	0.001
	Return migration	0.1	0.003	0.0	0.001
	Annual	0.4	0.010	0.1	0.003
Latest Count (66,452)	Full breeding	0.0	0.001	0.0	0.000
	Post-breeding migration	0.2	0.002	0.1	0.001
	Return migration	0.1	0.002	0.0	0.001
	Annual	0.4	0.007	0.1	0.002

8.13.3.1.6 Operational and maintenance phase potential combined displacement and collision risk impacts on the qualifying feature in isolation

1673. As presented within **Table 8.43** and **Table 8.45** the combined displacement and collision risk impacts apportioned to the gannet feature of Ailsa Craig SPA, equates to less than a single (0.5 – 0.6) additional breeding adult mortality on an annual basis (when considering a displacement rate of 60-80% and a mortality rate of 1%). This represents a baseline mortality rate increase of 0.014-0.016% when considering the citation population or an increase of 0.010-0.011% when considering the recent 2014 colony count annually.

1674. If macro avoidance is considered, the combined displacement and collision risk impacts apportioned to the gannet feature of Ailsa Craig SPA, is less than a single (0.2 – 0.3) additional breeding adult mortality on an annual basis (when considering a displacement rate of 60-80% and a mortality rate of 1%). This represents a baseline mortality rate increase of 0.006-0.008% when considering the citation population or an increase of 0.004-0.005% when considering the recent 2014 colony count annually.

1675. The addition of less than a single additional breeding adult mortality per annum equates to 0.016% increase in baseline mortality rate at most, when considering either the citation or the latest colony count. This level of impact would be indistinguishable from the natural fluctuations in the population. The potential for **<u>an AEoI to the conservation objectives of the gannet feature of Ailsa Craig SPA in relation to combined displacement and collision risk in the operation and maintenance phase from the Project alone can be ruled out</u>**. Therefore, subject to natural change, gannet will be maintained as a feature in the long term.

8.13.3.1.7 Consideration of entanglement with mooring lines

1676. Consideration of the potential impact of entanglement with mooring lines on the ornithology qualifying features of SPAs screened in for assessment is provided in **Section 8.27**. As presented within **Section 8.27**, the potential for **<u>an AEoI to the conservation objectives of the gannet feature of Ailsa Craig SPA in relation to entanglement of mooring from the Project can be ruled out</u>**. Therefore, subject to natural change, gannet will be maintained as a feature in the long term.

8.13.3.1.8 Potential effects on the qualifying feature in-combination with other projects

Construction and decommissioning phase

1677. When considering the construction and decommissioning phase, as detailed above, the potential level of impact for the Project alone on gannet was concluded as trivial and inconsequential. As this level of effect would be well within the error margins of the assessment there is no potential for any contribution for an in-combination effect to occur within the construction and decommissioning phase.

Operation and maintenance phase

1678. When considering the operation and maintenance phase, as detailed above, the potential level of impact for the Project alone was concluded as trivial and inconsequential as it is well under one breeding adult per annum. That level of impact would be well within the error margins of the assessment. Therefore, such a trivial impact would have no potential for any contribution for an in-combination effect to occur within the operation and maintenance phase.

8.13.3.2 Guillemot

8.13.3.2.1 Status

1679. The SPA population is cited as 3,350 pairs. The most recent count (2021) is 9,568 individuals (SMP, 2023).

1680. Based on the most recent SPA population of assumed breeding adults, and an annual breeding adult baseline mortality rate of 0.06 (1-0.939, Horswill and Robinson (2015)), 574 breeding adults from the SPA population would be subject to natural mortality per annum.

8.13.3.2.2 Functional linkage and seasonal apportionment of potential effects

1681. The Project is outside of the mean max plus one SD foraging distance of 55.5+39.7km (Woodward *et al*. 2019). Therefore, the guillemot impact assessments for Ailsa Craig SPA have only been considered for the non-breeding season.

8.13.3.2.3 Potential disturbance and displacement effects on the qualifying feature in isolation

1682. Distant projects have been combined and assessed for all SPAs in **Section 8.30**. As presented within **Section 8.30**, the potential for **an AEoI to the conservation objectives of the guillemot feature of Ailsa Craig SPA in relation to disturbance and displacement from the Project can be ruled out**. Therefore, subject to natural change, guillemot will be maintained as a feature in the long term.

8.13.3.2.4 Consideration of entanglement with mooring lines

1683. Consideration of the potential impact of entanglement with mooring lines on the ornithology qualifying features of SPAs screened in for assessment is provided in **Section 8.27**. As presented within **Section 8.27**, the potential for **an AEoI to the conservation objectives of the guillemot feature of Ailsa Craig SPA in relation to entanglement of mooring from the Project can be ruled out**.

Therefore, subject to natural change, guillemot will be maintained as a feature in the long term.

8.13.3.2.5 Potential effects on the qualifying feature in-combination with other projects

1684. As detailed in **Section 8.30**, the potential level of impact for the Project alone was concluded as trivial and inconsequential as it is well under one breeding adult per annum for any project phase. That level of impact would be well within the error margins of the assessment, and therefore such a trivial impact would have no potential for any contribution for an in-combination effect to occur within any project phase.

8.14 Rathlin Island SPA

1685. The Rathlin Island SPA boundary is located approximately 454km from the Project, while the seabird colony is located approximately 460km distant. The Project therefore does not directly overlap with the SPA boundary or any cited areas of functional linkages.

8.14.1 Description of designation

1686. Rathlin Island is a large marine island situated some 4km from the north Antrim coast of Northern Ireland. There are basalt and chalk cliffs, some as high as 100m, as well as several sea stacks on the north and west shores of the island. The south and east shores are more gently sloping with areas of maritime grassland and rocky shore. The length of the coastline is approximately 30km. The cliffs are principally important for the seabird colonies, most notably around the area of West Light, but also along sections of the north coast. This extensive habitat also supports a notable breeding population of Peregrine.

8.14.2 Conservation Objectives

1687. The overarching conservation objectives for the qualifying feature of the SPA is to ensure the conservation status of the qualifying features is 'favourable condition'. With respect to Rathlin Island SPA, a species 'favourable' condition can be assessed against the following objectives (NB : bold text indicates those attributes that are relevant to this assessment, based on the proximity of the SPA and functional linkages described above in relation to the Project):

- To maintain or enhance the population of the qualifying species
- Fledging success sufficient to maintain or enhance population
- To maintain or enhance the range of habitats utilised by the qualifying species
- To ensure that the integrity of the site is maintained

- To ensure there is no significant disturbance of the species
- To ensure that the following are maintained in the long term:
    - **Population of the species as a viable component of the site**
    - Distribution of the species within site
    - Distribution and extent of habitats supporting the species
    - Structure, function and supporting processes of habitats supporting the species.

8.14.3 Appropriate Assessment

1688. The qualifying features of this SPA screened into the Appropriate Assessment are listed in **Table 5.4**. These are guillemot, kittiwake and razorbill.

8.14.3.1 Guillemot

8.14.3.1.1 Status

1689. The SPA population is cited as 41,887 individuals. The most recent count (2021) is 200,343 individuals (SMP, 2023).

1690. Based on the cited SPA population of assumed breeding adults, and an annual breeding adult baseline mortality rate of 0.06 (1-0.939, Horswill and Robinson (2015)), 2,513 breeding adults from the SPA population would be subject to natural mortality per annum.

1691. Based on the most recent SPA population of assumed breeding adults, and an annual breeding adult baseline mortality rate of 0.06 (1-0.939, Horswill and Robinson (2015)), 12,021 breeding adults from the SPA population would be subject to natural mortality per annum.

8.14.3.1.2 Functional linkage and seasonal apportionment of potential effects

1692. The Project is outside of the mean max plus one SD foraging distance of 55.5+39.7km (Woodward *et al*. 2019). Therefore, the guillemot impact assessments for Rathlin Island SPA have only been considered for the non-breeding season.

8.14.3.1.3 Potential disturbance and displacement effects on the qualifying feature in isolation

1693. Distant projects have been combined and assessed for all SPAs in **Section 8.30**. As presented within **Section 8.30**, the potential for **an AEoI to the conservation objectives of the guillemot feature of Rathlin Island SPA in relation to disturbance and displacement from the Project can be ruled out**. Therefore, subject to natural change, guillemot will be maintained as a feature in the long term.

8.14.3.1.4 Consideration of entanglement with mooring lines

1694. Consideration of the potential impact of entanglement with mooring lines on the ornithology qualifying features of SPAs screened in for assessment is provided in **Section 8.27**. As presented within **Section 8.27**, the potential for **<u>an AEoI to the conservation objectives of the guillemot feature of Rathlin Island SPA in relation to entanglement of mooring from the Project can be ruled out</u>**. Therefore, subject to natural change, guillemot will be maintained as a feature in the long term.

8.14.3.1.5 Potential effects on the qualifying feature in-combination with other projects

1695. As detailed in **Section 8.30**, the potential level of impact for the Project alone was concluded as trivial and inconsequential as it is well under one breeding adult per annum for any project phase. That level of impact would be well within the error margins of the assessment. Therefore, such a trivial impact would have no potential for any contribution for an in-combination effect to occur within any project phase.

8.14.3.2 Kittiwake

8.14.3.2.1 Status

1696. The SPA population is cited as 6,822 pairs. The most recent count (2021) is 13,706 apparently occupied nests, or 27,412 breeding adults (SMP, 2023).

1697. Based on the cited SPA population of breeding adults, and an annual breeding adult baseline mortality rate of 0.146 (1-0.854, Horswill and Robinson (2015)), 1,992 breeding adults from the SPA population would be subject to natural mortality per annum.

1698. Based on the most recent SPA population of breeding adults, and an annual breeding adult baseline mortality rate of 0.146 (1-0.854, Horswill and Robinson (2015)), 4,002 breeding adults from the SPA population would be subject to natural mortality per annum.

8.14.3.2.2 Functional linkage and seasonal apportionment of potential effects

1699. The Project is outside of the mean max plus one SD foraging distance of 156.1+144.5km (Woodward *et al*. 2019). Therefore, the kittiwake impact assessment for Rathlin Island SPA have only been considered for the non-breeding seasons.

8.14.3.2.3 Potential collision risk effects on the qualifying feature in isolation

1700. Distant projects have been combined and assessed for all SPAs in **Section 8.30**. As presented within **Section 8.30**, the potential for **<u>an AEoI to the conservation objectives of the kittiwake feature of Rathlin Island SPA in relation to</u>**

collision risk from the Project can be ruled out. Therefore, subject to natural change, kittiwake will be maintained as a feature in the long term.

8.14.3.2.4 Potential effects on the qualifying feature in-combination with other projects

1701. When considering the operation and maintenance phase, as detailed above, the potential level of impact for the Project alone on kittiwake was concluded as trivial and inconsequential as it was well under one breeding adult per annum. As this level of effect would be well within the error margins of the assessment there is, therefore, no potential for any contribution for an in-combination effect to occur within the operation and maintenance phase.

8.14.3.3 Razorbill

8.14.3.3.1 Status

1702. The SPA population is cited as 8,922 individuals. The most recent count (2021) is 30,044 individuals (SMP, 2023).

1703. Based on the cited SPA population of assumed breeding adults, and an annual breeding adult baseline mortality rate of 0.105 (1-0.895, Horswill and Robinson (2015)), 936 breeding adults from the SPA population would be subject to natural mortality per annum.

1704. Based on the most recent SPA population of assumed breeding adults, and an annual breeding adult baseline mortality rate of 0.105 (1-0.895, Horswill and Robinson (2015)), 3,154 breeding adults from the SPA population would be subject to natural mortality per annum.

8.14.3.3.2 Functional linkage and seasonal apportionment of potential effects

1705. The Project is outside of the mean max plus one SD foraging distance of 73.8+48.4km (Woodward *et al*. 2019). Therefore, the razorbill impact assessments for Rathlin Island SPA have only been considered for the non-breeding seasons.

8.14.3.3.3 Potential disturbance and displacement effects on the qualifying feature in isolation

1706. Distant projects have been combined and assessed for all SPAs in **Section 8.30**. As presented within **Section 8.30**, the potential for **an AEoI to the conservation objectives of the razorbill feature of Rathlin Island SPA in relation to disturbance and displacement from the Project can be ruled out**. Therefore, subject to natural change, razorbill will be maintained as a feature in the long term.

8.14.3.3.4 Consideration of entanglement with mooring lines

1707. Consideration of the potential impact of entanglement with mooring lines on the ornithology qualifying features of SPAs screened in for assessment is provided in

Section 8.27. As presented within **Section 8.27**,the potential for **an AEoI to the conservation objectives of the razorbill feature of Rathlin Island SPA in relation to entanglement of mooring from the Project can be ruled out**. Therefore, subject to natural change, razorbill will be maintained as a feature in the long term.

8.14.3.3.5 Potential effects on the qualifying feature in-combination with other projects

1708. As detailed in **Section 8.30**, the potential level of impact for the Project alone was concluded as trivial and inconsequential as it is well under one breeding adult per annum for any project phase. That level of impact would be well within the error margins of the assessment, and therefore such a trivial impact would have no potential for any contribution for an in-combination effect to occur within any project phase.

8.15 North Colonsay and Western Cliffs SPA

1709. The North Colonsay and Western Cliffs SPA boundary is located approximately 545km from the Project, while the seabird colony is approximately 551km distant. The Project therefore does not directly overlap with the SPA boundary or any cited areas of functional linkages.

8.15.1 Description of designation

1710. North Colonsay and Western Cliffs SPA covers an area of rocky coast, cliffs, and maritime heath on the island of Colonsay in Argyll, Scotland. It supports the northernmost stable population of chough in Europe, and is particularly significant to the maintenance of the breeding range of the chough in Britain and the EC. The SPA overlaps the boundaries of the North Colonsay SSSI and the West Colonsay Seabird Cliffs SSSI, and the seaward extension extends approximately 1km into the marine environment to include the seabed, water column and surface.

8.15.2 Conservation Objectives

1711. The overarching conservation objectives of the site are (NB: bold text indicates those objectives and targets that are relevant to this assessment, based on the proximity of the SPA and functional linkages described above in relation to the Project):

- To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained

- To ensure for the qualifying species that the following are maintained in the long term:
    - **Population of the species as a viable component of the site**
    - Distribution of the species within site
    - Distribution and extent of habitats supporting the species
    - Structure, function and supporting processes of habitats supporting the species
    - No significant disturbance of the species.

8.15.3 Appropriate Assessment

1712. Two qualifying features of this SPA are screened into the Appropriate Assessment (**Table 5.4**); guillemot and kittiwake.

8.15.3.1 Guillemot

8.15.3.1.1 Status

1713. The SPA population is cited as 6,656 pairs. The most recent count (2022) is 24,724 individuals (SMP, 2023).

1714. Based on the cited SPA population of assumed breeding adults, and an annual breeding adult baseline mortality rate of 0.06 (1-0.939, Horswill and Robinson (2015)), 799 breeding adults from the SPA population would be subject to natural mortality per annum.

1715. Based on the most recent SPA population of assumed breeding adults, and an annual breeding adult baseline mortality rate of 0.06 (1-0.939, Horswill and Robinson (2015)), 1,483 breeding adults from the SPA population would be subject to natural mortality per annum.

8.15.3.1.2 Functional linkage and seasonal apportionment of potential effects

1716. The Project is outside of the mean max plus one SD foraging distance of 55.5+39.7km (Woodward *et al.* 2019). Therefore, the guillemot impact assessments for North Colonsay and Western Cliffs SPA have only been considered for the non-breeding season.

8.15.3.1.3 Potential disturbance and displacement effects on the qualifying feature in isolation

1717. Distant projects have been combined and assessed for all SPAs in **Section 8.30**. As presented within **Section 8.30**, the potential for **an AEoI to the conservation objectives of the guillemot feature of North Colonsay and Western Cliffs SPA in relation to disturbance and displacement from the Project can be**

ruled out. Therefore, subject to natural change, guillemot will be maintained as a feature in the long term.

8.15.3.1.4 Consideration of entanglement with mooring lines

1718. Consideration of the potential impact of entanglement with mooring lines on the ornithology qualifying features of SPAs screened in for assessment is provided in **Section 8.27**. As presented within **Section 8.27**, the potential for **an AEoI to the conservation objectives of the guillemot feature of North Colonsay and Western Cliffs SPA in relation to entanglement of mooring from the Project can be ruled out**. Therefore, subject to natural change, guillemot will be maintained as a feature in the long term.

8.15.3.1.5 Potential effects on the qualifying feature in-combination with other projects

1719. As detailed in **Section 8.30**, the potential level of impact for the Project alone was concluded as trivial and inconsequential as it is well under one breeding adult per annum for any project phase. That level of impact would be well within the error margins of the assessment, and therefore such a trivial impact would have no potential for any contribution for an in-combination effect to occur within any project phase.

8.15.3.2 Kittiwake

8.15.3.2.1 Status

1720. The SPA population is cited as 4,512 pairs. The most recent count (2022) is 78 apparently occupied nests, or 156 breeding adults (SMP, 2023).

1721. Based on the most recent SPA population of breeding adults, and an annual breeding adult baseline mortality rate of 0.146 (1-0.854, Horswill and Robinson (2015)), 23 breeding adults from the SPA population would be subject to natural mortality per annum.

8.15.3.2.2 Functional linkage and seasonal apportionment of potential effects

1722. The Project is outside of the mean max plus one SD foraging distance of 156.1+144.5km (Woodward *et al.* 2019). Therefore, the kittiwake impact assessment for North Colonsay and Western Cliffs SPA have only been considered for the non-breeding seasons.

8.15.3.2.3 Potential collision risk effects on the qualifying feature in isolation

1723. Distant projects have been combined and assessed for all SPAs in **Section 8.30**. As presented within **Section 8.30**, the potential for **an AEoI to the conservation objectives of the kittiwake feature of North Colonsay and Western Cliffs SPA in relation to collision risk from the Project can be ruled out**. Therefore, subject to natural change, kittiwake will be maintained as a feature in the long term.

8.15.3.2.4 Potential effects on the qualifying feature in-combination with other projects

1724. When considering the operation and maintenance phase, as detailed above, the potential level of impact for the Project alone on kittiwake was concluded as trivial and inconsequential as it was well under one breeding adult per annum. As this level of effect would be well within the error margins of the assessment there is no potential for any contribution for an in-combination effect to occur within the operation and maintenance phase.

8.16 Mingulay and Berneray SPA

1725. The Mingulay and Berneray SPA boundary is located approximately 635km from the Project, while the seabird colony is located approximately 641km distant. The Project therefore does not directly overlap with the SPA boundary or any cited areas of functional linkages.

8.16.1 Description of designation

1726. Mingulay and Berneray SPA consists of two adjacent islands at the southern end of the Outer Hebrides. They have a maritime/paramaritime vegetation and predominantly cliffed, rocky coastlines. The boundary of the SPA overlaps with the boundary of Mingulay and Berneray SSSI, and the seaward extension extends approximately 2km into the marine environment to include the seabed, water column and surface.

8.16.2 Conservation Objectives

1727. The overarching conservation objectives of the site are (NB: bold text indicates those objectives and targets that are relevant to this assessment, based on the proximity of the SPA and functional linkages described above in relation to the Project):

- To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained
- To ensure for the qualifying species that the following are maintained in the long term:
    - **Population of the species as a viable component of the site**
    - Distribution of the species within site
    - Distribution and extent of habitats supporting the species
    - Structure, function and supporting processes of habitats supporting the species
    - No significant disturbance of the species.

8.16.3 Appropriate Assessment

1728. The qualifying features of this SPA screened into the Appropriate Assessment are listed in **Table 5.4**. These are guillemot, kittiwake and razorbill.

8.16.3.1 Guillemot

8.16.3.1.1 Status

1729. The SPA population is cited as 30,900 individuals. The most recent count (2018) is 50,639 individuals (SMP, 2023).

1730. Based on the cited SPA population of assumed breeding adults, and an annual breeding adult baseline mortality rate of 0.06 (1-0.939, Horswill and Robinson (2015)), 1,854 breeding adults from the SPA population would be subject to natural mortality per annum.

1731. Based on the most recent SPA population of assumed breeding adults, and an annual breeding adult baseline mortality rate of 0.06 (1-0.939, Horswill and Robinson (2015)), 3,038 breeding adults from the SPA population would be subject to natural mortality per annum.

8.16.3.1.2 Functional linkage and seasonal apportionment of potential effects

1732. The Project is outside of the mean max plus one SD foraging distance of 55.5+39.7km (Woodward *et al*. 2019). Therefore, the guillemot impact assessments for Mingulay and Berneray SPA have only been considered for the non-breeding season.

8.16.3.1.3 Potential disturbance and displacement effects on the qualifying feature in isolation

1733. Distant projects have been combined and assessed for all SPAs in **Section 8.30**. As presented within **Section 8.30**, the potential for **<u>an AEoI to the conservation objectives of the guillemot feature of Mingulay and Berneray SPA in relation to disturbance and displacement from the Project can be ruled out</u>**. Therefore, subject to natural change, guillemot will be maintained as a feature in the long term.

8.16.3.1.4 Consideration of entanglement with mooring lines

1734. Consideration of the potential impact of entanglement with mooring lines on the ornithology qualifying features of SPAs screened in for assessment is provided in **Section 8.27**. As presented within **Section 8.27**, the potential for **<u>an AEoI to the conservation objectives of the guillemot feature of Mingulay and Berneray SPA in relation to entanglement of mooring from the Project can</u>**

be ruled out. Therefore, subject to natural change, guillemot will be maintained as a feature in the long term.

8.16.3.1.5 Potential effects on the qualifying feature in-combination with other projects

1735. As detailed in **Section 8.30**, the potential level of impact for the Project alone was concluded as trivial and inconsequential as it is well under one breeding adult per annum for any project phase. That level of impact would be well within the error margins of the assessment. Therefore, such a trivial impact would have no potential for any contribution for an in-combination effect to occur within any project phase.

8.16.3.2 Kittiwake

8.16.3.2.1 Status

1736. The SPA population is cited as 17,200 breeding adults. The most recent counts comprise 750 apparently occupied nests on Berneray (2021) and 1338 apparently occupied nests on Mingulay (2017), an equivalent of 4,176 breeding adults (SMP, 2023).

1737. Based on the cited SPA population of breeding adults, and an annual breeding adult baseline mortality rate of 0.146 (1-0.854, Horswill and Robinson (2015)), 2,511 breeding adults from the SPA population would be subject to natural mortality per annum.

1738. Based on the most recent SPA population of breeding adults, and an annual breeding adult baseline mortality rate of 0.146 (1-0.854, Horswill and Robinson (2015)), 610 breeding adults from the SPA population would be subject to natural mortality per annum.

8.16.3.2.2 Functional linkage and seasonal apportionment of potential effects

1739. The Project is outside of the mean max plus one SD foraging distance of 156.1+144.5km (Woodward *et al*. 2019). Therefore, the kittiwake impact assessment for Mingulay and Berneray SPA have only been considered for the non-breeding seasons.

8.16.3.2.3 Potential collision risk effects on the qualifying feature in isolation

1740. Distant projects have been combined and assessed for all SPAs in **Section 8.30**. As presented within **Section 8.30**, the potential for **an AEoI to the conservation objectives of the kittiwake feature of Mingulay and Berneray SPA in relation to collision risk from the Project can be ruled out**. Therefore, subject to natural change, kittiwake will be maintained as a feature in the long term.

8.16.3.2.4 Potential effects on the qualifying feature in-combination with other projects

1741. When considering the operation and maintenance phase, as detailed above, the potential level of impact for the Project alone on kittiwake was concluded as trivial and inconsequential as it was well under one breeding adult per annum. As this level of effect would be well within the error margins of the assessment there is, therefore, no potential for any contribution for an in-combination effect to occur within the operation and maintenance phase.

8.16.3.3 Razorbill

8.16.3.3.1 Status

1742. The SPA population is cited as 16,890 individuals. The most recent counts, undertaken on Berneray and Outer Heisker in 2021, and Mingulay in 2017, total 26,787 breeding adults (SMP, 2023).

1743. Based on the cited SPA population of assumed breeding adults, and an annual breeding adult baseline mortality rate of 0.105 (1-0.895, Horswill and Robinson (2015)), 1,773 breeding adults from the SPA population would be subject to natural mortality per annum.

1744. Based on the most recent SPA population of assumed breeding adults, and an annual breeding adult baseline mortality rate of 0.105 (1-0.895, Horswill and Robinson (2015)), 2,813 breeding adults from the SPA population would be subject to natural mortality per annum.

8.16.3.3.2 Functional linkage and seasonal apportionment of potential effects

1745. The Project is outside of the mean max plus one SD foraging distance of 73.8+48.4km (Woodward *et al*. 2019). Therefore, the razorbill impact assessments for Mingulay and Berneray SPA have only been considered for the non-breeding seasons.

8.16.3.3.3 Potential disturbance and displacement effects on the qualifying feature in isolation

1746. Distant projects have been combined and assessed for all SPAs in **Section 8.30**. As presented within **Section 8.30**, the potential for **an AEoI to the conservation objectives of the razorbill feature of Mingulay and Berneray SPA in relation to disturbance and displacement from the Project can be ruled out**. Therefore, subject to natural change, razorbill will be maintained as a feature in the long term.

8.16.3.3.4 Consideration of entanglement with mooring lines

1747. Consideration of the potential impact of entanglement with mooring lines on the ornithology qualifying features of SPAs screened in for assessment is provided in

Section 8.27. As presented within **Section 8.27**, the potential for **an AEoI to the conservation objectives of the razorbill feature of Mingulay and Berneray SPA in relation to entanglement of mooring from the Project can be ruled out**. Therefore, subject to natural change, razorbill will be maintained as a feature in the long term.

8.16.3.3.5 Potential effects on the qualifying feature in-combination with other projects

1748. As detailed in **Section 8.30**, the potential level of impact for the Project alone was concluded as trivial and inconsequential as it is well under one breeding adult per annum for any project phase. That level of impact would be well within the error margins of the assessment. Therefore, such a trivial impact would have no potential for any contribution for an in-combination effect to occur within any project phase.

8.17 Rum SPA

1749. The Rum SPA boundary is located approximately 636km from the Windfarm Site, while the seabird colony is approximately 642km distant. The Project therefore does not directly overlap with the SPA boundary or any cited areas of functional linkages.

8.17.1 Description of designation

1750. Rum SPA includes the Inner Hebridean Island of Rum, which has a largely rocky coast with cliffs rising to 210m, and adjacent coastal waters. There are a few exposed beaches and a more sheltered shingle and boulder beach with intertidal mudflats in the inlet of Loch Scresort. Submaritime grasslands and heaths are widely distributed along the coast, notably on cliff tops and above exposed beaches on the west coast. The interior consists almost entirely of mountain and moorland with numerous streams and small lochs. Vestigial saltmarsh is restricted to small areas on gravelly silt deposits and there is a small sand-dune system backed by machair grading into alluvial marsh on the flood plain of the Kilmory River. The island is largely treeless with fragments of natural woodland and scrub only in a few rocky gullies, though there are additional areas of planted woodland.

1751. The boundary of the SPA overlaps with Rum SSSI and the seaward extension extends approximately 4km into the marine environment to include the seabed, water column and surface. Immediately offshore of Rum the sediments are a mixture of mud and sand with water depth generally less than 40 m although round much of the island this increases rapidly up to 80m. Maximum tidal currents generally vary between 0.5 and 1.0m/sec. A number of fish species spawn off the north-west coast of Scotland with the seas around the Small Isles particularly important as nursery areas for saithe and cod. Many of these species will form the food resource for marine waterbirds.

8.17.2 Conservation Objectives

1752. The overarching conservation objectives of the site are (NB: bold text indicates those objectives and targets that are relevant to this assessment, based on the proximity of the SPA and functional linkages described above in relation to the Project):

- To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained
- To ensure for the qualifying species that the following are maintained in the long term:
    - **Population of the species as a viable component of the site**
    - Distribution of the species within site
    - Distribution and extent of habitats supporting the species
    - Structure, function and supporting processes of habitats supporting the species
    - No significant disturbance of the species.

8.17.3 Appropriate Assessment

1753. One qualifying feature of this SPA is screened into the Appropriate Assessment (**Table 5.4**); Manx shearwater.

8.17.3.1 Manx shearwater

8.17.3.1.1 Status

1754. The SPA population is cited as 61,000 pairs. The most recent count is 120,000 apparently occupied sites identified by SMP (2023); an equivalent of 240,000 breeding adults.

1755. Based on the cited SPA population of breeding adults, and an annual breeding adult baseline mortality rate of 0.13 (1-0.870, Horswill and Robinson (2015)), 15,860 breeding adults from the SPA population would be subject to natural mortality per annum.

1756. Based on the most recent SPA population of breeding adults, and an annual breeding adult baseline mortality rate of 0.13 (1-0.870, Horswill and Robinson (2015)), 31,200 breeding adults from the SPA population would be subject to natural mortality per annum.

8.17.3.1.2 Functional linkage and seasonal apportionment of potential effects

1757. The Project is within the mean max plus one SD foraging distance of 2,365.5km (Woodward *et al*. 2019). Accordingly, this species is assessed for the full breeding (April to August), post-breeding migration (September to October) and return migration (March) seasons based on Furness (2015), with the level of abundance apportioned for the Windfarm Site plus 2km buffer to Rum SPA presented in **Table 8.46**.

1758. As detailed in **Section 1449**, for Manx shearwater a displacement distance of the Windfarm Site plus 2km buffer has been selected. A displacement rate of 10% and a mortality rate of 1-10% for operational and maintenance phase impacts are applied, as recommended in the Joint SNCB interim guidance on displacement (Updated, 2022). The focus of assessment being on the Applicant's position of 10% displacement rate and a 1% mortality rate, which is considered to represent a realistic, yet precautionary, assessment based on SNCBs guidance and additional evidence presented within **Section 1449**. However, the standard SNCB's maximum displacement mortality rate of 10% is also provided for each assessment.

Table 8.46 Manx shearwater level of abundance apportioned to Rum Islands SPA seasonally

Season	Level of apportionment (%)	Apportioned Abundance (breeding adults)
Full Breeding (Apr – Aug)	0.14	17.4
Post-breeding migration (Sep – Oct)	15.18	3.3
Return migration (Mar)	15.18	5.0

1759. Further detail of how the level of impact apportioned to each SPA is derived, is presented within **Appendix 13.A: Offshore Ornithology Technical Report** and **Appendix 13.C: Revised Collision Risk Modelling** of the Offshore ES.

8.17.3.1.3 Construction and decommissioning phase potential disturbance and displacement effects on the qualifying feature in isolation

1760. During the construction and decommissioning phase, the potential level of impact apportioned to the SPA seasonally is summarised in **Table 8.47** for both the Applicant's and SNCB's assumed preferred approach.

1761. The potential impact of the loss of less than a single additional breeding adult (<0.1, see **Table 8.47**) on an annual basis to the Rum SPA (with a classified population of 122,000 breeding adults and an annual background mortality of

15,860 breeding adults) would represent a <0.001% increase in baseline mortality rate annually, respectively.

1762. However, as the population of Manx shearwaters has increased significantly since the citation population count the potential impact on the population is more reasonably assessed against the latest population count undertaken in 2001, which was 240,000 breeding adults. On this basis, when considering the potential impact of this loss to Rum SPA (with an annual background mortality of 31,200 breeding adults) then the prediction of less than a single breeding adult suffering displacement consequent mortality would represent a <0.001% increase in baseline mortality rate annually, respectively.

1763. The addition of less than a single additional breeding adult mortalities per annum equates to a <0.001% increase in baseline mortality rate at most, when considering either the citation or the latest colony count. This level of impact would be indistinguishable from natural fluctuations in the population. The potential for **an AEoI to the conservation objectives of the Manx shearwater feature of Rum SPA in relation to disturbance and displacement effects in the construction and decommissioning phase from the Project alone can be ruled out**. Therefore, subject to natural change, Manx shearwater will be maintained as a feature in the long term.

8.17.3.1.4 Operational and maintenance phase potential disturbance and displacement effects on the qualifying feature in isolation

1764. During the operation and maintenance phase the potential level of impact apportioned to the SPA seasonally is summarised in **Table 8.48** for both the Applicant's and SNCB's assumed preferred approach.

1765. An annual displacement matrix is also presented for the apportioned abundance for the Windfarm Site plus 2km buffer to Rum SPA (**Table 8.49**).

1766. The potential impact of the loss of less than a single additional (<0.1, see **Table 8.48**) on an annual basis to the Rum SPA (with a classified population of 122,000 breeding adults and an annual background mortality of 15,860 breeding adults) would represent a <0.001% increase in baseline mortality rate annually.

Table 8.47 Summary of Manx shearwater construction and decommissioning phase disturbance and displacement impacts apportioned to Rum SPA

Population Size (Breeding adults)	**Season**	**Applicant's approach disturbance and displacement impact**		**SNCBs assumed approach disturbance and displacement impact**	
		5% Disp; 1% Mort (Breeding adults per annum)	Increase in baseline mortality rate (%)	5% Disp; 1-10% Mort (Breeding adults per annum)	Increase in baseline mortality rate (%)
Citation (122,000)	Full breeding	0.0	0.000	0.0 – 0.1	0.000 – 0.001
	Post-breeding migration	0.0	0.000	0.0	0.000
	Return migration	0.0	0.000	0.0	0.000
	Annual	0.0	0.000	0.0 – 0.1	0.000
Latest Count (240,000)	Full breeding	0.0	0.000	0.0 – 0.1	0.000
	Post-breeding migration	0.0	0.000	0.0	0.000
	Return migration	0.0	0.000	0.0	0.000
	Annual	0.0	0.000	0.0 – 0.1	0.000

Table 8.48 Summary of Manx shearwater operation and maintenance phase disturbance and displacement impacts apportioned to Rum SPA

Population Size (Breeding adults)	Season	Applicant's approach disturbance and displacement impact		SNCBs assumed approach disturbance and displacement impact	
		10% Disp; 1% Mort (Breeding adults per annum)	Increase in baseline mortality rate (%)	10% Disp; 1-10% Mort (Breeding adults per annum)	Increase in baseline mortality rate (%)
Citation (122,000)	Full breeding	0.0	0.000	0.0 – 0.2	0.000 – 0.001
	Post-breeding migration	0.0	0.000	0.0	0.000
	Return migration	0.0	0.000	0.0 – 0.1	0.000
	Annual	0.0	0.000	0.0 – 0.3	0.000 – 0.002
Latest Count (240,000)	Full breeding	0.0	0.000	0.0 – 0.2	0.000 – 0.001
	Post-breeding migration	0.0	0.000	0.0	0.000
	Return migration	0.0	0.000	0.0 – 0.1	0.000
	Annual	0.0	0.000	0.0 – 0.3	0.000 – 0.001

Table 8.49 Manx shearwater operation and maintenance phase disturbance annual displacement matrix for impacts apportioned to Rum SPA

Displacement (%)	**Mortality rates (%)**															
	0	**1**	**2**	**3**	**4**	**5**	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	1	1	1	1	2	2	2	2	3
15	0	0	0	0	0	0	0	1	1	2	2	2	3	3	3	4
20	0	0	0	0	0	0	1	1	2	2	3	3	4	4	5	5
25	0	0	0	0	0	0	1	1	2	3	3	4	4	5	6	6
30	0	0	0	0	0	0	1	2	2	3	4	5	5	6	7	8
35	0	0	0	0	0	0	1	2	3	4	4	5	6	7	8	9
40	0	0	0	0	0	1	1	2	3	4	5	6	7	8	9	10
50	0	0	0	0	1	1	1	3	4	5	6	8	9	10	12	13
60	0	0	0	0	1	1	2	3	5	6	8	9	11	12	14	15
70	0	0	0	1	1	1	2	4	5	7	9	11	13	14	16	18
80	0	0	0	1	1	1	2	4	6	8	10	12	14	16	19	21
90	0	0	0	1	1	1	2	5	7	9	12	14	16	19	21	23
100	0	0	1	1	1	1	3	5	8	10	13	15	18	21	23	26

	🟩	<1% increase in baseline mortality	🟩	>1% baseline mortality threshold for latest population	🟦	>1% baseline mortality threshold for citation population

1767. However, as the population of Manx shearwaters has increased significantly since the citation population count the potential impact on the population is more reasonably assessed against the latest population count undertaken in 2001, which was 240,000 breeding adults. On this basis, when considering the potential impact of this loss to Rum SPA (with an annual background mortality of 31,200 breeding adults) then the prediction of less than a single breeding adult suffering displacement consequent mortality would represent a <0.001% increase in baseline mortality rate annually.

1768. The addition of less than a single additional breeding adult mortality per annum equates to a <0.001% increase in baseline mortality rate at most, when considering either the citation or the latest colony count. This level of impact would be indistinguishable from natural fluctuations in the population. The potential for **an AeoI to the conservation objectives of the Manx shearwater feature of Rum SPA in relation to disturbance and displacement effects in the operation and maintenance phase from the Project alone can be ruled out**. Therefore, subject to natural change, Manx shearwater will be maintained as a feature in the long term.

8.17.3.1.5 Consideration of entanglement with mooring lines

1769. Consideration of the potential impact of entanglement with mooring lines on the ornithology qualifying features of SPAs screened in for assessment is provided in **Section 8.27**. As presented within **Section 8.27**, the potential for **an AEoI to the conservation objectives of the Manx shearwater feature of Rum SPA in relation to entanglement of mooring from the Project can be ruled out**. Therefore, subject to natural change, Manx shearwater will be maintained as a feature in the long term.

8.17.3.1.6 Indirect impacts due to effects on habitats and prey species

1770. Consideration of the potential indirect impacts due to effects on habitats and prey species on the ornithology qualifying features of SPAs screened in for assessment is provided in **Section 8.28**. As presented within **Section 8.28**, the potential for **an AEoI to the conservation objectives of the Manx shearwater feature of Rum SPA in relation to indirect impacts from the Project can be ruled out**. Therefore, subject to natural change, Manx shearwater will be maintained as a feature in the long term.

8.17.3.1.7 Potential effects on the qualifying feature in-combination with other projects

Construction and decommissioning phase

1771. When considering the construction and decommissioning phase, as detailed above, the potential level of impact for the Project alone on Manx shearwater was concluded as trivial and inconsequential. As this level of effect would be well within the error margins of the assessment there is no potential for any contribution for an in-combination effect to occur within the construction and decommissioning phase.

Operation and maintenance phase

1772. When considering the operation and maintenance phase, as detailed above, the potential level of impact for the Project alone was concluded as trivial and inconsequential as it is well under one breeding adult per annum. That level of impact would be well within the error margins of the assessment, and therefore such a trivial impact would have no potential for any contribution for an in-combination effect to occur within the operation and maintenance phase.

8.18 Canna and Sanday SPA

1773. The Canna and Sanday SPA boundary is located approximately 652km from the Windfarm Site, while the seabird colony is located approximately 658km distant. The Project therefore does not directly overlap with the SPA boundary or any cited areas of functional linkages.

8.18.1 Description of designation

1774. The island of Canna is the most western of the Small Isles in the Inner Hebrides. The site also includes part of the smaller island of Sanday, which is connected to Canna at low tide. The coastline of Canna consists mainly of steep cliffs capped by a ridge of wet heath and blanket bog. Sanday and the more low-lying areas of Canna support a varied range of coastal grassland and heath communities. The boundary of the SPA overlaps with the boundary of Canna and Sanday SSSI, and the seaward extension extends approximately 1km into the marine environment to include the seabed, water column and surface.

8.18.2 Conservation Objectives

1775. The overarching conservation objectives of the site are (NB: bold text indicates those objectives and targets that are relevant to this assessment, based on the proximity of the SPA and functional linkages described above in relation to the Project):

- To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained
- To ensure for the qualifying species that the following are maintained in the long term:

  - **Population of the species as a viable component of the site**
  - Distribution of the species within site
  - Distribution and extent of habitats supporting the species
  - Structure, function and supporting processes of habitats supporting the species
  - No significant disturbance of the species.

8.18.3 Appropriate Assessment

1776. One qualifying feature of this SPA is screened into the Appropriate Assessment (**Table 5.4**); guillemot.

8.18.3.1 Guillemot

8.18.3.1.1 Status

1777. The SPA population is cited as 5,800 individuals. The most recent count (2018) is 3,819 individuals (SMP, 2023).

1778. Based on the cited SPA population of assumed breeding adults, and an annual breeding adult baseline mortality rate of 0.06 (1-0.939, Horswill and Robinson (2015)), 348 breeding adults from the SPA population would be subject to natural mortality per annum.

1779. Based on the most recent SPA population of assumed breeding adults, and an annual breeding adult baseline mortality rate of 0.06 (1-0.939, Horswill and Robinson (2015)), 229 breeding adults from the SPA population would be subject to natural mortality per annum.

8.18.3.1.2 Functional linkage and seasonal apportionment of potential effects

1780. The Project is outside of the mean max plus one SD foraging distance of 55.5+39.7km (Woodward *et al*. 2019). Therefore, the guillemot impact assessment for disturbance and displacement for Canna and Sanday SPA have only been considered for the non-breeding season.

8.18.3.1.3 Potential disturbance and displacement effects on the qualifying feature in isolation

1781. Distant projects have been combined and assessed for all SPAs in **Section 8.30**. As presented within **Section 8.30**, the potential for **an AEoI to the conservation objectives of the guillemot feature of Canna and Sanday SPA in relation to disturbance and displacement from the Project can be ruled out**. Therefore, subject to natural change, guillemot will be maintained as a feature in the long term.

8.18.3.1.4 Consideration of entanglement with mooring lines

1782. Consideration of the potential impact of entanglement with mooring lines on the ornithology qualifying features of SPAs screened in for assessment is provided in **Section 8.27**. As presented within **Section 8.27**, the potential for **<u>an AEoI to the conservation objectives of the guillemot feature of Canna and Sanday SPA in relation to entanglement of mooring from the Project can be ruled out</u>**. Therefore, subject to natural change, guillemot will be maintained as a feature in the long term.

8.18.3.1.5 Potential effects on the qualifying feature in-combination with other projects

1783. As detailed in **Section 8.30**, the potential level of impact for the Project alone was concluded as trivial and inconsequential as it is well under one breeding adult per annum for any project phase. That level of impact would be well within the error margins of the assessment. Therefore, such a trivial impact would have no potential for any contribution for an in-combination effect to occur within any project phase.

8.19 Shiant Islands SPA

1784. The Shiant Islands SPA boundary is located approximately 744km from the Windfarm Site, while the seabird colony is located approximately 749km distant. The Project therefore does not directly overlap with the SPA boundary or any cited areas of functional linkages.

8.19.1 Description of designation

1785. The four islands comprising the Shiant Isles SPA, with their skerries, are situated in The SPA overlaps with the boundary of Shiant Islands SSSI, and the seaward extension extends approximately 2km into the marine environment to include the seabed, water column and surface.

8.19.2 Conservation Objectives

1786. The overarching conservation objectives of the site are (NB: bold text indicates those objectives and targets that are relevant to this assessment, based on the proximity of the SPA and functional linkages described above in relation to the Project):

- To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained
- To ensure for the qualifying species that the following are maintained in the long term:

- **Population of the species as a viable component of the site**
- Distribution of the species within site
- Distribution and extent of habitats supporting the species
- Structure, function and supporting processes of habitats supporting the species
- No significant disturbance of the species.

8.19.3 Appropriate Assessment

1787. The qualifying features of this SPA screened into the Appropriate Assessment are listed in **Table 5.4**. These are guillemot and razorbill.

8.19.3.1 Guillemot

8.19.3.1.1 Status

1788. The SPA population is cited as 18,380 individuals. The most recent count (2018) is 12,132 individuals (SMP, 2023).

1789. Based on the cited SPA population of assumed breeding adults, and an annual breeding adult baseline mortality rate of 0.06 (1-0.939, Horswill and Robinson (2015)), 1,103 breeding adults from the SPA population would be subject to natural mortality per annum.

1790. Based on the most recent SPA population of assumed breeding adults, and an annual breeding adult baseline mortality rate of 0.06 (1-0.939, Horswill and Robinson (2015)), 728 breeding adults from the SPA population would be subject to natural mortality per annum.

8.19.3.1.2 Functional linkage and seasonal apportionment of potential effects

1791. The Project is outside of the mean max plus one SD foraging distance of 55.5+39.7km (Woodward *et al*. 2019). Therefore, the guillemot impact assessment for disturbance and displacement for Shiant Islands SPA have only been considered for the non-breeding season.

8.19.3.1.3 Potential disturbance and displacement effects on the qualifying feature in isolation

1792. Distant projects have been combined and assessed for all SPAs in **Section 8.30**. As presented within **Section 8.30**, the potential for **an AEoI to the conservation objectives of the guillemot feature of Shiant Islands SPA in relation to disturbance and displacement from the Project can be ruled out**. Therefore, subject to natural change, guillemot will be maintained as a feature in the long term.

8.19.3.1.4 Consideration of entanglement with mooring lines

1793. Consideration of the potential impact of entanglement with mooring lines on the ornithology qualifying features of SPAs screened in for assessment is provided in **Section 8.27**. As presented within **Section 8.27**, the potential for **an AEoI to the conservation objectives of the guillemot feature of Shiant Islands SPA in relation to entanglement of mooring from the Project can be ruled out**. Therefore, subject to natural change, guillemot will be maintained as a feature in the long term.

8.19.3.1.5 Potential effects on the qualifying feature in-combination with other projects

1794. As detailed in **Section 8.30**, the potential level of impact for the Project alone was concluded as trivial and inconsequential as it is well under one breeding adult per annum for any project phase. That level of impact would be well within the error margins of the assessment. Therefore, such a trivial impact would have no potential for any contribution for an in-combination effect to occur within any project phase.

8.19.3.2 Razorbill

8.19.3.2.1 Status

1795. The SPA population is cited as 10,950 individuals. The most recent count (2015) is 10,759 individuals (SMP, 2023).

1796. Based on the cited SPA population of assumed breeding adults, and an annual breeding adult baseline mortality rate of 0.105 (1-0.895, Horswill and Robinson (2015)), 1,150 breeding adults from the SPA population would be subject to natural mortality per annum.

1797. Based on the most recent SPA population of assumed breeding adults, and an annual breeding adult baseline mortality rate of 0.105 (1-0.895, Horswill and Robinson (2015)), 1,130 breeding adults from the SPA population would be subject to natural mortality per annum.

8.19.3.2.2 Functional linkage and seasonal apportionment of potential effects

1798. The Project is outside of the mean max plus one SD foraging distance of 73.8+48.4km (Woodward *et al*. 2019). Therefore, the razorbill impact assessment for disturbance and displacement for Shiant Islands SPA have only been considered for the non-breeding season.

8.19.3.2.3 Potential disturbance and displacement effects on the qualifying feature in isolation

1799. Distant projects have been combined and assessed for all SPAs in **Section 8.30**. As presented within **Section 8.30**, the potential for **an AEoI to the conservation objectives of the razorbill feature of Shiant Islands SPA in relation to**

disturbance and displacement from the Project can be ruled out. Therefore, subject to natural change, razorbill will be maintained as a feature in the long term.

8.19.3.2.4 Consideration of entanglement with mooring lines

1800. Consideration of the potential impact of entanglement with mooring lines on the ornithology qualifying features of SPAs screened in for assessment is provided in **Section 8.27**. As presented within **Section 8.27**, the potential for **an AeoI to the conservation objectives of the razorbill feature of Shiant Islands SPA in relation to entanglement of mooring from the Project can be ruled out**. Therefore, subject to natural change, razorbill will be maintained as a feature in the long term.

8.19.3.2.5 Potential effects on the qualifying feature in-combination with other projects

1801. As detailed in **Section 8.30**, the potential level of impact for the Project alone was concluded as trivial and inconsequential as it is well under one breeding adult per annum for any project phase. That level of impact would be well within the error margins of the assessment. Therefore such a trivial impact would have no potential for any contribution for an in-combination effect to occur within any project phase.

8.20 St Kilda SPA

1802. The St Kilda SPA boundary is located approximately 756km from the Windfarm Site, while the seabird colony is located approximately 762km distant. The Project therefore does not directly overlap with the SPA boundary or any known areas of functional linkages.

8.20.1 Description of designation

1803. St Kilda is a group of remote Scottish islands lying in the North Atlantic about 70km west of North Uist in the Outer Hebrides. The islands are steep, with precipitous cliffs reaching 430m on Hirta and 380m on Soay and Boreray. The vegetation is strongly influenced by sea spray and the presence of seabirds and livestock. Inland on Hirta, species-poor acidic grassland and sub-maritime heaths occupy extensive areas. The islands provide a strategic nesting locality for seabirds that feed in the rich waters to the west of Scotland. The total population of seabirds exceeds 600,000 individuals, making this one of the largest concentrations in the North Atlantic and the largest in the UK. The boundary of the SPA overlaps with the boundary of St. Kilda SSSI, and the seaward extension extends approximately 4km into the marine environment to include the seabed, water column and surface.

8.20.2 Conservation Objectives

1804. The overarching conservation objectives of the site are (NB: bold text indicates those objectives and targets that are relevant to this assessment, based on the proximity of the SPA and functional linkages described above in relation to the Project):

- To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained
- To ensure for the qualifying species that the following are maintained in the long term:
    - **Population of the species as a viable component of the site**
    - Distribution of the species within site
    - Distribution and extent of habitats supporting the species
    - Structure, function and supporting processes of habitats supporting the species
    - No significant disturbance of the species.

8.20.3 Appropriate Assessment

1805. The qualifying features of this SPA screened into the Appropriate Assessment are listed in **Table 5.4**. These are gannet, guillemot and Manx shearwater.

8.20.3.1 Gannet

8.20.3.1.1 Status

1806. The SPA population at classification was cited as 50,050 pairs, or 100,100 breeding adults. The most recent count (2013) is 60,290 apparently occupied sites, or 120,580 breeding adults (SMP, 2023).

1807. Based on the cited SPA population of breeding adults, and an annual breeding adult baseline mortality rate of 0.081 (1-0.919, Horswill and Robinson (2015)), 8,108 breeding adults from the SPA population would be subject to natural mortality per annum.

1808. Based on the most recent SPA population of breeding adults, and an annual breeding adult baseline mortality rate of 0.081 (1-0.919, Horswill and Robinson (2015)), 9,767 breeding adults from the SPA population would be subject to natural mortality per annum.

8.20.3.1.2 Functional linkage and seasonal apportionment of potential effects

1809. The Project is outside of the mean max plus one SD foraging distance of 509.4km (Woodward *et al*. 2019). Therefore, the gannet impact assessments for St Kilda SPA have only been considered for the non-breeding season.

8.20.3.1.3 Potential disturbance and displacement effects on the qualifying feature in isolation

1810. Distant projects have been combined and assessed for all SPAs in **Section 8.30**. As presented within **Section 8.30**, the potential for **an AEoI to the conservation objectives of the gannet feature of St Kilda SPA in relation to disturbance and displacement from the Project can be ruled out**. Therefore, subject to natural change, gannet will be maintained as a feature in the long term.

8.20.3.1.4 Potential collision risk effects on the qualifying feature in isolation

1811. Distant projects have been combined and assessed for all SPAs in **Section 8.30**. As presented within **Section 8.30**, the potential for **an AEoI to the conservation objectives of the gannet feature of St Kilda SPA in relation to collision risk from the Project can be ruled out**. Therefore, subject to natural change, gannet will be maintained as a feature in the long term.

8.20.3.1.5 Consideration of entanglement with mooring lines

1812. Consideration of the potential impact of entanglement with mooring lines on qualifying features of SPAs screened in for assessment is provided in **Section 8.27**. As presented within **Section 8.27**, the potential for **an AEoI to the conservation objectives of the gannet feature of St Kilda SPA in relation to entanglement of mooring from the Project can be ruled out**. therefore, subject to natural change, gannet will be maintained as a feature in the long term.

8.20.3.1.6 Potential effects on the qualifying feature in-combination with other projects

1813. As detailed in **Section 8.30**, the potential level of impact for the Project alone was concluded as trivial and inconsequential as it is well under one breeding adult per annum for any project phase. That level of impact would be well within the error margins of the assessment. Therefore, such a trivial impact would have no potential for any contribution for an in-combination effect to occur within any project phase.

8.20.3.2 Guillemot

8.20.3.2.1 Status

1814. The SPA population is cited as 22,700 individuals. The most recent counts, undertaken in 2015 and 2016, identified 13,806 individuals (SMP, 2023).

1815. Based on the cited SPA population of assumed breeding adults, and an annual breeding adult baseline mortality rate of 0.06 (1-0.939, Horswill and Robinson

(2015)), 1,362 breeding adults from the SPA population would be subject to natural mortality per annum.

1816. Based on the most recent SPA population of assumed breeding adults, and an annual breeding adult baseline mortality rate of 0.06 (1-0.939, Horswill and Robinson (2015)), 828 breeding adults from the SPA population would be subject to natural mortality per annum.

1817. Based on the most recent SPA population of assumed breeding adults, and an annual breeding adult baseline mortality rate of 0.06 (1-0.939, Horswill and Robinson (2015)), 828 breeding adults from the SPA population would be subject to natural mortality per annum.

8.20.3.2.2 Functional linkage and seasonal apportionment of potential effects

1818. The Project is outside of the mean max plus one SD foraging distance of 55.5+39.7km (Woodward *et al.* 2019). Therefore, the guillemot impact assessments for St Kilda SPA have only been considered for the non-breeding season.

8.20.3.2.3 Potential disturbance and displacement effects on the qualifying feature in isolation

1819. Distant projects have been combined and assessed for all SPAs in **Section 8.30**. As presented within **Section 8.30**, the potential for **an AEoI to the conservation objectives of the guillemot feature of St Kilda SPA in relation to disturbance and displacement from the Project can be ruled out**. Therefore, subject to natural change, guillemot will be maintained as a feature in the long term.

8.20.3.2.4 Consideration of entanglement with mooring lines

1820. Consideration of the potential impact of entanglement with mooring lines on the ornithology qualifying features of SPAs screened in for assessment is provided in **Section 8.27**. As presented within **Section 8.27**, the potential for **an AEoI to the conservation objectives of the guillemot feature of St Kilda SPA in relation to entanglement of mooring from the Project can be ruled out**. Therefore, subject to natural change, guillemot will be maintained as a feature in the long term.

8.20.3.2.5 Potential effects on the qualifying feature in-combination with other projects

1821. As detailed in **Section 8.30**, the potential level of impact for the Project alone was concluded as trivial and inconsequential as it is well under one breeding adult per annum for any project phase. That level of impact would be well within the error margins of the assessment. Therefore, such a trivial impact would have no potential for any contribution for an in-combination effect to occur within any project phase.

8.20.3.3 Manx shearwater

8.20.3.3.1 Status

1822. The SPA population at classification was cited as 5,000 pairs, or 10,000 breeding adults. The latest count, in 1999, identified 9,606 individuals (SMP, 2023).

1823. Based on the cited SPA population of breeding adults, and an annual breeding adult baseline mortality rate of 0.13 (1-0.870, Horswill and Robinson (2015)), 1,300 breeding adults from the SPA population would be subject to natural mortality per annum.

1824. Based on the most recent SPA population of breeding adults, and an annual breeding adult baseline mortality rate of 0.13 (1-0.870, Horswill and Robinson (2015)), 1,249 breeding adults from the SPA population would be subject to natural mortality per annum.

8.20.3.3.2 Functional linkage and seasonal apportionment of potential effects

1825. The Project is within the mean max plus one SD foraging distance of 2,365.5km (Woodward *et al*. 2019), Accordingly, this species is assessed for the full breeding (April to August), post-breeding migration (September to October) and return migration (March) seasons based on Furness (2015), with the level of abundance apportioned for the WIndfarm Site plus 2km buffer to St Kilda SPA presented in **Table 8.50**.

Table 8.50 Manx shearwater level of abundance apportioned to St Kilda Islands SPA seasonally

Season	Level of apportionment (%)	Apportioned Abundance (breeding adults)
Full Breeding (Apr – Aug)	0.00	0.3
Post-breeding migration (Sep – Oct)	0.61	0.1
Return migration (Mar)	0.61	0.2

1826. As detailed in **Section 1449**, for Manx shearwater a displacement distance of the Windfarm Site plus 2km buffer has been selected. A displacement rate of 10% and a mortality rate of 1-10% for operational and maintenance phase impacts are used, as recommended in the Joint SNCB interim guidance on displacement (Updated, 2022). The focus of the assessment is on the Applicant's position of 10% displacement rate and a 1% mortality rate. This is considered to represent a realistic, yet precautionary, assessment based on SNCBs guidance and additional evidence presented within **Section 1449**. However, the standard SNCB's maximum displacement mortality rate of 10% is also provided for each assessment.

1827. Further detail of how the level of impact apportioned to each SPA is derived, is presented within **Appendix 13.A: Offshore Ornithology Technical Report** and **Appendix 13.C: Revised Collision Risk Modelling** of the Offshore ES.

8.20.3.3.3 Construction and decommissioning phase potential disturbance and displacement effects on the qualifying feature in isolation

1828. During the construction and decommissioning phase, the potential level of impact apportioned to the SPA seasonally is summarised in **Table 8.51** for both the Applicant's and SNCB's assumed preferred approach.

1829. The potential impact of the loss of less than a single additional breeding adult (<0.1, see **Table 8.51**) on an annual basis to the St Kilda SPA (with a classified population of 10,000 breeding adults and an annual background mortality of 1,300 breeding adults) would represent a <0.001% increase in baseline mortality rate annually.

1830. However, as the population of Manx shearwaters has changed since the citation population count the potential impact on the population is more reasonably assessed against the latest population count undertaken in 1999, which was 9,606 breeding adults. On this basis, when considering the potential impact of this loss to St Kilda SPA (with an annual background mortality of 1,249 breeding adults) then the prediction of less than a single breeding adult suffering displacement consequent mortality would represent a <0.001% increase in baseline mortality rate annually, respectively.

1831. The addition of less than a single additional breeding adult mortality per annum equates to a <0.001% increase in baseline mortality rate at most, when considering either the citation or the latest colony count. This level of impact would be indistinguishable from natural fluctuations in the population. Therefore, the potential for **an AEoI to the conservation objectives of the Manx shearwater feature of St Kilda SPA in relation to disturbance and displacement effects in the construction and decommissioning phase from the Project alone can be ruled out**. Subject to natural change, Manx shearwater will be maintained as a feature in the long term.

8.20.3.3.4 Operational and maintenance phase potential disturbance and displacement effects on the qualifying feature in isolation

1832. During the operation and maintenance phase the potential level of impact apportioned to the SPA seasonally is summarised in **Table 8.52** for both the Applicant's and SNCB's assumed preferred approach.

1833. An annual displacement matrix is also presented for the apportioned abundance for the Windfarm Site plus 2km buffer to St Kilda SPA (**Table 8.53**).

1834. The potential impact of the loss of less than a single additional breeding adult (<0, see **Table 8.52**) on an annual basis to the St Kilda SPA (with a classified population of 10,000 breeding adults and an annual background mortality of 1,300 breeding adults) would represent a <0.001% increase in baseline mortality rate annually, respectively.

1835. However, as the population of Manx shearwaters has changed since the citation population count the potential impact on the population is more reasonably assessed against the latest population count undertaken in 1999, which was 9,606 breeding adults. On this basis, when considering the potential impact of this loss to St Kilda SPA (with an annual background mortality of 1,249 breeding adults) then the prediction of less than a single breeding adult suffering displacement consequent mortality would represent a <0.001% increase in baseline mortality rate annually, respectively.

1836. The addition of less than a single additional breeding adult mortality per annum equates to a 0.000% increase in baseline mortality rate at most, when considering either the citation or the latest colony count. This level of impact would be indistinguishable from natural fluctuations in the population. Therefore, the potential for **an AEoI to the conservation objectives of the Manx shearwater feature of St Kilda SPA in relation to disturbance and displacement effects in the operation and maintenance phase from the Project alone can be ruled out**. Subject to natural change, Manx shearwater will be maintained as a feature in the long term.

8.20.3.3.5 Consideration of entanglement with mooring lines

1837. Consideration of the potential impact of entanglement with mooring lines on the ornithology qualifying features of SPAs screened in for assessment is provided in **Section 8.27**. As presented within **Section 8.27**, the potential for **an AEoI to the conservation objectives of the Manx shearwater feature of St Kilda SPA in relation to entanglement of mooring from the Project can be ruled out**. Therefore, subject to natural change, Manx shearwater will be maintained as a feature in the long term.

Table 8.51 Summary of Manx shearwater construction and decommissioning phase disturbance and displacement impacts apportioned to St Kilda SPA

Population Size (Breeding adults)	**Season**	**Applicant's approach disturbance and displacement impact**		**SNCBs assumed approach disturbance and displacement impact**	
		5% Disp; 1% Mort (Breeding adults per annum)	Increase in baseline mortality rate (%)	5% Disp; 1-10% Mort (Breeding adults per annum)	Increase in baseline mortality rate (%)
Citation (10,000)	Full breeding	0.0	0.000	0.0	0.000
	Post-breeding migration	0.0	0.000	0.0	0.000
	Return migration	0.0	0.000	0.0	0.000
	Annual	0.0	0.000	0.0	0.000
Latest Count (9,606)	Full breeding	0.0	0.000	0.0	0.000
	Post-breeding migration	0.0	0.000	0.0	0.000
	Return migration	0.0	0.000	0.0	0.000
	Annual	0.0	0.000	0.0	0.000

Table 8.52 Summary of Manx shearwater operation and maintenance phase disturbance and displacement impacts apportioned to St Kilda SPA

Population Size (Breeding adults)	**Season**	**Applicant's approach disturbance and displacement impact**		**SNCBs assumed approach disturbance and displacement impact**	
		10% Disp; 1% Mort (Breeding adults per annum)	Increase in baseline mortality rate (%)	10% Disp; 1-10% Mort (Breeding adults per annum)	Increase in baseline mortality rate (%)
Citation (10,000)	Full breeding	0.0	0.000	0.0	0.000
	Post-breeding migration	0.0	0.000	0.0	0.000
	Return migration	0.0	0.000	0.0	0.000
	Annual	0.0	0.000	0.0	0.001
Latest Count (9,606)	Full breeding	0.0	0.000	0.0	0.000
	Post-breeding migration	0.0	0.000	0.0	0.000
	Return migration	0.0	0.000	0.0	0.000
	Annual	0.0	0.000	0.0	0.001

Table 8.53 Manx shearwater operation and maintenance phase disturbance annual displacement matrix for impacts apportioned to St Kilda SPA

Displacement (%)	**Mortality rates (%)**															
	0	**1**	**2**	**3**	**4**	**5**	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
100	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1

🟩	<1% increase in baseline mortality	🟩	>1% baseline mortality threshold for latest population	🟦	>1% baseline mortality threshold for citation population

8.20.3.3.6 Potential effects on the qualifying feature in-combination with other projects

Construction and decommissioning phase

1838. When considering the construction and decommissioning phase, as detailed above, the potential level of impact for the Project alone on Manx shearwater was concluded as trivial and inconsequential. As this level of effect would be well within the error margins of the assessment there is no potential for any contribution for an in-combination effect to occur within the construction and decommissioning phase.

Operation and maintenance phase

1839. When considering the operation and maintenance phase, as detailed above, the potential level of impact for the Project alone was concluded as trivial and inconsequential as it is well under one breeding adult per annum. That level of impact would be well within the error margins of the assessment. Therefore, such a trivial impact would have no potential for any contribution for an in-combination effect to occur within the operation and maintenance phase.

8.21 Handa SPA

1840. The Handa SPA boundary is located approximately 796km from the Windfarm Site, while the seabird colony is located approximately 801km distant. The Project therefore does not directly overlap with the SPA boundary or any cited areas of functional linkages.

8.21.1 Description of designation

1841. Handa SPA consists of an island surrounded by high sea-cliffs and adjacent coastal waters lying a short distance from the west coast of Sutherland in Scotland. It provides a strategic nesting locality for seabirds that feed in the productive waters of the northern Minch, outside the SPA. Most of the island is vegetated with sub-maritime grasslands and heaths. The SPA's principal ornithological importance is for its breeding seabirds. The boundary of the SPA overlaps with the boundary of Handa Island SSSI, and the seaward extension extends approximately 2km into the marine environment to include the seabed, water column and surface.

8.21.2 Conservation Objectives

1842. The overarching conservation objectives of the site are (NB: bold text indicates those objectives and targets that are relevant to this assessment, based on the proximity of the SPA and functional linkages described above in relation to the Project):

- To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained
- To ensure for the qualifying species that the following are maintained in the long term:
    - **Population of the species as a viable component of the site**
    - Distribution of the species within site
    - Distribution and extent of habitats supporting the species
    - Structure, function and supporting processes of habitats supporting the species
    - No significant disturbance of the species.

8.21.3 Appropriate Assessment

1843. Two qualifying features of this SPA are screened into the Appropriate Assessment (**Table 5.4**); guillemot and razorbill.

8.21.3.1 Guillemot

8.21.3.1.1 Status

1844. The SPA population is cited as 98,686 individuals. The most recent count (2018) identified 91,822 individuals (SMP, 2023).

1845. Based on the cited SPA population of assumed breeding adults, and an annual breeding adult baseline mortality rate of 0.06 (1-0.939, Horswill and Robinson (2015)), 5,921 breeding adults from the SPA population would be subject to natural mortality per annum.

1846. Based on the most recent SPA population of assumed breeding adults, and an annual breeding adult baseline mortality rate of 0.06 (1-0.939, Horswill and Robinson (2015)), 5,509 breeding adults from the SPA population would be subject to natural mortality per annum.

8.21.3.1.2 Functional linkage and seasonal apportionment of potential effects

1847. The Project is outside of the mean max plus one SD foraging distance of 55.5+39.7km (Woodward *et al*. 2019). Therefore, the guillemot impact assessments for Handa SPA have only been considered for the non-breeding season.

8.21.3.1.3 Potential disturbance and displacement effects on the qualifying feature in isolation

1848. Distant projects have been combined and assessed for all SPAs in **Section 8.30**. As presented within **Section 8.30**, the potential for **an AEoI to the conservation objectives of the guillemot feature of Handa SPA in relation to disturbance**

and displacement from the Project can be ruled out. Therefore, subject to natural change, guillemot will be maintained as a feature in the long term.

8.21.3.1.4 Consideration of entanglement with mooring lines

1849. Consideration of the potential impact of entanglement with mooring lines on the ornithology qualifying features of SPAs screened in for assessment is provided in **Section 8.27**. As presented within **Section 8.27**, the potential for **an AEoI to the conservation objectives of the guillemot feature of Handa SPA in relation to entanglement of mooring from the Project can be ruled out**. Therefore, subject to natural change, guillemot will be maintained as a feature in the long term.

8.21.3.1.5 Potential effects on the qualifying feature in-combination with other projects

1850. As detailed in **Section 8.30**, the potential level of impact for the Project alone was concluded as trivial and inconsequential as it is well under one breeding adult per annum for any project phase. That level of impact would be well within the error margins of the assessment. Therefore, such a trivial impact would have no potential for any contribution for an in-combination effect to occur within any project phase.

8.21.3.2 Razorbill

8.21.3.2.1 Status

1851. The SPA population is cited as 16,394 individuals. The most recent count (2019) identified 10,997 individuals (SMP, 2023).

1852. Based on the cited SPA population of assumed breeding adults, and an annual breeding adult baseline mortality rate of 0.105 (1-0.895, Horswill and Robinson (2015)), 1,721 breeding adults from the SPA population would be subject to natural mortality per annum.

1853. Based on the most recent SPA population of assumed breeding adults, and an annual breeding adult baseline mortality rate of 0.105 (1-0.895, Horswill and Robinson (2015)), 1,154 breeding adults from the SPA population would be subject to natural mortality per annum.

8.21.3.2.2 Functional linkage and seasonal apportionment of potential effects

1854. The Project is outside of the mean max plus one SD foraging distance of 73.8+48.4km (Woodward *et al*. 2019). Therefore, the razorbill impact assessments for Handa SPA have only been considered for the non-breeding season.

8.21.3.2.3 Potential effects on the qualifying feature in isolation

1855. Distant projects have been combined and assessed for all SPAs in **Section 8.30**. As presented within **Section 8.30**, the potential for **an AEoI to the conservation**

objectives of the razorbill feature of Handa SPA in relation to disturbance and displacement from the Project can be ruled out. Therefore, subject to natural change, razorbill will be maintained as a feature in the long term.

8.21.3.2.4 Consideration of entanglement with mooring lines

1856. Consideration of the potential impact of entanglement with mooring lines on the ornithology qualifying features of SPAs screened in for assessment is provided in **Section 8.27**. As presented within **Section 8.27**, the potential for **an AEoI to the conservation objectives of the razorbill feature of Handa SPA in relation to entanglement of mooring from the Project can be ruled out**. Therefore, subject to natural change, razorbill will be maintained as a feature in the long term.

8.21.3.2.5 Potential effects on the qualifying feature in-combination with other projects

1857. As detailed in **Section 8.30**, the potential level of impact for the Project alone was concluded as trivial and inconsequential as it is well under one breeding adult per annum for any project phase. That level of impact would be well within the error margins of the assessment. Therefore, such a trivial impact would have no potential for any contribution for an in-combination effect to occur within any project phase.

8.22 Flannan Isles SPA

1858. The Flannan Islands SPA boundary is located approximately 797km from the Windfarm Site, while the seabird colony is located approximately 803km distant. The Project therefore does not directly overlap with the SPA boundary or any cited areas of functional linkages.

8.22.1 Description of designation

1859. The Flannan Isles SPA consists of a group of seven rocky islands, outlying skerries and adjacent coastal waters lying approximately 30km west of Lewis in the Outer Hebrides off the north-west coast of Scotland. The islands provide a strategically placed nesting locality for seabirds, which feed in the rich waters off the Western Isles. The vegetation of the islands is predominantly maritime grassland. The boundary of the SPA overlaps with the boundary of the Flannan Isles SSSI, and the seaward extension extends approximately 2km into the marine environment to include the seabed, water column and surface.

8.22.2 Conservation Objectives

1860. The overarching conservation objectives of the site are (NB: bold text indicates those objectives and targets that are relevant to this assessment, based on the proximity of the SPA and functional linkages described above in relation to the Project):

- To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained
- To ensure for the qualifying species that the following are maintained in the long term:
    - **Population of the species as a viable component of the site**
    - Distribution of the species within site
    - Distribution and extent of habitats supporting the species
    - Structure, function and supporting processes of habitats supporting the species
    - No significant disturbance of the species.

8.22.3 Appropriate Assessment

1861. One qualifying feature of this SPA has been screened into the Appropriate Assessment as summarised in **Table 5.4**; guillemot.

8.22.3.1 Guillemot

8.22.3.1.1 Status

1862. The SPA population is cited as 21,930 individuals. The most recent count (2018) is 7,547 individuals (SMP, 2023).

1863. Based on the cited SPA population of assumed breeding adults, and an annual breeding adult baseline mortality rate of 0.06 (1-0.939, Horswill and Robinson (2015)), 1,316 breeding adults from the SPA population would be subject to natural mortality per annum.

1864. Based on the most recent SPA population of assumed breeding adults, and an annual breeding adult baseline mortality rate of 0.06 (1-0.939, Horswill and Robinson (2015)), 453 breeding adults from the SPA population would be subject to natural mortality per annum.

8.22.3.1.2 Functional linkage and seasonal apportionment of potential effects

1865. The Project is outside of the mean max plus one SD foraging distance of 55.5+39.7km (Woodward *et al*. 2019). Therefore, the guillemot impact assessments for Flannan Isles SPA have only been considered for the non-breeding season.

8.22.3.1.3 Potential disturbance and displacement effects on the qualifying feature in isolation

1866. Distant projects have been combined and assessed for all SPAs in **Section 8.30**. As presented within **Section 8.30**, the potential for **an AEoI to the conservation objectives of the guillemot feature of Flannan Isles SPA in relation to disturbance and displacement from the Project can be ruled out**. Therefore, subject to natural change, guillemot will be maintained as a feature in the long term.

8.22.3.1.4 Consideration of entanglement with mooring lines

1867. Consideration of the potential impact of entanglement with mooring lines on the ornithology qualifying features of SPAs screened in for assessment is provided in **Section 8.27**. As presented within **Section 8.27**, the potential for **an AEoI to the conservation objectives of the guillemot feature of Flannan Isles SPA in relation to entanglement of mooring from the Project can be ruled out**. Therefore, subject to natural change, guillemot will be maintained as a feature in the long term.

8.22.3.1.5 Potential effects on the qualifying feature in-combination with other projects

1868. As detailed in **Section 8.30**, the potential level of impact for the Project alone was concluded as trivial and inconsequential as it is well under one breeding adult per annum for any project phase. That level of impact would be well within the error margins of the assessment. Therefore, such a trivial impact would have no potential for any contribution for an in-combination effect to occur within any project phase.

8.23 Cape Wrath SPA

1869. The Cape Wrath SPA boundary is located approximately 819km from the Windfarm Site, while the seabird colony is located approximately 825km distant. The Project therefore does not directly overlap with the SPA boundary or any cited areas of functional linkages.

8.23.1 Description of designation

1870. Cape Wrath SPA covers two stretches of Torridonian sandstone and Lewisian gneiss cliff around Cape Wrath headland in north-west Scotland. These cliffs support large colonies of breeding seabirds. The boundary of the SPA overlaps with the boundary of Cape Wrath SSSI, and the seaward extension extends approximately 2km into the marine environment to include the seabed, water column and surface.

8.23.2 Conservation Objectives

1871. The overarching conservation objectives of the site are (NB: bold text indicates those objectives and targets that are relevant to this assessment, based on the proximity of the SPA and functional linkages described above in relation to the Project):

- To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained
- To ensure for the qualifying species that the following are maintained in the long term:
    - **Population of the species as a viable component of the site**
    - Distribution of the species within site
    - Distribution and extent of habitats supporting the species
    - Structure, function and supporting processes of habitats supporting the species
    - No significant disturbance of the species.

8.23.3 Appropriate Assessment

1872. The qualifying features of this SPA screened into the Appropriate Assessment are listed in **Table 5.4**. These are guillemot, kittiwake and razorbill.

8.23.3.1 Guillemot

8.23.3.1.1 Status

1873. The SPA population is cited as 13,700 individuals. The most recent count (2017) identified 51,066 individuals (SMP, 2023).

1874. Based on the cited SPA population of assumed breeding adults, and an annual breeding adult baseline mortality rate of 0.06 (1-0.939, Horswill and Robinson (2015)), 822 breeding adults from the SPA population would be subject to natural mortality per annum.

1875. Based on the most recent SPA population of assumed breeding adults, and an annual breeding adult baseline mortality rate of 0.06 (1-0.939, Horswill and Robinson (2015)), 3,064 breeding adults from the SPA population would be subject to natural mortality per annum.

8.23.3.1.2 Functional linkage and seasonal apportionment of potential effects

1876. The Project is outside of the mean max plus one SD foraging distance of 55.5+39.7km (Woodward *et al.* 2019). Therefore, the guillemot impact assessments for Cape Wrath SPA have only been considered for the non-breeding season.

8.23.3.1.3 Potential disturbance and displacement effects on the qualifying feature in isolation

1877. Distant projects have been combined and assessed for all SPAs in **Section 8.30**. As presented within **Section 8.30**, the potential for **an AEoI to the conservation objectives of the guillemot feature of Cape Wrath SPA in relation to disturbance and displacement from the Project can be ruled out**. Therefore, subject to natural change, guillemot will be maintained as a feature in the long term.

8.23.3.1.4 Consideration of entanglement with mooring lines

1878. Consideration of the potential impact of entanglement with mooring lines on the ornithology qualifying features of SPAs screened in for assessment is provided in **Section 8.27**. As presented within **Section 8.27**, the potential for **an AEoI to the conservation objectives of the guillemot feature of Cape Wrath SPA in relation to entanglement of mooring from the Project can be ruled out**. Therefore, subject to natural change, guillemot will be maintained as a feature in the long term.

8.23.3.1.5 Potential effects on the qualifying feature in-combination with other projects

1879. As detailed in **Section 8.30**, the potential level of impact for the Project alone was concluded as trivial and inconsequential as it is well under one breeding adult per annum for any project phase. That level of impact would be well within the error margins of the assessment. Therefore, such a trivial impact would have no potential for any contribution for an in-combination effect to occur within any project phase.

8.23.3.2 Kittiwake

8.23.3.2.1 Status

1880. The SPA population is cited as 9,700 pairs, equating to 19,400 breeding adults. The most recent count (2017) identified 3,622 apparently occupied nests, or 7,244 breeding adults (SMP, 2023).

1881. Based on the most recent SPA population of breeding adults, and an annual breeding adult baseline mortality rate of 0.146 (1-0.854, Horswill and Robinson (2015)), 2,832 breeding adults from the SPA population would be subject to natural mortality per annum.

1882. Based on the most recent SPA population of breeding adults, and an annual breeding adult baseline mortality rate of 0.146 (1-0.854, Horswill and Robinson (2015)), 1,058 breeding adults from the SPA population would be subject to natural mortality per annum.

8.23.3.2.2 Functional linkage and seasonal apportionment of potential effects

1883. The Project is outside of the mean max plus one SD foraging distance of 156.1+144.5km (Woodward *et al*. 2019). Therefore, the kittiwake impact assessments for Cape Wrath SPA have only been considered for the non-breeding seasons.

8.23.3.2.3 Potential collision risk effects on the qualifying feature in isolation

1884. Distant projects have been combined and assessed for all SPAs in **Section 8.30**. As presented within **Section 8.30**, the potential for **an AEoI to the conservation objectives of the kittiwake feature of Cape Wrath SPA in relation to collision risk from the Project can be ruled out**. Therefore, subject to natural change, kittiwake will be maintained as a feature in the long term.

8.23.3.2.4 Potential effects on the qualifying feature in-combination with other projects

1885. When considering the operation and maintenance phase, as detailed above, the potential level of impact for the Project alone on kittiwake was concluded as trivial and inconsequential as it was well under one breeding adult per annum. As this level of effect would be well within the error margins of the assessment there is no potential for any contribution for an in-combination effect to occur within the operation and maintenance phase.

8.23.3.3 Razorbill

8.23.3.3.1 Status

1886. The SPA population is cited as 1,800 individuals. The most recent count (2017) identified 4,350 individuals (SMP, 2023).

1887. Based on the cited SPA population of assumed breeding adults, and an annual breeding adult baseline mortality rate of 0.105 (1-0.895, Horswill and Robinson (2015)), 189 breeding adults from the SPA population would be subject to natural mortality per annum.

1888. Based on the most recent SPA population of assumed breeding adults, and an annual breeding adult baseline mortality rate of 0.105 (1-0.895, Horswill and Robinson (2015)), 457 breeding adults from the SPA population would be subject to natural mortality per annum.

8.23.3.3.2 Functional linkage and seasonal apportionment of potential effects

1889. The Project is outside of the mean max plus one SD foraging distance of 73.8+48.4km (Woodward *et al*. 2019). Therefore, the razorbill impact assessments for Cape Wrath SPA have only been considered for the non-breeding seasons.

8.23.3.3.3 Potential disturbance and displacement effects on the qualifying feature in isolation

1890. Distant projects have been combined and assessed for all SPAs in **Section 8.30**. As presented within **Section 8.30**, the potential for **an AEoI to the conservation objectives of the razorbill feature of Cape Wrath SPA in relation to disturbance and displacement from the Project can be ruled out**. Therefore, subject to natural change, razorbill will be maintained as a feature in the long term.

8.23.3.3.4 Consideration of entanglement with mooring lines

1891. Consideration of the potential impact of entanglement with mooring lines on the ornithology qualifying features of SPAs screened in for assessment is provided in **Section 8.27**. As presented within **Section 8.27**, the potential for **an AEoI to the conservation objectives of the razorbill feature of Cape Wrath SPA in relation to entanglement of mooring from the Project can be ruled out**. Therefore, subject to natural change, razorbill will be maintained as a feature in the long term.

8.23.3.3.5 Potential effects on the qualifying feature in-combination with other projects

1892. As detailed in **Section 8.30**, the potential level of impact for the Project alone was concluded as trivial and inconsequential as it is well under one breeding adult per annum for any project phase. That level of impact would be well within the error margins of the assessment, and therefore such a trivial impact would have no potential for any contribution for an in-combination effect to occur within any project phase.

8.24 Sule Skerry and Sule Stack SPA

1893. The Sule Skerry and Sule Stack SPA boundary is located approximately 870km from the Windfarm Site, while the seabird colony is located approximately 875km distant. The Project therefore does not directly overlap with the SPA boundary or any cited areas of functional linkages.

8.24.1 Description of designation

1894. Sule Skerry and Sule Stack are isolated islets 60km west of Mainland, Orkney. Sule Skerry is larger, low-lying and vegetated whereas Sule Stack is a higher, bare rock stack with no vascular plants. The boundary of the SPA overlaps with those of Sule Skerry SSSI and Sule Stack SSSI and the seaward extension extends approximately 2km into the marine environment to include the seabed, water column and surface.

8.24.2 Conservation Objectives

1895. The overarching conservation objectives of the site are (NB: bold text indicates those objectives and targets that are relevant to this assessment, based on the proximity of the SPA and functional linkages described above in relation to the Project):

- To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained
- To ensure for the qualifying species that the following are maintained in the long term:
    - **Population of the species as a viable component of the site**
    - Distribution of the species within site
    - Distribution and extent of habitats supporting the species
    - Structure, function and supporting processes of habitats supporting the species
    - No significant disturbance of the species.

8.24.3 Appropriate Assessment

1896. The qualifying features of this SPA screened into the Appropriate Assessment are listed in **Table 5.4**. These are gannet and guillemot.

8.24.3.1 Gannet

8.24.3.1.1 Status

1897. The SPA population at classification was cited as 5,900 pairs, equating to 11,800 individuals. The most recent count (2018) identified 4,515 apparently occupied sites, or 9,030 breeding adults (SMP, 2023).

1898. Based on the cited SPA population of breeding adults, and an annual breeding adult baseline mortality rate of 0.081 (1-0.919, Horswill and Robinson (2015)), 956 breeding adults from the SPA population would be subject to natural mortality per annum.

1899. Based on the most recent SPA population of breeding adults, and an annual breeding adult baseline mortality rate of 0.081 (1-0.919, Horswill and Robinson (2015)), 731 breeding adults from the SPA population would be subject to natural mortality per annum.

8.24.3.1.2 Functional linkage and seasonal apportionment of potential effects

1900. The Project is outside of the mean max plus one SD foraging distance of 509.4km (Woodward *et al*. 2019). Therefore, the gannet impact assessments for Sule Skerry and Sule Stack SPA have only been considered for the non-breeding seasons.

8.24.3.1.3 Potential disturbance and displacement effects on the qualifying feature in isolation

1901. Distant projects have been combined and assessed for all SPAs in **Section 8.30**. As presented within **Section 8.30**, the potential for **an AEoI to the conservation objectives of the gannet feature of Sule Skerry and Sule Stack SPA in relation to disturbance and displacement from the Project can be ruled out**. Therefore, subject to natural change, gannet will be maintained as a feature in the long term.

8.24.3.1.4 Potential collision risk effects on the qualifying feature in isolation

1902. Distant projects have been combined and assessed for all SPAs in **Section 8.30**. As presented within **Section 8.30**, the potential for **an AEoI to the conservation objectives of the gannet feature of Sule Skerry and Sule Stack SPA in relation to collision risk from the Project can be ruled out**. Therefore, subject to natural change, gannet will be maintained as a feature in the long term.

8.24.3.1.5 Consideration of entanglement with mooring lines

1903. Consideration of the potential impact of entanglement with mooring lines on the ornithology qualifying features of SPAs screened in for assessment is provided in **Section 8.27**. As presented within **Section 8.27**, the potential for **an AEoI to the conservation objectives of the gannet feature of Sule Skerry and Sule Stack SPA in relation to entanglement of mooring from the Project can be ruled out**. Therefore, subject to natural change, gannet will be maintained as a feature in the long term.

8.24.3.1.6 Potential effects on the qualifying feature in-combination with other projects

1904. As detailed in **Section 8.30**, the potential level of impact for the Project alone was concluded as trivial and inconsequential as it is well under one breeding adult per annum for any project phase. That level of impact would be well within the error margins of the assessment. Therefore, such a trivial impact would have no potential for any contribution for an in-combination effect to occur within any project phase.

8.24.3.2 Guillemot

8.24.3.2.1 Status

1905. The SPA population is cited as 6,298 pairs. The most recent counts are 1,062 individuals on Sule Stack (1998) and 13,491 individuals on Sule Skerry (2018) (SMP, 2023).

1906. Based on the most recent SPA population of assumed breeding adults, and an annual breeding adult baseline mortality rate of 0.06 (1-0.939, Horswill and Robinson (2015)), 810 breeding adults from the SPA population would be subject to natural mortality per annum.

8.24.3.2.2 Functional linkage and seasonal apportionment of potential effects

1907. The Project is outside of the mean max plus one SD foraging distance of 55.5+39.7km (Woodward *et al.* 2019). Therefore, the guillemot impact assessments for Sule Skerry and Sule Stack SPA have only been considered for the non-breeding season.

8.24.3.2.3 Potential disturbance and displacement effects on the qualifying feature in isolation

1908. Distant projects have been combined and assessed for all SPAs in **Section 8.30**. As presented within **Section 8.30**, the potential for **an AEoI to the conservation objectives of the guillemot feature of Sule Skerry and Sule Stack SPA in relation to disturbance and displacement from the Project can be ruled out**. Therefore, subject to natural change, guillemot will be maintained as a feature in the long term.

8.24.3.2.4 Consideration of entanglement with mooring lines

1909. Consideration of the potential impact of entanglement with mooring lines on the ornithology qualifying features of SPAs screened in for assessment is provided in **Section 8.27**. As presented within **Section 8.27**, the potential for **an AEoI to the conservation objectives of the guillemot feature of Sule Skerry and Sule Stack SPA in relation to entanglement of mooring from the Project can be ruled out**. Therefore, subject to natural change, guillemot will be maintained as a feature in the long term.

8.24.3.2.5 Potential effects on the qualifying feature in-combination with other projects

1910. As detailed in **Section 8.30**, the potential level of impact for the Project alone was concluded as trivial and inconsequential as it is well under one breeding adult per annum for any project phase. That level of impact would be well within the error margins of the assessment. Therefore, such a trivial impact would have no potential for any contribution for an in-combination effect to occur within any project phase.

8.25 North Rona and Sula Sgeir SPA

1911. The North Rona and Sula Sgeir SPA boundary is located approximately 877km from the Windfarm Site, while the seabird colony is located approximately 883km distant. The Project therefore does not directly overlap with the SPA boundary or any cited areas of functional linkages.

8.25.1 Description of designation

1912. The uninhabited islands of North Rona and Sula Sgeir, together with several outlying rocky islets and adjacent waters, lie 65km north of Lewis. The coastlines of both islands consist mainly of cliffs except for two low-lying peninsulas on North Rona. North Rona is well covered by peat or soil, and vegetated by submaritime grassland. Sula Sgeir lies about 15km west of North Rona. It is much the smaller of the two islands and has little soil or vegetation. The boundary of the SPA overlaps with the boundary of North Rona & Sula Sgeir SSSI, and the seaward extension extends approximately 2km into the marine environment to include the seabed, water column and surface.

8.25.2 Conservation Objectives

1913. The overarching conservation objectives of the site are (NB: bold text indicates those objectives and targets that are relevant to this assessment, based on the proximity of the SPA and functional linkages described above in relation to the Project):

- To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained
- To ensure for the qualifying species that the following are maintained in the long term:
    - **Population of the species as a viable component of the site**
    - Distribution of the species within site
    - Distribution and extent of habitats supporting the species
    - Structure, function and supporting processes of habitats supporting the species
    - No significant disturbance of the species.

8.25.3 Appropriate Assessment

1914. The qualifying features of this SPA screened into the Appropriate Assessment are listed in **Table 5.4**. These are gannet and guillemot.

8.25.3.1 Gannet

8.25.3.1.1 Status

1915. The SPA population at classification was cited as 10,400 pairs, equating to 20,800 breeding adults. The most recent count (2013) identified 11,230 apparently occupied sites, or 22,460 breeding adults (SMP, 2023).

1916. Based on the cited SPA population of breeding adults, and an annual breeding adult baseline mortality rate of 0.081 (1-0.919, Horswill and Robinson (2015)), 1,685 breeding adults from the SPA population would be subject to natural mortality per annum.

1917. Based on the most recent SPA population of breeding adults, and an annual breeding adult baseline mortality rate of 0.081 (1-0.919, Horswill and Robinson (2015)), 1,819 breeding adults from the SPA population would be subject to natural mortality per annum.

8.25.3.1.2 Functional linkage and seasonal apportionment of potential effects

1918. The Project is outside of the mean max plus one SD foraging distance of 509.4km (Woodward *et al*. 2019). Therefore, the gannet impact assessments for North Rona and Sula Sgeir SPA have only been considered for the non-breeding seasons.

8.25.3.1.3 Potential disturbance and displacement effects on the qualifying feature in isolation

1919. Distant projects have been combined and assessed for all SPAs in **Section 8.30**. As presented within **Section 8.30**, the potential for **an AEoI to the conservation objectives of the gannet feature of North Rona and Sula Sgeir SPA in relation to disturbance and displacement from the Project can be ruled out**. Therefore, subject to natural change, gannet will be maintained as a feature in the long term.

8.25.3.1.4 Potential collision risk effects on the qualifying feature in isolation

1920. Distant projects have been combined and assessed for all SPAs in **Section 8.30**. As presented within **Section 8.30**, the potential for **an AEoI to the conservation objectives of the gannet feature of North Rona and Sula Sgeir SPA in relation to collision risk from the Project can be ruled out**. Therefore, subject to natural change, gannet will be maintained as a feature in the long term.

8.25.3.1.5 Consideration of entanglement with mooring lines

1921. Consideration of the potential impact of entanglement with mooring lines on the ornithology qualifying features of SPAs screened in for assessment is provided in **Section 8.27**. As presented within **Section 8.27**, the potential for **an AEoI to the conservation objectives of the gannet feature of North Rona and Sula**

Sgeir SPA in relation to entanglement of mooring from the Project can be ruled out. Therefore, subject to natural change, gannet will be maintained as a feature in the long term.

8.25.3.1.6 Potential effects on the qualifying feature in-combination with other projects

1922. As detailed in **Section 8.30**, the potential level of impact for the Project alone was concluded as trivial and inconsequential as it is well under one breeding adult per annum for any project phase. That level of impact would be well within the error margins of the assessment. Therefore, such a trivial impact would have no potential for any contribution for an in-combination effect to occur within any project phase.

8.25.3.2 Guillemot

8.25.3.2.1 Status

1923. The SPA population is cited as 43,200 individuals. The most recent count (2021) identified 10,354 individuals (SMP, 2023).

1924. Based on the cited SPA population of assumed breeding adults, and an annual breeding adult baseline mortality rate of 0.06 (1-0.939, Horswill and Robinson (2015)), 2,592 breeding adults from the SPA population would be subject to natural mortality per annum.

1925. Based on the most recent SPA population of assumed breeding adults, and an annual breeding adult baseline mortality rate of 0.06 (1-0.939, Horswill and Robinson (2015)), 621 breeding adults from the SPA population would be subject to natural mortality per annum.

8.25.3.2.2 Functional linkage and seasonal apportionment of potential effects

1926. The Project is outside of the mean max plus one SD foraging distance of 55.5+39.7km (Woodward *et al*. 2019). Therefore, the guillemot impact assessments for North Rona and Sula Sgeir SPA have only been considered for the non-breeding season.

8.25.3.2.3 Potential disturbance and displacement effects on the qualifying feature in isolation

1927. Distant projects have been combined and assessed for all SPAs in **Section 8.30**. As presented within **Section 8.30**, the potential for **an AEoI to the conservation objectives of the guillemot feature of North Rona and Sula Sgeir SPA in relation to disturbance and displacement from the Project can be ruled out**. Therefore, subject to natural change, guillemot will be maintained as a feature in the long term.

8.25.3.2.4 Consideration of entanglement with mooring lines

1928. Consideration of the potential impact of entanglement with mooring lines on the ornithology qualifying features of SPAs screened in for assessment is provided in **Section 8.27**. As presented within **Section 8.27**, the potential for **an AEoI to the conservation objectives of the guillemot feature of North Rona and Sula Sgeir SPA in relation to entanglement of mooring from the Project can be ruled out**. Therefore, subject to natural change, guillemot will be maintained as a feature in the long term.

8.25.3.2.5 Potential effects on the qualifying feature in-combination with other projects

1929. As detailed in **Section 8.30**, the potential level of impact for the Project alone was concluded as trivial and inconsequential as it is well under one breeding adult per annum for any project phase. That level of impact would be well within the error margins of the assessment. Therefore, such a trivial impact would have no potential for any contribution for an in-combination effect to occur within any project phase.

8.26 Saltee Islands SPA

1930. The Saltee Islands SPA boundary is located approximately 132km from the Windfarm Site, while the seabird colony is approximately 137km distant. The Project therefore does not directly overlap with the SPA boundary or any cited areas of functional linkages.

8.26.1 Description of designation

1931. The Saltee Islands SPA is situated some 4-5km off the coast of south County Wexford, Ireland, and comprises the two islands, Great Saltee and Little Saltee, and the surrounding seas both between them and to a distance of 500m from them. The bedrock of the islands is of Precambrian gneiss and granite. Both islands have exposed rocky cliffs on their south and east – those on Great Saltee being mostly c. 30m high, those on Little Saltee about half this height. The northern and western sides of both islands are fringed with shingle and boulder shores, backed by boulder clay cliffs, as well as small areas of intertidal sandflats. Sea caves occur at the base of the cliffs on Great Saltee.

8.26.2 Conservation Objectives

1932. The overarching conservation objectives for each of the qualifying species of the SPA is '**To maintain the favourable conservation condition of [species] in the Saltee Islands SPA**', which is defined by a list of attributes (NB: bold text indicates those attributes that are relevant to this assessment, based on the proximity of the SPA and functional linkages described above in relation to the Project):

- Breeding population abundance
- Productivity rate
- Distribution
- Prey biomass available
- Barrier to connectivity
- Disturbance at the breeding site
- Disturbance at marine areas immediately adjacent to the colony.

8.26.3 Appropriate Assessment

1933. one qualifying feature of this SPA has been screened into the Appropriate Assessment (**Table 5.4**); gannet.

8.26.3.1 Gannet

8.26.3.1.1 Status

1934. The SPA population was cited as 2,446 pairs in 2004, equating to 4,892 breeding adults (NPWSa, 2022). The latest colony count identified 9,444 individuals (SMP, 2023). Note that these SMP data are for Great Saltee only, as no data for Little Saltee are available.

1935. Based on the cited SPA population of breeding adults, and an annual breeding adult baseline mortality rate of 0.081 (1-0.919, Horswill and Robinson (2015)), 396 breeding adults from the SPA population would be subject to natural mortality per annum.

1936. Based on the most recent SPA population of breeding adults, and an annual breeding adult baseline mortality rate of 0.081 (1-0.919, Horswill and Robinson (2015)), 765 breeding adults from the SPA population would be subject to natural mortality per annum.

8.26.3.1.2 Functional linkage and seasonal apportionment of potential effects

1937. The Project is within the mean max plus one SD foraging distance of 315.2+194.2km (Woodward *et al*. 2019). Accordingly, this species is assessed for the full breeding (March to September), post-breeding migration (October to November) and return migration (December to February) seasons based on Furness (2015). It should be noted however, given that gannets are known to show space partitioning with adjacent colonies (Wakefield *et al*., 2013), breeding season connectivity for more distant colonies such as Saltee Islands SPA is likely to be limited.

1938. As detailed in **Section 1449**, for gannet a displacement distance of the Windfarm Site plus 2km buffer has been selected. A displacement rate of 60-80% and a mortality rate of 1-10% for operational and maintenance phase impacts is used, as recommended in the Joint SNCB interim guidance on displacement (Updated, 2022). The focus of the assessment is on the Applicant's position of 60-80% displacement rate and a 1% mortality rate. This is considered to represent a realistic, yet precautionary, assessment based on SNCBs guidance and additional evidence presented within **Section 1449**. However, the standard SNCB's maximum displacement mortality rate of 10% is also provided for each assessment. The level of abundance apportioned is presented in **Table 8.54**.

Table 8.54 Gannet level of abundance and collision risk apportioned to Saltee Islands SPA seasonally

Season	Level of apportionment (%)	Apportioned Abundance (breeding adults)	Apportioned collision risk (breeding adults)
Full Breeding (Mar-Sep)	1.41	3.4	0.1
Post-breeding migration (Oct-Nov)	0.35	0.5	0.2
Return migration (Dec-Feb)	0.43	0.3	0.1

1939. For collision risk, impacts have apportioned for the worst-case scenario design as detailed in **Section 8.3** and presented in **Table 8.54.**

1940. Further detail of how the level of impact apportioned to each SPA is derived, is presented within **Appendix 13.A: Offshore Ornithology Technical Report** and **Appendix 13.C: Revised Collision Risk Modelling** of the Offshore ES.

8.26.3.1.3 Construction and decommissioning phase potential disturbance and displacement effects on the qualifying feature in isolation

1941. During the construction and decommissioning phase, the potential level of impact apportioned to the SPA seasonally is summarised in **Table 8.55** for both the Applicant's and SNCB's assumed preferred approach.

1942. The potential impact of the loss of less than a single additional breeding adult (<0.1, see **Table 8.55**) on an annual basis to the Saltee Islands SPA (with a classified population of 4,892 breeding adults and an annual background mortality of 396 breeding adults) would represent a 0.004 – 0.006% increase in baseline mortality rate annually, respectively.

1943. However, as the population of gannets has increased significantly since the citation population count the potential impact on the population is more reasonably assessed against the latest population count undertaken in 2013, which was 9,444 breeding adults. On this basis, when considering the potential impact of this loss to Saltee Islands SPA (with an annual background mortality of 765 breeding adults) then the prediction of less than a single breeding adult suffering displacement consequent mortality would represent a 0.002 – 0.003% increase in baseline mortality rate annually, respectively.

1944. The addition of less than a single additional breeding adult mortalities per annum equates to a 0.006% increase in baseline mortality rate at most, when considering either the citation or the latest colony count. This level of impact would be indistinguishable from natural fluctuations in the population. The potential for **an AEoI to the conservation objectives of the gannet feature of Saltee Islands SPA in relation to disturbance and displacement effects in the construction and decommissioning phase from the Project alone can be ruled out**. Therefore, subject to natural change, gannet will be maintained as a feature in the long term.

8.26.3.1.4 Operational and maintenance phase potential disturbance and displacement effects on the qualifying feature in isolation

1945. During the operation and maintenance phase the potential level of impact apportioned to the SPA seasonally is summarised in **Table 8.56** for both the Applicant's and SNCB's assumed preferred approach.

1946. An annual displacement matrix is also presented for the apportioned abundance for the Windfarm Site plus 2km buffer to Saltee Islands SPA (**Table 8.57**).

1947. The potential impact of the loss of less than a single additional breeding adult (<0.1, see **Table 8.56**) on an annual basis to the Saltee Islands SPA (with a classified population of 4,892 breeding adults and an annual background mortality of 396 breeding adults) would represent a 0.007 – 0.008% increase in baseline mortality rate annually, respectively.

Table 8.55 Summary of gannet construction and decommissioning phase disturbance and displacement impacts apportioned to Saltee Islands SPA

Population Size (Breeding adults)	Season	Applicant's / SNCB's assumed minimum approach disturbance and displacement impact		SNCBs assumed maximum approach disturbance and displacement impact	
		30-40% Disp; 1% Mort (Breeding adults per annum)	Increase in baseline mortality rate (%)	30-40% Disp; 10% Mort (Breeding adults per annum)	Increase in baseline mortality rate (%)
Citation (4,896)	Full breeding	0.0 – 0.0	0.003 – 0.005	0.1 – 0.1	0.017 – 0.026
	Post-breeding migration	0.0 – 0.0	0.000 – 0.001	0.0 – 0.0	0.002 – 0.004
	Return migration	0.0 – 0.0	0.000 – 0.000	0.0 – 0.0	0.002 – 0.002
	Annual	0.0 – 0.0	0.004 – 0.006	0.1 – 0.1	0.011 – 0.016
Latest Count (9,444)	Full breeding	0.0 – 0.0	0.002 – 0.003	0.1 – 0.1	0.009 – 0.013
	Post-breeding migration	0.0 – 0.0	0.000 – 0.000	0.0 – 0.0	0.001 – 0.002
	Return migration	0.0 – 0.0	0.000 – 0.000	0.0 – 0.0	0.001 – 0.001
	Annual	0.0 – 0.0	0.002 – 0.003	0.1 – 0.1	0.011 – 0.016

Table 8.56 Summary of gannet operation and maintenance phase disturbance and displacement impacts apportioned to Saltee Islands SPA

Population Size (Breeding adults)	Season	Applicant's / SNCB's assumed minimum approach disturbance and displacement impact		SNCBs assumed maximum approach disturbance and displacement impact	
		60-80% Disp; 1% Mort (Breeding adults per annum)	Increase in baseline mortality rate (%)	60-80% Disp; 10% Mort (Breeding adults per annum)	Increase in baseline mortality rate (%)
Citation (4,892)	Full breeding	0.0 – 0.0	0.006 – 0.007	0.1 – 0.1	0.030 – 0.034
	Post-breeding migration	0.0 – 0.0	0.001 – 0.001	0.0 – 0.0	0.004 – 0.005
	Return migration	0.0 – 0.0	0.001 – 0.001	0.0 – 0.0	0.003 – 0.003
	Annual	0.0 – 0.0	0.007 – 0.008	0.2 – 0.2	0.037 – 0.042
Latest Count (9,444)	Full breeding	0.0 – 0.0	0.003 – 0.004	0.1 – 0.1	0.015 – 0.018
	Post-breeding migration	0.0 – 0.0	0.000 – 0.001	0.0 – 0.0	0.002 – 0.003
	Return migration	0.0 – 0.0	0.000 – 0.000	0.0 – 0.0	0.001 – 0.002
	Annual	0.0 – 0.0	0.004 – 0.004	0.2 – 0.2	0.019 – 0.022

Table 8.57 Gannet operation and maintenance phase disturbance annual displacement matrix for impacts apportioned to Saltee Islands SPA

Displacement	**Mortality rates (%)**															
	0	1	2	3	4	5	10	20	30	40	50	60	70	80	90	100
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
20	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1
25	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
30	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1
35	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1
40	0	0	0	0	0	0	0	0	1	1	1	1	1	1	2	2
50	0	0	0	0	0	0	0	0	1	1	1	1	1	2	2	2
60	0	0	0	0	0	0	0	1	1	1	1	2	2	2	2	3
70	0	0	0	0	0	0	0	1	1	1	1	2	2	2	3	3
80	0	0	0	0	0	0	0	1	1	1	2	2	2	3	3	3
90	0	0	0	0	0	0	0	1	1	2	2	2	3	3	3	4
100	0	0	0	0	0	0	0	1	1	2	2	3	3	3	4	4

🟩	<1% increase in baseline mortality	🟩	>1% baseline mortality threshold for latest population	□	>1% baseline mortality threshold for citation population

1948. However, as the population of gannets has increased significantly since the citation population count the potential impact on the population is more reasonably assessed against the latest population count undertaken in 2013, which was 9,444 breeding adults. On this basis, when considering the potential impact of this loss to Saltee Islands SPA (with an annual background mortality of 765 breeding adults) then the prediction of less than a single breeding adult suffering displacement consequent mortality would represent a 0.004 – 0.004% increase in baseline mortality rate annually, respectively.

1949. The addition of less than a single additional breeding adult mortalities per annum equates to a 0.008% increase in baseline mortality rate at most, when considering either the citation or the latest colony count. This level of impact would be indistinguishable from natural fluctuations in the population. The potential for **an AEoI to the conservation objectives of the gannet feature of Saltee Islands SPA in relation to disturbance and displacement effects in the operation and maintenance phase from the Project alone can be ruled out**. Therefore, subject to natural change, gannet will be maintained as a feature in the long term.

8.26.3.1.5 Operational and maintenance phase potential collision risk impacts on the qualifying feature in isolation

1950. As detailed in **Table 8.58** the annual predicted gannet collision resultant mortality as a result of the operation of the Project is less than a single (0.4) breeding adults per annum. This represents an increase of 0.099% when considering the 4,892 citation population (with an annual background mortality of 396) or an increase of 0.051% when considering the recent 2013 colony count (9,444 breeding adults with an annual background mortality of 765) across all seasons.

1951. If macro-avoidance is considered for gannet, the annual predicted collision resultant mortality as a result of the operation of the Project is less than a single (0.1) breeding adult per annum (Table 8.58). This represents an increase of 0.030% when considering the citation population or an increase of 0.015% when considering the latest colony count.

Table 8.58 Summary of gannet operation and maintenance phase collision risk impacts apportioned to Saltee Islands SPA

Population Size (Breeding adults)	Season	Collision risk impact		Collision risk impact using macro-avoidance	
		Breeding adults per annum	Increase in baseline mortality rate (%)	Breeding adults per annum	Increase in baseline mortality rate (%)
Citation (66,000)	Full breeding	0.1	0.014	0.0	0.004
	Post-breeding migration	0.2	0.024	0.1	0.007
	Return migration	0.1	0.024	0.0	0.007
	Annual	0.4	0.099	0.1	0.030
Latest Count (72,022)	Full breeding	0.1	0.007	0.0	0.002
	Post-breeding migration	0.2	0.013	0.1	0.004
	Return migration	0.1	0.013	0.0	0.004
	Annual	0.4	0.099	0.1	0.015

1952. The addition of less than a single additional breeding adult mortality per annum equates to 0.099% increase in baseline mortality rate at most, when considering either the citation or the latest colony count. This level of impact would be indistinguishable from the natural fluctuations in the population. The potential for **an AEoI to the conservation objectives of the gannet feature of Saltee Islands SPA in relation to collision risk in the operation and maintenance phase from the Project alone can be ruled out**. Therefore, subject to natural change, gannet will be maintained as a feature in the long term.

8.26.3.1.6 Operational and maintenance phase potential combined displacement and collision risk impacts on the qualifying feature in isolation

1953. As presented within **Table 8.56** and **Table 8.58** the combined displacement and collision risk impacts apportioned to the gannet feature of Saltee Islands SPA, equates to less than a single (0.4) additional breeding adult mortality on an annual basis (when considering a displacement rate of 60-80% and a mortality rate of 1%). This represents a baseline mortality rate increase of 0.107-0.109% when considering the citation population or an increase of 0.056-0.057% when considering the recent 2013 colony count annually.

1954. If macro avoidance is considered, the combined displacement and collision risk impacts apportioned to the gannet feature of Saltee Islands SPA, is less than a single (0.1) additional breeding adult mortality on an annual basis (when considering a displacement rate of 60-80% and a mortality rate of 1%). This represents a baseline mortality rate increase of 0.032-0.089% when considering the citation population or an increase of 0.016-0.017% when considering the recent 2014 colony count annually.

1955. The addition of less than a single additional breeding adult mortality per annum equates to 0.109% increase in baseline mortality rate at most, when considering either the citation or the latest colony count. This level of impact would be indistinguishable from the natural fluctuations in the population. The potential for **an AEoI to the conservation objectives of the gannet feature of Saltee Islands SPA in relation to combined displacement and collision risk in the operation and maintenance phase from the Project alone can be ruled out**. Therefore, subject to natural change, gannet will be maintained as a feature in the long term.

8.26.3.1.7 Consideration of entanglement with mooring lines

1956. Consideration of the potential impact of entanglement with mooring lines on the ornithology qualifying features of SPAs screened in for assessment is provided in **Section 8.27**. As presented within **Section 8.27**, the potential for **an AEoI to the conservation objectives of the gannet feature of Saltee Islands SPA in relation to entanglement of mooring from the Project can be ruled out**. Therefore, subject to natural change, gannet will be maintained as a feature in the long term.

8.26.3.1.8 Potential effects on the qualifying feature in-combination with other projects

Construction and decommissioning phase

1957. When considering the construction and decommissioning phase, as detailed above, the potential level of impact for the Project alone on gannet was concluded as trivial and inconsequential. As this level of effect would be well within the error margins of the assessment there is no potential for any contribution for an in-combination effect to occur within the construction and decommissioning phase.

Operation and maintenance phase

1958. When considering the operation and maintenance phase, as detailed above, the potential level of impact for the Project alone was concluded as trivial and inconsequential as it is well under one breeding adult. That level of impact would be well within the error margins of the assessment. Therefore, such a trivial impact would have no potential for any contribution for an in-combination effect to occur within the operation and maintenance phase.

8.27 Entanglement with Mooring Lines

The following SPA's and qualifying features were screened in due to potential for an LSE from entanglement with mooring lines:

- Skomer, Skokholm and the Seas off Pembrokeshire SPA: Manx shearwater and seabird assemblage
- Grassholm SPA: gannet
- Aberdaron Coast and Bardsey Islands SPA: Manx shearwater
- Copeland Islands SPA: Manx shearwater
- Ailsa SPA: gannet and guillemot
- Rathlin Island SPA: guillemot and razorbill
- North Colonsay and Western Cliffs SPA: guillemot
- Mingulay and Berneray SPA: guillemot and razorbill
- Rum SPA: Manx shearwater
- Canna and Sanday SPA: guillemot
- Shiant Islands SPA: guillemot and razorbill
- St Kilda SPA: gannet, guillemot and Manx shearwater
- Handa SPA: guillemot and razorbill
- Flannan Isles SPA
- Cape Wrath SPA: guillemot and razorbill
- Sule Skerry and Sule Stack SPA: gannet and guillemot
- North Rona and Sula Sgeir SPA: gannet and guillemot
- Saltee Islands SPA: gannet.

Currently, there is no clear guidance on the assessment and monitoring approaches required for floating WTG designs for potential bird entanglement. Similarly, a short review of published reports from similar floating OWF projects and other moored infrastructures do not provide examples of where entanglement for seabirds has been scoped in for assessment. This is most likely due to this potential impact pathway being an incredibly rare occurrence and considering that floating structures in relation to the oil and gas industry have been present in this region of the North Sea for several decades, the potential for a significant impact is considered unlikely.

Direct entanglement risk is thought to be unlikely due to the design parameters, with the mooring lines being under tension and the dimensions of the chain reducing the likelihood of full or partial entanglement to be highly unlikely. The embedded maintenance and monitoring practices of the deployed infrastructure will further contribute to decreasing the risk.

Entangled fishing gear on the mooring lines may increase the extent infrastructure will act as a FAD along with the risk of indirect entanglement by diving birds within entangled netting within the Project The embedded maintenance and monitoring practices of the deployed infrastructure will likely contribute to this decreased risk, which are to include maintenance inspections to collect and remove debris (such as abandoned fishing nets, pots and other marine rubbish) amongst the mooring lines. This embedded mitigation will help reduce the potential likelihood of any entanglement. Therefore, it is concluded that there is **no potential for a AEoI with respect to entanglement in mooring lines for any designated sites and ornithology features** screened in for assessment.

8.28 Indirect impacts through effects on habitats and prey species

1959. Impacts, namely from the production of suspended sediments, may alter the distribution, physiology and behaviour of prey species and habitats. These mechanisms could potentially result in reduced prey availability in seabird foraging areas adjacent to operational floating wind sites. This may result in disturbance and displacement effects, effectively reducing habitat availability for foraging and other activities. Any form of indirect effect (including reductions in prey and habitat availability) may cause reduced survival or reproductive fitness of the species deemed at risk. The maximum impact on ornithological receptors will result from the maximum impact on fish and benthic organisms.

1960. These potential indirect impacts may occur during the construction, operational and decommissioning phase of the Project Potential impacts are likely to occur within or immediately next to the Project, the Offshore Export Cable Corridor and areas of intertidal Landfall through effects on benthic habitat and prey species. Such potential effects on benthic invertebrates and fish have been assessed at an EIA level within **Chapter 10: Benthic and Intertidal Ecology** and **Chapter 11: Fish and Shellfish Ecology** of the Offshore ES, and with respect to HRA in **Section 5.4** for Habitats and **Section 5.4** for migratory fish. The conclusions of those assessments inform this assessment of indirect effects on ornithology receptors.

1961. With regard to changes to the seabed and to suspended sediment levels, **Chapter 8: Marine and Physical Processes**, **Chapter 9: Marine Water and Sediment Quality** and **Chapter 10: Benthic and Intertidal Ecology** of the Offshore ES discusses the nature of any change and impacts on the seabed and benthic habitats. Impacts that have been assessed are considered to have no potential for AEoI to any designated site. The consequent indirect impact on fish through habitat loss is considered to be low at most (see **Chapter 11: Fish and Shellfish Ecology** of the Offshore ES) from an EIA perspective for species such as herring, sprat and sandeel, which are the main prey items of seabirds such as gannet and auks. There is also no potential for an AEoI with respect to fish species from designated sites assessed (see **Section 9**). With a low impact on fish that are bird prey species, it is concluded that the there is **no potential for an AEoI with respect to changes in prey availability for any designated sites and ornithology features** screened in for assessment.

8.29 Migratory collision risk

1962. The following SPA's and qualifying features were screened in due to potential for an LSE from collision risk based on their migratory flights:

- Skomer, Skokholm and the Seas off Pembrokeshire SPA: short eared owl
- Burry Inlet SPA: Arctic tern, black tern, common tern, curlew, dunlin, greenshank, grey plover, knot, little tern, oystercatcher, pintail, redshank, Sandwich tern, shelduck, shoveler, teal, turnstone, whimbrel, wigeon
- Tamar Estuaries Complex SPA: Avocet, little egret
- Strangford Lough SPA: Sandwich tern
- Larne Lough SPA: Sandwich tern.

1963. There is potential that seabirds, waders, passerines, raptors and wildfowl may intersect the Project area whilst undertaking annual migratory movements between their breeding and wintering grounds. A strategic assessment for 27 different seabird and 38 non-seabird migratory species was undertaken in relation to migratory collision risk by WWT and MacArthur Green Ltd (2014).

1964. For seabird species it was considered that based on expert opinion and known migratory behaviour, seabirds tend to migrate within coastal bands out to a maximum of 60km from the coast. The tendency for migratory seabirds to travel up to a maximum of 60km from the coast correlates with the Project site-specific survey results, as a very limited number of migratory seabirds were recorded within the Project area during migratory months. The shortest distance to shore from the Project is 52km, which suggests limited intersection of potential migratory corridors.

1965. For wildfowl and wader species, WWT and MacArthur Green (2014) indicate that collision estimates are very small. Waterfowl and wader species migratory flights are at a high altitude and so collisions with WTGs are highly unlikely. Only during unfavourable weather occurs will these species lower their flight altitude and follow coastal pointers to navigate (van de Kam *et al*, 2004).

1966. The most recent project to consider and quantify the impacts of migratory collision risk in the western waters BDMPS was Awel y Môr OWF (APEM, 2022). Awel y Môr is located 10.5km off the North Wales coast and is a proposed development of up to 50 WTGs. The results of Awel y Môr migratory collision risk modelling predicted an annual collision mortality value for the majority of species assessed of well under a single individual and a maximum predicted mortality of less than two individuals per annum. When considering the above predicted impacts for Awel y Môr, it can be inferred that the level of predicted impacts apportioned to migratory species from the Project would almost certainly be immaterial. This is due to the Project consisting of significantly fewer WTGs and due to being located at the limit of species potential migratory corridors.

1967. In relation to the above evidence, it can therefore be confidently concluded that there is **<u>no potential for an AEoI with respect to migratory bird species that are qualifying features of the SPA's screened in</u>** for assessment.

8.29.1 Updates since application

1968. Since application, modelling of migratory bird movements and migratory CRM has been undertaken by the Applicant in accordance with the request from Natural England. Results of migratory modelling are presented in **Appendix 13.B: Migratory Birds Report**.

1969. Within this report, migratory seabird species were assessed using the 'broad front' approach, whilst non-seabird species were modelled using APEM Ltd's bespoke 'MIGROPATH' modelling tool in accordance with Natural England's best practice guidance (Parker *et al.* 2022). Further detail on modelling methods and species selection is provided within **Appendix : Migratory Birds Report**.

1970. In relation to migratory seabird species, the modelling results predicted for any seabird species modelled, an annual predicted mortality rate of significantly less than a single individual at an EIA level. This level of predicted impact further validates the original assumptions and conclusions made within the RIAA, that there is no potential for an AEoI with respect to migratory seabird bird species that are qualifying features of the SPA's screened in for assessment.

1971. The results for migratory non-seabirds showed that for all species screened into assessment, significantly less than 1% of the UK population was expected to pass through the Windfarm Site. It can therefore be concluded that there is no potential for a significant adverse effect from collision risk whilst on migration, due to the limited levels of connectivity predicted. This level of predicted impact further validates the original assumptions and conclusions made within the RIAA, that there is no potential for an AEoI with respect to migratory non-seabird species that are qualifying features of the SPA's screened in for assessment.

8.30 UK SPAs – Non-breeding

8.30.1 Kittiwake

1972. The kittiwake feature of a number of UK SPAs has been screened in for the assessment of operational and maintenance phase impacts. The potential impacts are from collision risk from the Project alone in relation to the conservation objectives outlined in previous sections for the following SPAs:

- Rathlin Island SPA
- North Colonsay and Western Cliffs SPA
- Mingulay and Berneray Cliffs SPA
- Cape Wrath SPA.

1973. In order to provide a more concise review of all such sites, the methods for considering kittiwake potentially susceptible to collision risk from more distant designated sites in UK waters are considered in this section together.

1974. The potential for impact on UK SPA kittiwake features varies by season and accordingly this assessment is carried out on a seasonal basis.

1975. The Project is beyond the mean max plus one SD foraging distance for kittiwake to any of these SPAs screened in (156.1±144.5km, Woodward *et al*, 2019). Accordingly, assessments have been undertaken for the non-breeding seasons only.

8.30.1.1 Non-breeding seasons – kittiwake

1976. As detailed in **Table 8.2**, the predicted EIA kittiwake collision resultant mortality, as a result of the operation of the Project, in the return migration season and the post-breeding migration season is estimated at 14 (13.5) and three (2.8) individuals per annum, respectively. **Table 8.59** below presents the apportioned predicted collision estimates to each designated site considered in the return migration season and post-breeding season, based on the apportionment process detailed in **Appendix 13.A: Offshore Ornithology Technical Report** and **Appendix 13.C: Revised Collision Risk Modelling** of the Offshore ES.

1977. The impact of collision risk that would occur throughout the operational life of the Project is a prediction of consequent mortality of less than a single breeding adult (<0.1 to 0.3) for these SPAs in the non-breeding seasons. Based on these mortality rates, the increase in mortality relative to baseline mortality rate is at most 0.03% in the non-breeding seasons for any SPA. The potential for **an AEoI to the conservation objectives of the kittiwake feature of any SPA assessed in relation to collision risk in the operation and maintenance phase from the**

Project alone can be ruled out. Therefore, subject to natural change, kittiwake will be maintained as a feature in the long term.

8.30.2 Guillemot

1978. The guillemot feature of a number of UK SPAs has been screened in for the assessment of operational and maintenance phase impacts. The potential impacts are from disturbance and displacement from the Project alone in relation to the conservation objectives outlined in previous sections for the following SPAs:

- Ailsa Craig SPA
- Rathlin Island SPA
- North Colonsay and Western Cliffs SPA
- Mingulay and Berneray SPA
- Canna and Sanday SPA
- Shiant Isles SPA
- St Kilda SPA
- Handa SPA
- Flannan Isles SPA
- Cape Wrath SPA
- Sule Skerry and Sule Stack SPA
- North Rona and Sula Sgeir SPA.

Table 8.59 Apportionment of potential kittiwake collision risk mortality values from the Project during the non-breeding seasons in the UK Western Waters

SPA	**SPA population as a percentage of the Western Waters (%)**		**Apportioned Collision mortality rate for each (Breeding adults per annum)**		**SPA population (breeding adults)**		**SPA population baseline mortality rate percentage increase during the migratory seasons (%) (return migration / post-breeding migration)**	
	Return migration	Post-breeding migration	Return migration	Post-breeding migration	Citation	Latest Count	Citation	Latest Count
Rathlin Island SPA	1.83	1.04	0.3	0.0	13,644	27,412	0.012 / 0.001	0.006 / 0.001
North Colonsay and Western Cliffs SPA	1.29	0.73	0.2	0.0	9,024	4,496	0.013 / 0.002	0.026 / 0.003
Mingulay and Berneray SPA	0.52	0.29	0.1	0.0	17,200	4,176	0.003 / 0.000	0.011 / 0.001
Cape Wrath SPA	2.39	1.36	0.3	0.0	19,400	7,244	0.011 / 0.001	0.030 / 0.004

1979. In order to provide a more concise review and reduce repetition of assessments of all such sites, the methods for considering guillemot potentially susceptible to disturbance and displacement from more distant designated sites in UK waters are considered in this section together, including consideration of project phases.

1980. The potential for impact on UK SPA guillemot features varies by season and accordingly this assessment is carried out on a seasonal basis.

1981. The Project is beyond the mean max plus one SD foraging distance for guillemot to any of these SPAs screened in (55.5±39.7km, Woodward *et al*, 2019). Accordingly, assessment have been undertaken for the non-breeding season only.

8.30.2.1 Non-breeding season - guillemot

1982. As detailed in **Table 8.1**, the number of guillemot EIA predicted mortalities as a result of being displaced from the Windfarm Site plus 2km buffer during the non-breeding season is estimated at five (5.3) individuals per annum. **Table 8.60** below presents the apportioned predicted consequent mortality as a result of disturbance and displacement effects to each designated site considered in the non-breeding season, based on the apportionment process detailed in **Appendix 13.A: Offshore Ornithology Technical Report** and **Appendix 13.C: Revised Collision Risk Modelling** of the Offshore ES.

1983. The impact of displacement from the Windfarm Site plus 2km buffer that would occur throughout the operational and maintenance phase of the Project is a prediction of consequent mortality of less than a single breeding adult (<0.1 to 0.8) breeding adults for these SPAs in the non-breeding season for guillemot (**Table 8.60**). Based on these mortality rates the increase in mortality relative to the baseline mortality is at most 0.032% in the non-breeding season for any SPA. The potential for **an AEoI to the conservation objectives of the guillemot feature of any SPA assessed in relation to disturbance and displacement effects in the operational and maintenance phase from the Project can be ruled out**. Therefore, subject to natural change, guillemot will be maintained as a feature in the long term.

Table 8.60 Apportionment of potential guillemot displacement and mortality values from the Project to SPAs during the non-breeding season using the Applicant's approach

SPA	**Proportioned displacement mortality based on 50% Disp 1% Mort for each SPA (breeding adults per annum)**	**SPA population (breeding adults)**		**SPA population baseline mortality rate percentage increase during the non-breeding season (%)**	
		Citation	Latest Count	Citation	Latest Count
Ailsa SPA	0.1	6,700	9,568	0.012	0.009
Rathlin SPA	0.8	41,887	200,343	0.032	0.007
North Colonsay and Western Cliffs SPA	0.1	13,312	24,724	0.016	0.008
Mingulay and Berneray SPA	0.1	30,900	50,639	0.006	0.004
Canna and Sanday SPA	0.0	5,800	3,819	0.010	0.015
Shiant Isles SPA	0.1	18,380	12,132	0.004	0.006
St Kilda SPA	0.1	22,700	13,806	0.010	0.017
Handa SPA	0.3	98,686	91,822	0.006	0.006
Flannan Isles SPA	0.1	21,930	7,547	0.007	0.019
Cape Wrath SPA	0.2	13,700	51,066	0.029	0.008
Sule Skerry and Sule Stack SPA	0.1	12,596	13,491	0.009	0.008
North Rona and Sula Sgeir SPA	0.0	43,200	10,354	0.002	0.007

Table 8.61 Apportionment of potential guillemot displacement and mortality values from the Project to SPAs during the non-breeding season using the SNCB's assumed approach

SPA	**Proportioned displacement mortality based on 30 -70% Disp 1 - 10% Mort for each SPA (breeding adults per annum)**	**SPA population (breeding adults)**		**SPA population baseline mortality rate percentage increase during the non-breeding season (%)**	
		Citation	Latest Count	Citation	Latest Count
Ailsa SPA	0.0 – 0.7	6,700	9,568	0.007 – 0.170	0.005 – 0.119
Rathlin SPA	0.5 – 11.4	41,887	200,343	0.019 – 0.453	0.004 – 0.095

SPA	Proportioned displacement mortality based on 30 -70% Disp 1 - 10% Mort for each SPA (breeding adults per annum)	SPA population (breeding adults)		SPA population baseline mortality rate percentage increase during the non-breeding season (%)	
		Citation	Latest Count	Citation	Latest Count
North Colonsay and Western Cliffs SPA	0.1 – 1.8	13,312	24,724	0.009 – 0.220	0.005 – 0.118
Mingulay and Berneray SPA	0.1 – 1.7	30,900	50,639	0.004 – 0.090	0.002 – 0.055
Canna and Sanday SPA	0.0 – 0.5	5,800	3,819	0.006 – 0.139	0.009 – 0.211
Shiant Isles SPA	0.0 – 0.6	18,380	12,132	0.002 – 0.058	0.004 – 0.087
St Kilda SPA	0.1 – 1.9	22,700	13,806	0.006 – 0.143	0.010 – 0.234
Handa SPA	0.2 – 4.7	98,686	91,822	0.003 – 0.079	0.004 – 0.085
Flannan Isles SPA	0.1 – 1.2	21,930	7,547	0.004 – 0.092	0.012 – 0.269
Cape Wrath SPA	0.1 – 3.4	13,700	51,066	0.018 – 0.411	0.005 – 0.110
Sule Skerry and Sule Stack SPA	0.0 – 0.9	12,596	13,491	0.005 – 0.125	0.005 – 0.117
North Rona and Sula Sgeir SPA	0.0 – 0.6	43,200	10,354	0.001 – 0.024	0.004 – 0.100

8.30.3 Razorbill

1984. The razorbill feature of a number of UK SPAs has been screened in for the assessment of operational and maintenance phase impacts. The potential impacts are from disturbance and displacement from the Project alone in relation to the conservation objectives outlined in previous sections for the following SPAs:

- Rathlin Island SPA
- Mingulay and Berneray SPA
- Shiant Isles SPA
- Handa SPA
- Cape Wrath SPA.

1985. In order to provide a more concise review and reduce repetition of assessments of all such sites, the methods for considering razorbill potentially susceptible to disturbance and displacement from more distant designated sites in UK waters are considered in this section together, including consideration of project phases.

1986. The potential for impact on UK SPA razorbill features varies by season and accordingly this assessment is carried out on a seasonal basis.

1987. The Project is beyond the mean max plus one SD foraging distance for razorbill to any of these SPAs screened in (73.8+48.4km, Woodward *et al*, 2019). Accordingly, assessments have been undertaken for the non-breeding seasons only.

8.30.3.1 Non-breeding seasons - razorbill

1988. As detailed in **Table 8.1**, the predicted EIA razorbill disturbance and displacement resultant mortality as a result of the operation of the Project in the return migration season, the post-breeding migration season and the winter season is estimated at 345, 40 and 361 individuals per annum, respectively. **Table 8.62** below presents the apportioned predicted disturbance and displacement estimates to each designated site considered in the non-breeding seasons, based on the apportionment process detailed in **Appendix 13.A: Offshore Ornithology Technical Report** and **Appendix 13.C: Revised Collision Risk Modelling** of the Offshore ES.

1989. The impact of displacement that would occur throughout the operational life of the Project is a prediction of consequent mortality of less than a single breeding adult (<0.1) for these SPAs in the non-breeding seasons. Based on these mortality rates, the increase in mortality relative to baseline mortality rate is at most 0.009% in the non-breeding seasons for any SPA. The potential for **an AEoI to the conservation objectives of the razorbill feature of any SPA assessed in relation to disturbance and displacement effects in the operational and maintenance phase from the Project can be ruled out**. Therefore, subject to natural change, razorbill will be maintained as a feature in the long term.

Table 8.62 Apportionment of potential razorbill displacement and mortality values from the Project to SPAs during the non-breeding seasons using the Applicant's approach

SPA	**SPA population as a percentage of the Western Waters (%)**			**Proportioned displacement mortality based on 50% Disp 1% Mort for each SPA (breeding adults per annum)**			**SPA population (breeding adults)**		**SPA population baseline mortality rate percentage increase during the non-breeding season (%)**					
	Return migration	Post-breeding migration	Winter	Return migration	Post-breeding migration	Winter	Citation	Latest Count	Citation			Latest Count		
							Return migration	Post-breeding migration	Winter	Return migration	Post-breeding migration		Winter	
Rathlin SPA	4.97	4.97	3.61	0.1	0.0	0.1	8,922	30,044	0.009	0.001	0.007	0.003	0.000	0.002
Mingulay and Berneray SPA	3.27	3.27	2.37	0.1	0.0	0.0	16,890	26,787	0.003	0.000	0.002	0.002	0.000	0.002
Shiant Isles SPA	1.37	1.37	1.00	0.0	0.0	0.0	10,950	10,759	0.002	0.000	0.002	0.002	0.000	0.002
Handa SPA	1.67	1.67	1.21	0.0	0.0	0.0	16,395	10,997	0.002	0.000	0.001	0.002	0.000	0.002
Cape Wrath SPA	0.67	0.67	0.49	0.0	0.0	0.0	1,800	4,350	0.006	0.001	0.005	0.003	0.000	0.002

Table 8.63 Apportionment of potential razorbill displacement and mortality values from the Project to SPAs during the non-breeding seasons using the SNCB's assumed approach

SPA	**SPA population as a percentage of the Western Waters (%)**			**Proportioned displacement mortality based on 39 - 70% Disp 1-10% Mort for each SPA (breeding adults per annum)**			**SPA population (breeding adults)**		**SPA population baseline mortality rate percentage increase during the non-breeding season (%)**					
	Return migration	Post-breeding migration	Winter	Return migration	Post-breeding migration	Winter	Citation	Latest Count	Citation			Latest Count		
									Return migration	Post-breeding migration	Winter	Return migration	Post-breeding migration	Winter
Rathlin SPA	4.97	4.97	3.61	0.1 – 1.2	0.0 – 0.1	0.0 – 0.9	8,922	30,044	0.005 – 0.128	0.001 – 0.015	0.004 – 0.097	0.002 – 0.038	0.000 – 0.004	0.001 – 0.029
Mingulay and Berneray SPA	3.27	3.27	2.37	0.0 – 0.8	0.0 – 0.1	0.0 – 0.6	16,890	26,787	0.002 – 0.044	0.000 – 0.005	0.001 – 0.034	0.001 – 0.028	0.000 – 0.003	0.001 – 0.021
Shiant Isles SPA	1.37	1.37	1.00	0.0 – 0.3	0.0 – 0.0	0.0 – 0.3	10,950	10,759	0.001 – 0.029	0.000 – 0.003	0.001 – 0.022	0.001 – 0.029	0.000 – 0.003	0.001 – 0.022
Handa SPA	1.67	1.67	1.21	0.0 – 0.4	0.0 – 0.1	0.0 – 0.3	16,395	10,997	0.001 – 0.023	0.000 – 0.003	0.001 – 0.018	0.001 – 0.035	0.000 – 0.004	0.001 – 0.026
Cape Wrath SPA	0.67	0.67	0.49	0.0 – 0.2	0.0 – 0.0	0.0 – 0.1	1,800	4,350	0.004 – 0.086	0.000 – 0.010	0.001 – 0.065	0.002 – 0.036	0.000 – 0.004	0.001 – 0.027

8.30.4 Gannet – disturbance and displacement

1990. The gannet feature of a number of UK SPAs has been screened in for the assessment of operational and maintenance phase impacts. The potential impacts are from disturbance and displacement from the Project alone in relation to the conservation objectives outlined in previous sections for the following SPAs:

- St Kilda
- Sule Skerry and Sule Stack SPA
- North Rona and Sula Sgeir SPA.

1991. In order to provide a more concise review and reduce repetition of assessments of all such sites, the methods for considering gannet potentially susceptible to disturbance and displacement from more distant designated sites in UK waters are considered in this section together, including consideration of project phases.

1992. The potential for impact on UK SPA gannet features varies by season and accordingly this assessment is carried out on a seasonal basis.

1993. The Project is beyond the mean max plus one SD foraging distance for gannet to any of these SPAs screened in (315.2+194.2km , Woodward *et al*, 2019). Accordingly, assessments have been undertaken for the non-breeding seasons only.

8.30.4.1 Non-breeding seasons - gannet

1994. As detailed in **Table 8.1**, the predicted EIA gannet disturbance and displacement resultant mortality as a result of the operation of the Project in the return migration season and the post-breeding migration season is estimated at 76 and 141 individuals per annum, respectively. **Table 8.64** below presents the apportioned predicted disturbance and displacement estimates to each designated site considered in the non-breeding seasons, based on the apportionment process detailed in **Appendix 13.A: Offshore Ornithology Technical Report** and **Appendix 13.C: Revised Collision Risk Modelling** of the Offshore ES.

1995. The impact of displacement that would occur throughout the operational life of the Project is a prediction of consequent mortality of less than a single breeding adult (<0.1 – 0.2) for these SPAs in the non-breeding seasons. Based on these mortality rates, the increase in mortality relative to baseline mortality rate is at most 0.002% in the non-breeding seasons for any SPA. The potential for **an AEoI to the conservation objectives of the gannet feature of any SPA assessed in relation to disturbance and displacement effects in the operational and**

maintenance phase from the Project can be ruled out. Therefore, subject to natural change, gannet will be maintained as a feature in the long term.

8.30.5 Gannet – collision risk

1996. The gannet feature of a number of UK SPAs has been screened in for the assessment of operational and maintenance phase impacts. The potential impacts are from collision risk from the Project alone in relation to the conservation objectives outlined in previous sections for the following SPAs:

- St Kilda
- Sule Skerry and Sule Stack SPA
- North Rona and Sula Sgeir SPA.

1997. In order to provide a more concise review of all such sites, the methods for considering gannet potentially susceptible to collision risk from more distant designated sites in UK waters are considered in this section together.

1998. The potential for impact on UK SPA gannet features varies by season and accordingly this assessment is carried out on a seasonal basis.

1999. The Project is beyond the mean max plus one SD foraging distance for gannet to any of these SPAs screened in (315.2±194.2km, Woodward *et al*, 2019). Accordingly, assessment have been undertaken for the non-breeding seasons only.

8.30.5.1 Non-breeding seasons – gannet

2000. As detailed in **Table 8.2**, the predicted EIA gannet collision resultant mortality as a result of the operation of the Project in the return migration season and the post-breeding migration season is estimated at less than a single (0.0 – 0.4) individual per annum, respectively. **Table 8.66** below presents the apportioned predicted collision estimates to each designated site considered in the return migration season, based on the apportionment process detailed in **Appendix 13.A: Offshore Ornithology Technical Report** and **Appendix 13.C: Revised Collision Risk Modelling** of the Offshore ES.

Table 8.64 Apportionment of potential gannet displacement and mortality values from the Project to SPAs during the migration seasons using the Applicant's approach / SNCB's assumed minimum displacement range

SPA	**SPA population as a percentage of the Western Waters (%)**		**Proportioned displacement mortality based on 60-80% Disp 1% Mort for each SPA (breeding adults per annum)**		**SPA population (breeding adults)**		**SPA population baseline mortality rate percentage increase during the non-breeding season (%)**			
	Return migration	Post-breeding migration	Return migration	Post-breeding migration	Citation	Latest Count	Citation		Latest Count	
							Return migration	Post-breeding migration	Return migration	Post-breeding migration
St Kilda SPA	18.02	19.66	0.1 – 0.1	0.2 - -0.2	100,100	120,580	0.001 – 0.001	0.002 – 0.003	0.001 – 0.001	0.002 – 0.002
Sule Skerry and Sule Stack SPA	1.41	1.54	0.0 – 0.0	0.0 – 0.0	11,800	9,030	0.001 – 0.001	0.001 – 0.002	0.001 – 0.001	0.002 – 0.002
North Rona and Sula Sgeir SPA	2.79	3.04	0.0 – 0.0	0.0 – 0.0	20,800	22,460	0.001 – 0.001	0.002 – 0.002	0.001 – 0.001	0.001 – 0.002

Table 8.65 Apportionment of potential gannet displacement and mortality values from the Project to SPAs during the migration seasons using the SNCB's assumed maximum displacement range

SPA	SPA population as a percentage of the Western Waters (%)		Proportioned displacement mortality based on 60-80% Disp 10% Mort for each SPA (breeding adults per annum)		SPA population (breeding adults)		SPA population baseline mortality rate percentage increase during the non-breeding season (%)			
	Return migration	Post-breeding migration	Return migration	Post-breeding migration	Citation	Latest Count	Citation		Latest Count	
							Return migration	Post-breeding migration	Return migration	Post-breeding migration
St Kilda SPA	18.02	21.84	0.8 – 1.1	1.9 – 2.5	100,100	120,580	0.010 – 0.014	0.023 – 0.030	0.008 – 0.011	0.019 – 0.025
Sule Skerry and Sule Stack SPA	1.41	1.71	0.1 – 0.1	1.7 – 0.2	11,800	9,030	0.007 – 0.009	0.015 – 0.020	0.009 – 0.012	0.020 – 0.026
North Rona and Sula Sgeir SPA	2.79	3.38	0.1 – 0.2	0.3 – 0.4	20,800	22,460	0.008 – 0.010	0.017 – 0.023	0.007 – 0.009	0.016 – 0.021

Table 8.66 Apportionment of potential gannet collision risk mortality values from the Project during the non-breeding seasons in the UK Western Waters

SPA	**SPA population as a percentage of the Western Waters (%)**		**Proportioned Collision mortality rate for each (Breeding adults per annum)**		**SPA population (breeding adults)**		**SPA population baseline mortality rate percentage increase during the migratory seasons (%) (return migration / post-breeding migration)**	
	Return migration	Post-breeding migration	Return migration	Post-breeding migration	Citation	Latest Count	Citation	Latest Count
St Kilda SPA	18.0	19.7	0.00	0.36	100,100	120,580	0.000/ 0.004	0.000/ 0.004
Sule Skerry and Sule Stack SPA	1.4	1.5	0.00	0.03	11,800	9,030	0.000/ 0.003	0.000/ 0.004
North Rona and Sula Sgeir SPA	2.8	3.0	0.00	0.06	20,800	22,460	0.000/ 0.003	0.000/ 0.003

2001. The impact of collision risk that would occur throughout the operational life of the Project is a prediction of consequent mortality of less than a single breeding adult (<0.1 to 0.4) breeding adult for these SPAs in the non-breeding seasons. Based on these mortality rates, the increase in mortality relative to baseline mortality rate is at most 0.005% in the non-breeding seasons for any SPA. The potential for **an AEoI to the conservation objectives of the gannet feature of any SPA assessed in relation to collision risk in the operation and maintenance phase from the Project alone can be ruled out**. Therefore, subject to natural change, gannet will be maintained as a feature in the long term.

8.30.6 Gannet – combined displacement and collision risk

2002. As presented within **Table 8.64** and **Table 8.66** the combined displacement and collision risk impacts apportioned to the gannet feature of any individual SPA, equates to less than a single additional breeding adult mortality during the non-breeding seasons at most (when considering a displacement rate of 60-80% and a mortality rate of 1%). This represents a maximum baseline mortality rate increase of 0.009% during the non-breeding seasons.

2003. If macro avoidance is considered, the maximum baseline mortality rate increase would equate to 0.005% during the non-breeding seasons.

2004. The potential for **an AEoI to the conservation objectives of the gannet feature of any SPA assessed in relation to combined displacement and collision risk in the operation and maintenance phase from the Project alone can be ruled out**. Therefore, subject to natural change, gannet will be maintained as a feature in the long term.

9. Appropriate Assessment: Annex II Species – Migratory Fish

9.1 Approach to Assessment

2005. This section provides information in order to determine the potential for the Project to have an adverse effect on the integrity of sites designated for Annex II fish species.

2006. For each site designated for fish species screened in for further assessment, the following has been provided:

- A summary of the ecology of the fish species relevant for each European site
- An assessment of the potential effects during the construction, operation, maintenance and decommissioning phases.
- An assessment of the potential for in combination effects alongside other relevant developments and projects.

9.2 Assessment of potential effects

2007. The HRA Screening Report (MMO Reference: EIA/2022/00002) identified the following LSE that should be taken forward for further assessment in relation to the construction, operation & maintenance and decommissioning phases of the Project:

- Temporary habitat loss and physical disturbance (during construction, operation and maintenance, and decommissioning)
- Long term/ permanent habitat loss (during operation and maintenance, and decommissioning)
- Increased SSC and sediment re-deposition (including mobilisation of contaminated sediments) during all project phases
- Underwater noise and vibration (particularly during construction phase due to pile driving)
- Electromagnetic fields from cables (during the operation and maintenance phase)
- Barrier effects (during all project phases)
- Ghost fishing (during operation and maintenance phase)
- Fish aggregation (during the operation and maintenance phase)
- Deterioration of water quality (during all project phases).

2008. Sediment samples collected in site-specific surveys indicate little to no evidence of contamination (**Appendix 8.A** of the Offshore ES). Therefore, no pathway for the impact of remobilisation of contaminated sediments or deterioration of water quality is present. As for **Chapter 11: Fish and Shellfish Ecology** of the Offshore ES, an assessment of these impacts is not considered necessary.

2009. The worst case scenario and embedded mitigation presented in **Section 9.3** and **Section 9.4** therefore relates only to the effects screened in for the appropriate assessment.

9.3 Worst-Case Scenario

2010. The final design will be confirmed through detailed engineering design studies that will be undertaken post-consent to enable the commencement of construction. In order to provide a precautionary but robust impact assessment at this stage of the development process, realistic worst-case scenarios have been defined in terms of the potential effects that may arise. These are presented in **Table 9.1**.

Table 9.1 Definition of realistic worst-case scenario details relevant to the assessment of impacts in relation to Annex II migratory fish

Impact	Realistic worst-case scenario	Rationale
Construction		
Temporary habitat loss/physical disturbance	Installation of Wind Turbine Generator (WTG) anchors/moorings: 8 x 12MW turbines using a catenary mooring system, with scour protection totalling 60,319m^2. Total drag embedment anchor footprint: 6,400m^2. Seabed preparation area for all turbines: 11,066m^2. Total area of anchor dragging and installation for all turbines: 38,400m^2. Installation of inter-array cables: 480,000m^2. Installation of protection material for inter-array cables: 22,400m^2. Area of sand wave excavation for inter-array cables: 12,000m^2. Area of sand wave excavation for export cables: 280,000m^2. Installation of export cables: 2 x export cables totalling 4,680,000m^2. Cable ground lay vessel anchoring: 3,600m^2. Installation of unburied export cable protection: 238,560m^2. Installation of export cable crossing protection: 14,000m^2.	Temporary habitat loss/physical disturbance has been assessed in terms of the area of seabed affected, as opposed to the volume of water affected. Drag embedment anchor disturbance area assumes an anchor of 10m x 10m footprint, with a worst case drag length of 50m. The total area of disturbance per anchor is therefore the sum of footprint (100m^2) and the drag area (500m^2), totalling 600m^2 per anchor. With 8 WTGs and 8 anchors per WTG. Total anchor disturbance is 600m^2 x 8 x 8 = 38,400m^2

Impact	Realistic worst-case scenario	Rationale
	Footprint of substation (inc scour protection): 1,257m$^{2.}$ Total area: 5,841,602m$^{2.}$	
Temporary increased suspended sediments and sediment deposition	Cable burial for two export cables would displace a volume of 1,684,800m^3 assuming 3m wide, 3m deep excavation for each. Jetting/ploughing considered the worst case. Sand wave removal for two export cables displacement volume = 842,400m^3 Inter-array cable burial displacement volume = 216,000m^3 Jetting/ploughing considered the worst case. Sand wave removal for inter-array cables sediment displacement volume = 24,000m^3. Seabed preparation for mooring system = 16,599m^3. Seabed preparation for one Offshore Substation Platform = 1,257m^3. Total sediment displacement = 2,785,056m^3	Cable burial for two export cables, and all interarray cables assuming 3m wide, 3m deep excavation for each. Jetting/ploughing considered the worst case. Sandwave removal required for 3% of the total export cable length. Up to 50m wide and 3m depth. Sandwave removal required for 5% of the total export cable length. Up to 10m wide and 3m depth. Seabed preparation for the mooring system assumes 2m preparation depth for entire 4,957m^2 mooring footprint. Seabed preparation for OSP assumes an area of 1,257m^2 and a 1m depth of preparation.
Underwater noise and vibration	UXO Charge Weight: 309.4kg. Impact piling modelling (Unweighted SEL$_{cum}$): 219dB. Vessel movement (large): 168dB. Vessel movement (medium): 161dB. Backhoe dredging: 165dB. Suction dredging: 186dB. Cable laying: 171dB. Trenching: 172dB. Rock placement: 172dB. Drag embedment anchors: 171dB. Suction pile installation: 192dB.	Values as presented within **Appendix 12.A: Marine Mammal and Marine Turtle Underwater Noise Modelling Report** of the Offshore ES.

Impact	Realistic worst-case scenario	Rationale
Barrier Effects	Volume of WTG anchors/moorings: 8 x 12MW turbines using a catenary mooring system, with scour protection, totalling 120,637m³. Volume of suspended inter-array cables: 282.7m³. Volume of protection material for inter-array cables: 23,040m³. Volume of protection material for unburied export cables: 136,320m³. Volume of protection material for export cable crossings: 14,400m³. Volume displaced by floating substructures = 109,268m³. Volume of OSP (draft fixed jacket substructure): 16,000m³. Total: 419,948m³.	The worst-case volume of the water column predicted to be impacted during the construction phase of the Project, is limited to the immediate volume of water surrounding physical structures, including the volume of water containing the offshore OSP and floating turbine platform structures.
Operation and Maintenance		
Permanent habitat loss	Area of WTG anchors/moorings: 8 x 12MW turbines using a catenary mooring system and associated scour protection totalling 60,319m². Area of protection material for inter-array cables: 22,400m². Area of protection material for unburied export cables: 238,560m². Area of protection material for export cable crossings: 14,000m². Area of sand wave excavation for inter-array cables: 12,000m². Area of sand wave excavation for export cables: 280,000m². Area of scour protection for substation: 1,257m². Total: 628,536m².	This impact exclusively refers to the area of seabed loss due to the placement of infrastructure (such as buried cable routes, catenary chains on the seabed, and anchors/moorings within the seabed).

Impact	Realistic worst-case scenario	Rationale
Temporary increased suspended sediments and sediment deposition	The magnitude of effects of increased suspended sediment concentration and sediment deposition are determined to be less than those that are predicted to arise during the construction and installation phase of the Project. Maximum displacement volume of sediment predicted to arise during the construction and installation phase of the Project is 2,785,056m³.	Cable burial for two cables assuming 3m wide, 3m deep excavation for each. Jetting/ploughing considered the worst case.
Underwater noise and vibration	Noise output from an 18MW turbine is predicted to be 132dB (SPL_{RMS}) at 150m from the largest proposed turbine, for a turbine running 24hr per day. This output increases to 136dB (SPL_{RMS}) at 100m, or 160dB (SPL_{RMS}) at 10m. Cable 'snapping' has been identified at a rate of up to 23 snaps per day, with <10 snaps exceeding 160dB (SPL_{peak}).	Values as presented within **Appendix 12.A Marine Mammal and Marine Turtle Underwater Noise Report** of the Offshore ES.
Electromagnetic fields	Radius of inter-array cable: 0.15m. Radius of export cable: 0.15m. Total length of suspended inter-array cable: 3,200m. Total length of export cable: 187,200m. Maximum detectable distance of EMF surrounding inter-array cable: 4m. Maximum detectable distance of EMF surrounding export cable: 4m. Maximum volume of water containing identifiable EMF from inter-array cable: 172,774m³. Maximum volume of water containing identifiable EMF from export cable (laid on the seabed surface): 5,043,384m³. Total volume: 5,216,158m³.	The spatial extent of impact has been determined as the cylindrical volume of water surrounding the cable in which EMF is elevated above baseline conditions. It has been determined that EMF becomes undetectable at 4m from the cable in seawater.

Impact	Realistic worst-case scenario	Rationale
Barrier effects	The worst-case scenario for barrier effects during the operation and maintenance phase of the Project is the same as the worst-case scenario for barrier effects during the construction phase. Total: 419,948m³.	The worst-case volume of the water column predicted to be impacted during the construction phase of the Project, is limited to the immediate volume of water surrounding physical structures, including the volume of water containing the offshore OSP and floating turbine platform structures.
Fish aggregation effects	The worst-case scenario for fish aggregation (assumed to occur within the same volume of water as barrier effects) during the operation and maintenance phase of the Project is the same as the worst-case scenario for barrier effects during the construction and operation and maintenance phases. Total: 419,948m³.	Fish aggregation effects will occur in regions of water immediately surrounding introduced barriers.
Ghost fishing	Annual monitoring of anchor/moorings will be undertaken during the lifetime of the Project Remotely operated vehicles (ROVs) will be used to identify any entanglement hazards such as abandoned, lost, or discarded fishing gear (ALDFG) snagged on Project substructures.	A worst-case scenario for this impact is difficult to determine due to the unknown location and likelihood of lost gear entering the array at any point in time.
Decommissioning		
It is anticipated that the decommissioning impacts would be similar in nature to those of construction, although the magnitude of effect is likely to be lower.		

9.4 Embedded Mitigation

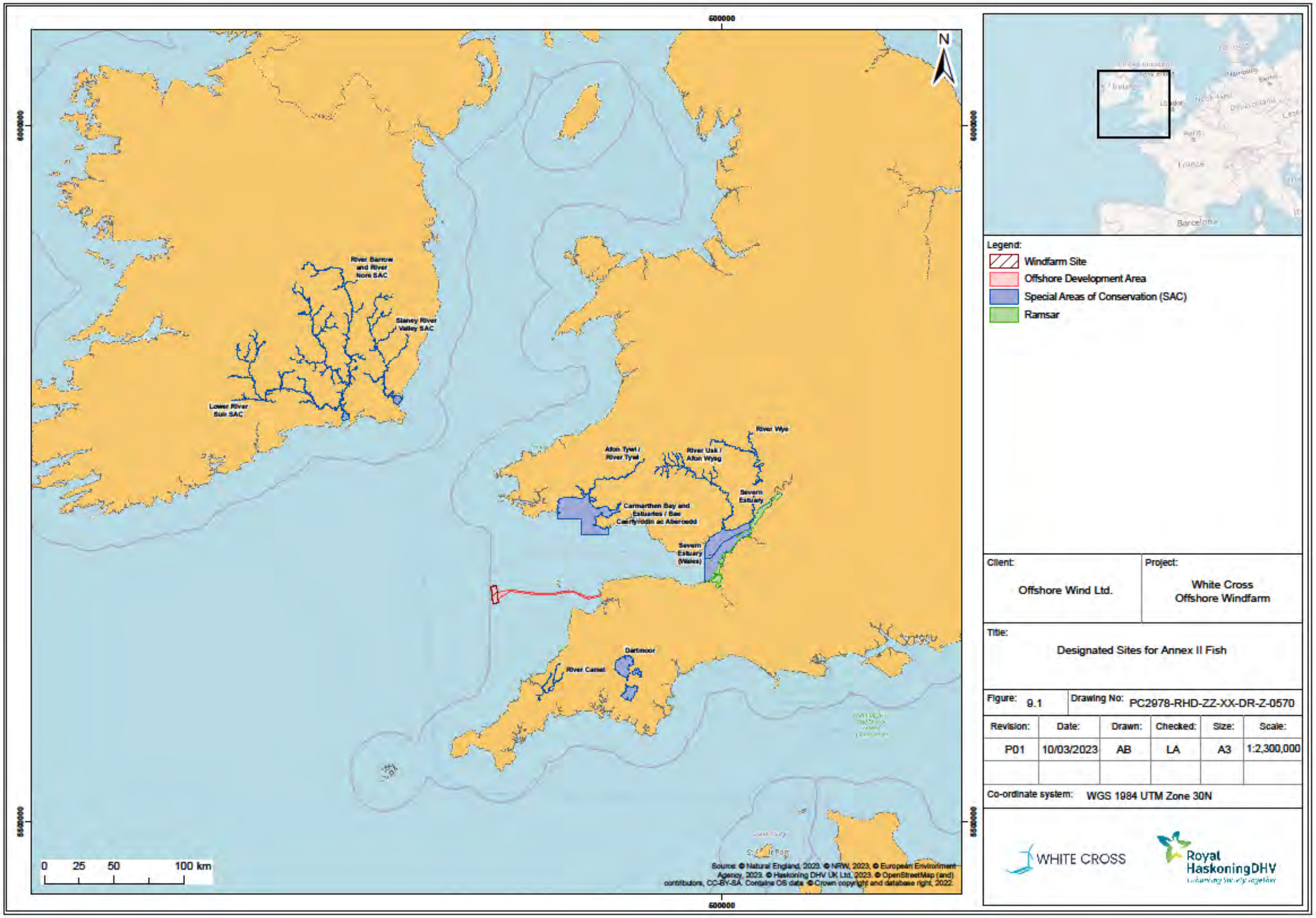
2011. This section outlines the embedded mitigation incorporated into the design of the Project (presented in **Table 9.2**) relevant to the assessment for Annex II fish species.

2012. No additional mitigation measures are recommended that relate to Fish and Shellfish Ecology.

Table 9.2 Embedded mitigation measures relevant to Annex II migratory fish

Component/Activity	Mitigation embedded into the design of the Project
Continuous monitoring of Project substructures for the presence of ALDFG and other potential entanglement hazards	Annual monitoring of anchor/moorings will be undertaken during the lifetime of the Project Remotely operated vehicles (ROVs) will be used to identify any entanglement hazards such as ALDFG snagged on Project substructures.
Cables and cable burial	The target burial depth is 1.5m where possible (recognised industry good practice and reducing effects of EMF), with a burial depth range of 0.5m – 3m. A detailed Cable Burial Risk Assessment (CBRA) will also be required, to confirm the extent to which cable burial can be achieved. Where it is not possible to achieve cable burial, additional cable protection (rock placement, concrete mattressing or grout bags) may be required, and this will also increase the minimum distance between the cable and a migratory fish. Cables will be specified to reduce EMF emissions, as per industry standards and best practice, such as the relevant IEC (International Electrotechnical Commission) specifications.
Construction Noise	A draft Marine Mammal Mitigation Protocol (MMMP) (**Appendix 12.C** of the Offshore ES) has been developed and will be implemented, which will include proposals for soft start and ramp-up of piling. A soft start and ramp up protocol for pile driving would allow mobile species to move away from the area of highest noise impact. The MMMP details the required mitigation measures to minimise the potential risk of physical and auditory injury (PTS) to marine mammals as a result of underwater noise during UXO clearance and piling. Any mitigation beneficial to marine mammals would also potentially reduce impacts on fish.

Figure 9.1 Designated Sites for Annex II Fish Species



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9.5 River Wye/ Afon Gwy SAC

9.5.1 Description of Designation

2013. The River Wye (125km east northeast of the Offshore Development Area, and 192km east northeast of the Windfarm Site) rises on Plynlimon in the Cambrian Mountains and flows in a generally south-easterly direction to enter the Severn Estuary at Chepstow. It is an extensive river system crossing the border between England and Wales. The site provides exceptionally good quality habitat for river lamprey *Lampetra fluviatilis*, sea lamprey *Petromyzon marinus*, Twaite shad *Alosa fallax*, Allis shad *Alosa alosa*, and Atlantic salmon *Salmo salar*.

9.5.1.1 Qualifying Features

2014. The site is designated under article 4(4) of the Directive (92/43/EEC) as it hosts the following migratory Annex II fish species:

- River lamprey
- Sea lamprey
- Twaite shad
- Allis shad
- Atlantic salmon.

9.5.1.2 Conservation Objectives

2015. The conservation objectives of the SAC are to ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by ensuring that:

- The size of the population should be stable or increasing, allowing for natural variability, and sustainable in the long term
- The distribution of the population should be being maintained
- There should be sufficient habitat, of sufficient quality, to support the population in the long term
- Factors affecting the population or its habitat should be under appropriate control.

9.5.1.3 Condition Assessment

2016. The conservation status of features of the SAC were assessed by NRW for developing the core management plan. For all Annex II fish species, the condition was assessed as unfavourable, un-classified. This status was applied to all species as a precautionary assessment, due to the presence of adverse factors, in particular the potential for flow depletion and localised water quality failures. (NRW, 2022a).

9.5.2 Appropriate Assessment

9.5.2.1 Assessment of potential effects of the Project alone

9.5.2.1.1 Temporary habitat loss and physical disturbance (during construction, operation and maintenance, and decommissioning)

2017. Temporary habitat loss/physical disturbance has the potential to occur via a number of pathways throughout the lifetime of the project. Anchor and mooring line installation, cable burial, cable protection installation, and associated seabed clearance may result in impacts. The magnitude of impact will be greatest during construction, then reducing over operation and maintenance, and decommissioning.

2018. Given the distance of the Project from the SAC there will be no direct habitat loss within the SAC.

2019. Migratory fish species at sea are highly mobile and are, therefore, considered tolerant and adaptable to temporary habitat loss/physical disturbance. They are capable of navigating away from any temporary habitat and physical disturbance caused by construction, operation and maintenance, and decommissioning of the Project. In addition, there is abundant suitable alternative habitat across the wider region, particularly in the context of long distance migrations of Annex II fish species.

2020. There is **no potential for the Project alone to have an AEoI of the River Wye/ Afon Gwy SAC due to temporary habitat loss and physical disturbance during construction, operation and maintenance or decommissioning**. The confidence in the assessment is high and is based on the assessment presented in **Chapter 11: Fish and Shellfish Ecology** of the Offshore ES.

9.5.2.1.2 Long term/ permanent habitat loss (during operation and maintenance, and decommissioning)

2021. This impact refers to the area of seabed loss due to the placement of infrastructure (such as buried cable routes, catenary chains on the seabed, and anchors/moorings within the seabed).

2022. The total worst-case scenario area for permanent habitat loss within the Fish and Shellfish Ecology Study Area is 0.95km² (see **Table 9.1**). This represents0.01% of the Fish and Shellfish Ecology Study Area (7,426km²), as defined in **Chapter 11: Fish and Shellfish Ecology** of the Offshore ES. This means that any migratory

Annex II fish from the SAC located 125km from the Project Boundary that move through the Fish and Shellfish Ecology Study Area as part of their migratory routes, will temporarily be subject to an area with 0.01% less of the current habitat (although this will be replaced with an alternative hard substrate habitat). This change in habitat is negligible in the context of long distance Annex II fish migrations.

2023. Permanent habitat loss is most likely to impact species with demersal life stages and/or have limited mobility: at sea Annex II migratory fish possess neither of these traits. It may also impact species which do not have a direct relationship with the seabed, but prey on species that will be impacted by this effect.

2024. Migratory Annex II fish species are diadromous [41]and mostly anadromous[42], therefore no spawning grounds are located within the Project area. As such, seabed habitat loss will not impact the sensitive spawning or nursery stages of migratory Annex II fish species.

2025. Given the distance of the Project from the SAC there will be no direct habitat loss within the SAC.

2026. There is **no potential for the Project alone to have an AEoI of the River Wye/ Afon Gwy SAC due to long term/ permanent habitat loss during construction, operation and maintenance or decommissioning**. The confidence in the assessment is high and is based on the assessment presented in **Chapter 11: Fish and Shellfish Ecology** of the Offshore ES.

9.5.2.1.3 Increased SSC and sediment re-deposition (including mobilisation of contaminated sediments) during all project phases

2027. The construction phase of the Project is predicted to result in an increase in suspended sediment concentration and increased sediment deposition. These increases will occur result of installation activities related to foundations, mooring lines, foundations, cable/scour protection, and export and array cables (including pre-cable works such as pre-lay grapnel run (PLGR) or sand wave levelling). Works at the Landfall site may also increase suspended sediments through potential open-cut trenching. The magnitude of SSC increases will be reduced in operation and

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[41] Diadromous fish travel between salt water and fresh water as part of their life cycle.

[42] Anadromous fish live most of their lives in salt water but are born in fresh water and return to fresh water to spawn.

maintenance (associated with cable maintenance and repair), and decommissioning.

2028. All migratory Annex II fish are determined to have high tolerance to localised increases in suspended sediment concentrations. Due to their high mobility, they are likely to avoid areas of increased suspended sediments until they have returned to background levels (ABP Research, 1999; EMU, 2004).

2029. There is **no potential for the Project alone to have an AEoI of the River Wye/ Afon Gwy SAC due to increased SSC and sediment re-deposition (including mobilisation of contaminated sediments) during construction, operation and maintenance or decommissioning**. The confidence in the assessment is high and is based on the assessment presented in **Chapter 11: Fish and Shellfish Ecology** of the Offshore ES.

9.5.2.1.4 Underwater noise and vibration (particularly during construction phase due to pile driving)

2030. Relatively few experiments on the hearing of fishes have been carried out under suitable acoustic conditions, and only a few species have valid data that provide actual thresholds of effect (Popper and Hawkins, 2019). Recent papers on the effects of underwater noise on fish and shellfish species have highlighted the lack of clear evidence to support setting thresholds for impacts on fish and shellfish receptors (Hawkins and Popper, 2017; Popper *et al.*, 2014). These have highlighted some of the shortcomings of impact assessments, including the use of broad criteria for injury and behavioural effects based on limited studies. The effects of particle motion are not well understood but are considered to be more important for many fish and species, than sound pressure which has been the main consideration in noise impact assessments to date (Popper and Hawkins, 2018).

2031. The most recent and relevant guidelines for the purposes of this assessment, are the Acoustical Society of America (ASA) Sound Exposure Guidelines for Fishes and Sea Turtles (Popper et al., 2014). These guidelines provide directions and recommendations for setting criteria (including injury and behavioural criteria) for fish. The Popper et al. (2014) guidelines broadly group fish into the following categories based on their anatomy and the available information on hearing of other fish species with comparable anatomies:

- Group 1: Fishes lacking swim bladders that are sensitive only to sound particle motion and show sensitivity to a narrow band of frequencies (includes river lamprey and sea lamprey)

- Group 2: Fishes with a swim bladder where the organ does not appear to play a role in hearing. These fish are sensitive only to particle motion and show sensitivity to a narrow band of frequencies (includes Atlantic salmon)
- Group 3: Fishes with swim bladders that are close, but not intimately connected to the ear. These fishes are sensitive to both particle motion and sound pressure and show a more extended frequency range than groups 1 and 2, extending to about 500 Hz (includes European eel)
- Group 4: Fishes that have special structures mechanically linking the swim bladder to the ear. These fishes are sensitive primarily to sound pressure, although they also detect particle motion. These species have a wider frequency range, extending to several kHz and generally show higher sensitivity to sound pressure than fishes in Groups 1, 2 and 3 (Allis and Twaite shad).

9.5.2.1.4.1 Underwater noise sources

2032. This assessment of underwater noise considers the worst-case noise sources relevant to the Project, namely UXO clearance activity and impact piling.

2033. The calculations and models used to predict impact ranges for UXO clearance and impact piling are detailed in **Appendix 12.A** of the Offshore ES.

9.5.2.1.4.2 UXO Clearance

2034. The UXO calculations assume a worst-case scenario where the UXO to be detonated is not buried, degraded, or subject to any other significant attenuation from its "as new" condition. It therefore assumes that a high-order clearance technique is used, where an additional charge ("donor charge") is used to detonate the explosive material, resulting in a blast wave equivalent to full detonation of the device.

2035. A summary of the impact ranges for UXO detonation, and mitigated (bubble curtain) UXO detonation using the unweighted SPLpeak explosion noise criteria from Popper et al. (2014) for species of fish, are given in **Table 9.3** and **Table 9.4**.

Table 9.3 Summary of the impact ranges (m) for UXO detonation using the unweighted SPL_{peak} explosion noise criteria from Popper et al. (2014) for species of fish

Popper *et al.* (2014) Unweighted SPL_{peak}		**Low-yield**	**Low-order**	**25kg**	**67.8kg**	**130kg**	**227kg**	**309.4kg**
Mortality & potential mortal injury	234dB	130	80	170	240	300	370	410
	229dB	210	120	290	410	510	610	680

Table 9.4 Summary of the impact ranges (m) for mitigated (bubble curtain) UXO detonation using the unweighted SPL_{peak} explosion noise criteria from Popper et al. (2014) for species of fish

Popper *et al.* (2014) Unweighted SPL_{peak}		**Low-yield**	**Low-order**	**25kg**	**67.8kg**	**130kg**	**227kg**	**309.4kg**
Mortality & potential mortal injury	234dB	<50	<50	65	90	110	130	140
	229dB	80	<50	100	140	180	220	240

2036. UXO clearance noise modelling is further detailed in **Appendix 12.A** of the Offshore ES.

9.5.2.1.4.3 Impact Piling

2037. Modelling of high-level impulsive subsea noise, such as that caused through piling activities, has been undertaken using the INSPIRE model (version 5.1). This is a semi-empirical underwater noise propagation model that is based on numerical, geometric, and energy loss methodology. The INSPIRE model estimates unweighted SPL_{peak}, SEL_{ss} and SEL_{cum} noise levels, with calculations made along 180 equally spaced radial transects. The results presented in this assessment, and in more detail in **Appendix 12.A** of the Offshore ES, should be considered conservative as maximum design parameters and worst-case assumptions have been selected for:

- piling hammer blow energies
- soft start, ramp-up profile and strike rate
- total duration of piling
- receptor swim speeds.

2038. The thresholds for mortality, mortal injury, recoverable injury and temporary threshold shifts (TTS), due to impact piling noise are detailed in **Table 9.5**.

2039. For fish with a swim bladder involved in hearing (hearing group 4), TTS onset is likely to occur at 186dB SEL_{cum}, while injury and mortality are not expected until an exposure of >203dB SEL_{cum} (Popper *et al.*, 2014). This receptor group is predicted to be the most sensitive, therefore higher levels of sound exposure will be required before these effects are predicted to occur for all other receptor groups. A summary of the maximum predicted impact ranges is presented in **Table 9.6**.

2040. Modelling predicts that the largest impact range (based on the most sensitive hearing group 3 and 4 species (i.e. shads and European eel) and group 2 (Atlantic salmon)) for maximum recoverable injury (203dB SEL_{cum}) is up to 14km for stationary receptors, and less than 100m for a fleeing receptor. TTS ranges (186dB SEL_{cum}) for fish with a swim bladder involved in hearing will be up to 24km for fleeing fish, or 51km for stationary receptors.

Table 9.5 SEL_{cum} (dB re 1 μPa^2s) Criteria for Onset of Injury to Fish due to Impulsive Piling (Popper et al., 2014)

Type of Animal	**Species**	**Mortality and Potential Mortal Injury**	**Recoverable Injury**	**TTS**
Group 1 Fish: no swim bladder (particle motion detection)	River lamprey Sea lamprey	>219	>216	>>186
Group 2 Fish: where swim bladder is not involved in hearing (particle motion detection)	Atlantic salmon	210	203	>186
Groups 3 and 4 Fish: where swim bladder is involved in hearing (primarily pressure detection)	Twaite shad Allis shad European eel (conservative inclusion due to lack of data)	207	203	186

Table 9.6 Summary of worst case impact ranges for impact piling modelling using the unweighted SEL$_{cum}$ pile driving criteria from Popper et al. (2014) for species of fish assuming both fleeing and stationary animals

Popper *et al.* (2014) Unweighted SEL$_{cum}$		**Area**	**Maximum range**	**Minimum range**	**Mean range**
Fleeing	**219dB**	<0.1km²	<100m	<100m	<100m
	216dB	<0.1km²	<100m	<100m	<100m
	210dB	<0.1km²	<100m	<100m	<100m
	207dB	<0.1km²	<100m	<100m	<100m
	203dB	<0.1km²	<100m	<100m	<100m
	186dB	1,400km²	24km	18km	21km
Stationary	**219dB**	8.4km²	1.7km	1.6km	1.6km
	216dB	21km²	2.6km	2.6km	2.6km
	210dB	110km²	6.0km	5.9km	5.9km
	207dB	230km²	8.6km	8.5km	8.5km
	203dB	550km²	14km	13km	13km
	186dB	6,500km²	51km	39km	46km

2041. For less sound sensitive sea lamprey and river lamprey (hearing group 1), the largest impact range for recoverable injury (216dB SEL$_{cum}$) is up to 2.6km for stationary receptors, and less than 100m for a fleeing receptor.

2042. With a maximum recoverable injury range for fleeing receptors determined as being <100m (and 14km maximum assuming a stationary receptor), there is no pathway for piling noise to cause recoverable injury to any Annex II species resident within SACs during important spawning periods (that occur within the river systems).

2043. There are a number of embedded mitigation measures that will be adhered to, including 1) gradual start of piling activities to allow fish to move away from the work site and reduce the exposure to noise; and 2) use of behavioural deterrent devices to ensure there are no sensitive species within the area at the start of operations (e.g. acoustic deterrent devices). This will reduce allow any Annex II species that may be present within the limited range for unrecoverable injury to move away at the onset of piling activity.

2044. It is acknowledged in the modelling report however that piling noise impact ranges in the order of tens of kilometres for stationary fish receptors are likely to be an overestimate (**Appendix 12.A Marine Mammal and Marine Turtle Underwater Noise Report** of the Offshore ES). This is due to the complex interactions of the sound wave with the seabed and the water column, causing piling noise to modify from a high energy impulse to a more continuous wave with energy spread over a greater (more continuous) duration, as described in detail by Southall (2021). Southall (2021) states that: *"..when onset criteria levels were applied to relatively high-intensity impulsive sources (e.g. pile driving), TTS onset was predicted in some instances at ranges of tens of kilometres from the sources. In reality, acoustic propagation over such ranges transforms impulsive characteristics in time and frequency (see Hastie et al., 2019; Amaral et al., 2020; Martin et al., 2020). Changes to received signals include less rapid signal onset, longer total duration, reduced crest factor, reduced kurtosis, and narrower bandwidth (reduced high- frequency content). A better means of accounting for these changes can avoid overly precautionary conclusions, although how to do so is proving vexing"*. The point is reenforced later in the discussion which points out that *"..it should be recognized that the use of impulsive exposure criteria for receivers at greater ranges (tens of kilometres) is almost certainly an overly precautionary interpretation of existing criteria"*. Regardless, TTS for migratory Annex II fish are by their nature temporary and reversible and will likely have a negligible effect overall.

2045. There is **no potential for the Project alone to have an AEoI of the River Wye/ Afon Gwy SAC due to underwater noise and vibration during construction, operation and maintenance or decommissioning**. The confidence in the assessment is high and is based on the assessment presented in **Chapter 11: Fish and Shellfish Ecology** of the Offshore ES.

9.5.2.1.5 Electromagnetic fields from cables (during the operation and maintenance phase)

2046. EMF has the potential to interfere with the navigation of sensitive migratory Annex II species by affecting the speed and/or course of their movements through the Project, causing subsequent potential issues if they are not able to reach spawning, nursery or feeding grounds.

2047. EMFs can have attractive and repulsive effects, that can cause barrier effects dependent on the species and the spatial scale of EMF. In the context of submarine transmission cables, it is well known that EMF strength dissipates rapidly, from 7.85μT at 0m, to 1.47μT at 4m, from the average windfarm inter-array cable buried 1m below the seabed (Normandeau *et al.*, 2011). For perspective, the earth's magnetic field has an estimated background magnitude of 25-65μT (Hutchinson et al, 2020).

2048. The worst-case maximum EMF magnitude and spatial extent predicted to potentially impact fish and shellfish is presented within **Table 9.7**. The spatial extent of impact has been determined as the cylindrical volume of water surrounding the cable in which EMF is elevated above baseline conditions. EMF generated by the Project's infrastructure will arise from a number of sources. Firstly, offshore export cables will generate EMF. The area of elevated EMF produced by offshore export cables will be reduced, but not eliminated by burying to a minimum of 0.5m. Inter-array cables will also generate EMF. Again, this will be reduced, but not eliminated by burying to 0.5m. In the case of inter-array cables, there will also be lengths of cable suspended within the water column that cannot be mitigated through burial. There has been limited research specific to EMF in the water column, however it has been determined that EMF becomes undetectable at 4m from the cable in seawater, as per Normandeau *et al*. (2011). A semi-cylindrical volume of EMF has been assumed for the export cable laid on the seabed[43]. For inter-array cable, a

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[43] This assumes the cable is laying on the seabed with no cable protection. This would not be a realistic scenario, with the majority of cable buried in the seabed or under cable protection systems and, therefore, having a reduced effect in the context of fish and shellfish ecology.

cylindrical volume has been used for the length of suspended inter-array cable, as the remainder of the cable will not be directly exposed to the water column.

Table 9.7 Worst-case extent of electromagnetic fields during operation and maintenance

Potential Pathway	Worst-case Scenario
Radius of inter-array cable	0.15m
Radius of export cable	0.15m
Total length of suspended inter-array cable (suspended in water column)	2,200m
Total length of buried inter-array cable (minimum 0.5m)	22,000m
Total length of buried export cable (minimum 0.5m)	187,200m
Maximum detectable distance of EMF surrounding cables	4m
Maximum volume of water in the water column containing identifiable EMF from suspended inter-array cable	118,878m³
Maximum volume of water containing identifiable EMF from buried inter-array cable (0.5m)	453,679m³
Maximum volume of water containing identifiable EMF from buried export cable (0.5m)	4,289,333m³
Total volume	4,861,8904m³

2049. The total worst-case volume of water containing identifiable EMF from inter-array cables is 572,557m³ (both buried cables and cables suspended within the water column), representing <0.005% of the volume available to fish within the array boundary, of 3.48km³. This value is the total area of the array multiplied by the average depth across the array (70.5m), assuming a level seabed.

2050. The worst-case volume of water containing identifiable EMF from export cables is 4,289,333m³, representing ~2.6% of the volume available to fish within the export cable route corridor (~168,000,000m³). This value is the total area of the 25m wide cable route corridors for 2 export cables multiplied by a linear gradient in depth from a maximum depth of 72m (the maximum Windfarm Site depth) to a minimum depth of 0m at Landfall, creating an assumed polyhedron 'wedge' of water above the cable in which Annex II fish species could possibly be present.

2051. The magnitude of impact associated with EMFs is based on the worst-case scenario of a 4m radius zone around all array cables, and a 4m radius semi-circular zone around both export cables within the Maximum Footprint Area. The greatest magnitude of impact will be in direct contact with cables, most likely the suspended array cables, in which the maximum EMF magnitude is <50μT.

2052. Swedpower (2003) found no measurable impact when subjecting salmon and sea trout to magnetic fields twice the magnitude of the geomagnetic field. Similarly, studies conducted by Marine Scotland Science (Armstrong *et al.* 2016) and Walker (2001) found no evidence of unusual behaviour in Atlantic salmon associated with magnetic fields and EMFs produced by cables. This is further confirmed by a study undertaken by the Bureau of Ocean Energy Management (BOEM) which found that energised cables do not appear to present a strong barrier to the natural seasonal movement patterns of migratory fish (BOEM, 2016).

2053. Any potential impacts on movement and behaviour in salmonids would be closely linked to the proximity of the fish to the EMF source. Gill and Barlett (2010) suggest that any impact associated with EMFs on the migration of salmon and sea trout would be dependent on the depth of water and the proximity of home rivers to development sites. During the later stages of marine migration, sea trout and Atlantic salmon rely on their olfactory system to find and identify their natal river. During these stages they are likely to be migrating in the mid to upper layers of the water column.

2054. When exposed directly to electric fields in laboratory conditions, sea lamprey have been shown to exhibit changes in neuronal activity and increase swimming activity in cathodal fields, suggesting they may be capable of electroreception, possibly as a means of homing in to host organisms during their parasitic adult phase (Chung-Davidson *et al.*, 2004). However, there is no evidence that lampreys respond to magnetic B fields (Gill & Bartlett, 2012). Literature searches have revealed no direct tests of lamprey behavioural responses to cable induced EMFs or simulations of such fields.

2055. No studies on the EMF effects on Allis or Twaite shad have been conducted to date. Given the fact that these species do not undergo long-distance migrations, rather remaining in estuarine and coastal environments for the at sea components of their life cycles, there is no pathway for EMF to meaningfully impact upon migratory behaviour in this case.

2056. Given the evidence of limited EMF sensitivity for the relevant annex II fish species, and the low magnitude of EMF produced by the Project (due to minimum cable burial and cable protection), there is **no potential for the Project alone to have an AEoI of the River Wye/ Afon Gwy SAC due to electromagnetic fields from cables during operation and maintenance**. The confidence in the assessment is high and is based on the assessment presented in **Chapter 11: Fish and Shellfish Ecology** of the Offshore ES.

9.5.2.1.6 Barrier effects (during all project phases)

2057. Barrier effects on migratory Annex II fish species have the potential to arise from a number of sources, including suspended sediment plumes, noise, EMFs, and anthropogenic structures within the water column. As such, the barrier effects due to suspended sediment plumes, noise, and EMFs have been assessed in this **Section 9.5.2** under the headings **Increased SSC and sediment re-deposition (including mobilisation of contaminated sediments) during all project phases**; **Underwater noise and vibration (particularly during construction phase due to pile driving)**; and **Electromagnetic fields from cables (during the operation and maintenance phase)**.

2058. Barrier effects due to anthropogenic structures in the water column have the potential to occur via a number of potential pathways throughout construction of the Project. Anchor and mooring line installation, cable protection installation, OSP installation, floating turbine platform structure installation, and associated seabed clearance may result in barriers to the migration of Annex II species. The barrier effect of these subsurface structures will remain throughout the operation and maintenance, and decommissioning phases.

2059. The magnitude of the barrier effect can be quantified as a proportion of water volume lost as a result of additional material on the seabed and within the water column. The volume of the Windfarm Site is equal to 3.48km^3 (total area of the array multiplied by the average depth across the array (70.5m), assuming a level seabed). The total volume of the Offshore Export Cable Corridor is equal to 0.17km^3 (total area of the 25m wide cable route corridors for 2 export cables multiplied by a linear gradient in depth from a maximum depth of 72m (the maximum Windfarm Site depth) to a minimum depth of 0m at Landfall, creating an assumed polyhedron 'wedge' of water above the cable). Combined, the volume of water within the Offshore Development Area is approximately 3.65km^3.

2060. The worst case volume of water column loss due to subsurface structures associated with the Project is 327,865.07m^3 (see **Table 9.1**), which accounts for 0.01% of the water volume within the Offshore Development Area.

2061. Given the limited loss of water column space, the high mobility and agility of migratory Annex II fish species, and the wide extent of alternative available water column space to navigate through, there is **no potential for the Project alone to have an AEoI on the River Wye/ Afon Gwy SAC due to barrier effects during construction, operation and maintenance or decommissioning**. The confidence in the assessment is high and is based on the assessment presented in **Chapter 11: Fish and Shellfish Ecology** of the Offshore ES.

9.5.2.1.7 Ghost fishing (during operation and maintenance phase)

2062. Ghost fishing refers to the trapping/entanglement of individuals within man-made debris, most commonly abandoned, lost, or discarded fishing gear (ALDFG) (Richardson *et al.*, 2019). In the context of the Project, ALDFG may drift onto the WTG mooring lines. Ghost nets are a well-known cause of mortality for fish species, however the degree of impact is dependent on the size and location of ALDFG. In the context of migratory Annex II fish species, which are pelagic during their at-sea migratory phases, they may be impacted by free-floating netting and hooks within the water column, or caught on infrastructure in mid-water.

2063. A worst-case scenario for this impact is difficult to determine due to the unknown location and likelihood of lost gear entering the array at any point in time. Data can be inferred from multiple sources, including fisheries data (Piet *et al.*, 2021) and charitable citizen science, however this is not likely to be sufficiently representable within the Windfarm Site. Salmonids, lamprey and shad are almost never reported in commercial landings data, even as bycatch (MMO, 2022), or within non-commercial scientific trawl data (ICES, 2022). This suggests that they are not susceptible to mortality from nets that target the seabed and lower levels of the water column. Scientific trawls targeting at-sea salmon use 'epipelagic' trawls to target the upper 5m of the water column where they are known to migrate (ICES, 2004), suggesting that ghost fishing may present the greatest risk to migratory Annex II fish species, within the epipelagic layer of the water column, where any entanglement hazards will be more readily visible from the surface.

2064. Annual monitoring of anchor/moorings will be undertaken during the lifetime of the Project Remotely operated vehicles (ROVs) will be used to identify any entanglement hazards such as ALDFG snagged on Project substructures. Whilst ALDFG may snag on Project infrastructure in the intervening period between monitoring surveys, due to the distance of the generation assets from the SAC (192km) and the dispersal of at sea migratory Annex II species at this distance, there is a negligible chance of a significant number of the fish population from the site being snagged on a single ALDFG within a single migratory season.

2065. Given the above commitment to ongoing monitoring of subsurface structures, and the removal of any identified ALDFG, the magnitude of the risk to migratory Annex II fish species is negligible.

2066. There is **no potential for the Project alone to have an AEoI of the River Wye/ Afon Gwy SAC due to ghost fishing during operation and maintenance**. The confidence in the assessment is high and is based on the assessment presented in **Chapter 11: Fish and Shellfish Ecology** of the Offshore ES.

9.5.2.1.8 Fish aggregation (during the operation and maintenance phase)

2067. The introduction of physical substructures associated with offshore windfarms will cause fish aggregation effects over time (Wilhelmsson *et al*., 2006). Physical structures provide a foundation for settling invertebrates, which increase the organic matter surrounding the structure, and underpin artificial reef ecosystems through 'bottom-up' control of productivity. Increasing nutrient availability and biomass presents opportunities for all fish and shellfish species, from top predators to detritivores (Raoux *et al*., 2017).

2068. Structures provide an increase in habitat complexity by increasing opportunities for shelter and increasing microhabitat diversity. Fish aggregation effects have been observed in multiple offshore industries, including monopile foundation WTG arrays (Linley *et al.,* 2007; Raoux *et al*., 2017; Rouse *et al*., 2017). Floating windfarms have a range of physical structures that extend throughout the water column, including to the OSP, anchoring/mooring chains, and transmission cables, that may cause fish aggregation effects.

2069. The effect of fish aggregations associated with man-made structures on migratory Annex II species is unknown. There is a possibility that migratory fish may use these areas of increased prey availability for foraging. However, this highly-localised benefit of increased prey is unlikely to be significant in the context of long-distance migratory routes, where heterogenous substrate types will not be uncommon. Conversely, the increased abundance of prey species at fish aggregations could attract predatory marine mammals and birds, leading to increased predation nearby migratory Annex II species.

2070. Anchoring/mooring chains for WTGs in the water column will provide minimal structural complexity, minimal surface for encrusting organisms, and little protection from predators, leading to negligible fish aggregation effects. The greatest potential for fish aggregation effects around the OSPs foundations, due to the lattice-like structure that provides shelter from larger predators. However, the use of only one substation is unlikely to have a significant effect during the lifetime of the Project.

2071. Given the limited extent of underwater structures associated within the Offshore Development Area, at 327,865.07m³ (see **Table 9.1**), the amount of fish aggregation effect associated with the Project will be negligible. There is **no potential for the Project alone to have an AEoI of the River Wye/ Afon Gwy SAC due to fish aggregation during operation and maintenance**. The confidence in the assessment is high and is based on the assessment presented in **Chapter 11: Fish and Shellfish Ecology** of the Offshore ES.

9.5.2.2 Assessment of potential effects of the Project in-combination with other plans and projects

2072. There is the potential for overlap of sediment plumes with other activities, plans and project. Other developments within the eastern Celtic Sea also have the potential to have a noise impact on fish.

2073. The list of considered projects and their anticipated potential for in-combination effects are summarised in **Table 9.8**.

Table 9.8 Projects identified as having the potential to cause in-combination effects at River Wye/ Afon Gwy SAC

Project	Status	Distance from Windfarm Site (km)	Included in the CIA?	Rationale
WACS Subsea Cable	Active	0	Yes	Project within windfarm site
TGN Atlantic Subsea Cable	Active	0	Yes	Project within windfarm site
TAT-11 Subsea Cable	Decommissioned	0.26	Yes	Project within 50km of windfarm site
Milford Haven Industrial Disposal Site	Closed	1.62	Yes	Project within 50km of windfarm site
Apollo Subsea Cable	Active	7.61	Yes	Project within 50km of windfarm site
TGN Western Europe Subsea Cable	Active	11.19	Yes	Project within 50km of windfarm site
Arctic Fibre Subsea Cable	Proposed	12.71	Yes	Project within 50km of windfarm site
French Telecommunications	Active	13.62	Yes	Project within 50km of windfarm site

Project	Status	Distance from Windfarm Site (km)	Included in the CIA?	Rationale
Cable 328 Subsea Cable				
Llŷr 2Proposed FLOW Lease Area 1 Offshore Wind	Proposed	16.05	Yes	Project within 50km of windfarm site
Llŷr 1	Proposed	16.86	Yes	Project within 50km of windfarm site
Valorous Offshore Wind	Proposed	19.12	Yes	Project within 50km of windfarm site
AC-2 Subsea Cable	Active	23.76	Yes	Project within 50km of windfarm site
TAT-14 Subsea Cable	Decommissioned	28.03	Yes	Project within 50km of windfarm site
Proposed FLOW Lease Area 17 Offshore Wind	Proposed	31.62	Yes	Project within 50km of windfarm site
SOLAS Subsea Cable	Active	31.62	Yes	Project within 50km of windfarm site
Erebus Offshore Wind	Planning	33.23	Yes	Project within 50km of windfarm site
GLO1 Subsea Cable	Active	35.99	Yes	Project within 50km of windfarm site
EIG Subsea Cable	Active	36.62	Yes	Project within 50km of windfarm site
Hartland Point Disposal Site	Closed	48.98	Yes	Project within 50km of windfarm site

9.5.2.2.1 Temporary habitat loss and physical disturbance (during construction, operation and maintenance, and decommissioning)

2074. Temporary and permanent habitat loss/physical displacement is limited to the direct footprint of the Development Area, and is therefore relevant for overlapping projects or those in close proximity to the Development Area. As such, the projects within 10km have been screened in for the assessment of this impact, including

WACS, TGN Atlantic, TAT-11, Milford Haven Industrial, and Apollo. In-combination temporary and permanent habitat loss/physical disturbance are only likely to occur during infrequent maintenance of the subsea cables, as the Milford Haven Industrial disposal site is closed.

2075. There is **no potential for the Project, in-combination with other plans and projects, to have an AEoI of the River Wye/ Afon Gwy SAC due to temporary habitat loss and physical disturbance during construction, operation and maintenance or decommissioning**. The confidence in the assessment is high and is based on the assessment presented in **Chapter 11: Fish and Shellfish Ecology** of the Offshore ES.

9.5.2.2.2 Long term/ permanent habitat loss (during operation and maintenance, and decommissioning)

2076. At the end of the construction phase, the worst-case scenario of permanent habitat loss/physical disturbance is approximately 982,273m^2 (0.98km^2), assuming that temporary habitat loss/physical disturbance due to the construction of the Project has recovered to baseline conditions prior to the operation and maintenance phase of the Project.

2077. In combination with developments provided in Table 9.8, the extent of total permanent habitat loss is anticipated to remain at levels below those likely to result in an impact to the local fish and shellfish population. These effects are highly localised and represent only a small proportion of total available habitat for species within the region. Further, the high mobility and/or fecundity of many fish and shellfish species will allow for rapid recovery at a population level should impact result.

2078. There is **no potential for the Project, in-combination with other plans and projects, to have an AEoI of the River Wye/ Afon Gwy SAC due to long term/ permanent habitat loss during construction, operation and maintenance or decommissioning**. The confidence in the assessment is high and is based on the assessment presented in **Chapter 11: Fish and Shellfish Ecology** of the Offshore ES.

9.5.2.2.3 Increased SSC and sediment re-deposition (including mobilisation of contaminated sediments) during all project phases

2079. Increased magnitude of impact of suspended sediments and sediment deposition as a result of in-combination effects during the construction phase is a possibility. However, suspended sediment and sediment deposition effects as a result of these activities are not predicted to expand significantly beyond the extents of the Project boundaries. Furthermore, the majority of suspended sediment is likely to clear within several tidal cycles, therefore any in-combination works would need to occur within this same period. Similarly, suspended sediments during operation are predicted to arise only during repair and remediation works, and will dissipate within several tidal cycles, it is unlikely there will be any in-combination effect.

2080. There is **<u>no potential for the Project, in-combination with other plans and projects, to have an AEoI of the River Wye/ Afon Gwy SAC due to increased SSC and sediment re-deposition (including mobilisation of contaminated sediments) during construction, operation and maintenance or decommissioning</u>**. The confidence in the assessment is high and is based on the assessment presented in **Chapter 11: Fish and Shellfish Ecology** of the Offshore ES.

9.5.2.2.4 Underwater noise and vibration (particularly during construction phase due to pile driving)

2081. The construction of the Project is unlikely to coincide with the construction of subsea telecommunications cable laying, but may overlap with the construction of the Valorous project. No overlap with the Milford Haven Industrial aggregate disposal site is expected, as this site has been closed. No overlap with other OWFs is expected during the construction phase, as the Project is likely to be in operation by this time.

2082. The operation and maintenance of the Project is likely to coincide with the operation and maintenance of subsea telecommunications cable laying, and multiple floating OWFs such as the Valorous and Erebus projects and, potentially, the construction of other projects assigned to the 3 proposed lease areas north of the Project The assessment of underwater noise and vibration for the Project alone concludes that there is no potential for the Project alone to have an AEoI of the River Wye/ Afon Gwy SAC, which has been assumed during the construction of future floating OWFs. Operational noise is considered negligible, and noise during maintenance of the Project will be of lower magnitude than the construction of the Project.

2083. There is **<u>no potential for the Project, in-combination with other plans and projects, to have an AEoI of the River Wye/ Afon Gwy SAC due to underwater noise and vibration during construction, operation and maintenance or decommissioning</u>**. The confidence in the assessment is high and is based on the assessment presented in **Chapter 11: Fish and Shellfish Ecology** of the Offshore ES.

9.5.2.2.5 Electromagnetic fields from cables (during the operation and maintenance phase)

2084. In-combination EMF effects are likely to occur if subsea cable is situated in close proximity to (<2km) or transects the Maximum Footprint Area. Two telecommunications cables fall into this category, namely WACS and TGN Atlantic, however both of these cables are fibre optic and therefore do not emit EMF. Other proposed OWF projects that utilise EMF-emitting power cables, are sufficiently distant from the Maximum Footprint Area for no compounding EMF impacts to occur.

2085. It is assumed that the highly localised raised levels of EMF, and lack of potential adverse effect found for this Project alone, will be reflected in other distant offshore renewables projects.

2086. Given the evidence of limited EMF sensitivity for the relevant annex II fish species, and the low magnitude of EMF produced by the Project (due to minimum cable burial and cable protection), there is **no potential for the Project, in-combination with other plans and projects, to have an AEoI of the River Wye/ Afon Gwy SAC due to electromagnetic fields from cables during operation and maintenance**. The confidence in the assessment is high and is based on the assessment presented in **Chapter 11: Fish and Shellfish Ecology** of the Offshore ES.

9.5.2.2.6 Barrier effects (during all project phases)

2087. Given the highly limited loss of water column space, the high mobility and agility of migratory Annex II fish species, and the wide extent of alternative available water column space to navigate through, as found in the Project alone assessment, there is **no potential for the Project, in-combination with other plans and projects, to have an AEoI of the River Wye/ Afon Gwy SAC due to barrier effects during construction, operation and maintenance or decommissioning**. The confidence in the assessment is high and is based on the assessment presented in **Chapter 11: Fish and Shellfish Ecology** of the Offshore ES.

9.5.2.2.7 Ghost fishing (during operation and maintenance phase)

2088. Annual monitoring of anchor/moorings will be undertaken during the lifetime of the Project ROVs will be used to identify any entanglement hazards, such as ALDFG, snagged on Project substructures. As a result, the magnitude of this effect is considered negligible. Ghost fishing resulting from other infrastructure is likely negligible when considering the wider spatial scale of Annex II fish migratory routes.

2089. There is **no potential for the Project, in-combination with other plans and projects, to have an AEoI of the River Wye/ Afon Gwy SAC due to ghost fishing during operation and maintenance**. The confidence in the assessment is high and is based on the assessment presented in **Chapter 11: Fish and Shellfish Ecology** of the Offshore ES.

9.5.2.2.8 Fish aggregation (during the operation and maintenance phase)

2090. Given the highly limited extent of underwater structure, the limited potential for aggregations of predator and prey species, and the negligible change in habitat heterogeneity and predator-pre dynamics in the context of long distance Annex II fish migratory routes, as found in the Project alone assessment, there is **no potential for the Project, in-combination with other plans and projects, to have an AEoI of the River Wye/ Afon Gwy SAC due to fish aggregation during the operation and maintenance phase**. The confidence in the assessment is high and is based on the assessment presented in **Chapter 11: Fish and Shellfish Ecology** of the Offshore ES.

9.6 River Usk/ Afon Wysg SAC

9.6.1 Description of Designation

2091. The River Usk SAC (99km east northeast of the Offshore Development Area, and 168km east northeast of the Windfarm Site) rises in the Black Mountain range in the west of the Brecon Beacons National Park and flows east and then south, to enter the Severn Estuary at Newport. The overall form of the catchment is long and narrow, with short, generally steep tributaries flowing north from the Black Mountain, Fforest Fawr and Brecon Beacons, and south from Mynydd Epynt and the Black Mountains. The site provides habitat for river lamprey, sea lamprey, Twaite shad, Allis shad, and Atlantic salmon.

9.6.1.1 Qualifying Features

2092. The site is designated under article 4(4) of the Directive (92/43/EEC) as it hosts the following migratory Annex II fish species:

- River lamprey
- Sea lamprey
- Twaite shad
- Allis shad
- Atlantic salmon.

9.6.1.2 Conservation Objectives

2093. The conservation objectives of the SAC are to ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by ensuring that:

- The size of the population should be stable or increasing, allowing for natural variability, and sustainable in the long term
- The distribution of the population should be being maintained
- There should be sufficient habitat, of sufficient quality, to support the population in the long term
- Factors affecting the population or its habitat should be under appropriate control.

9.6.1.3 Condition Assessment

2094. The conservation status of features of the SAC were assessed by the NRW for developing the core management plan. For sea lamprey, Allis shad, Twaite shad, and Atlantic salmon, the condition was assessed as unfavourable, un-classified. This status was applied due to precautionary assessments of feature distribution and abundance, probable partial barriers further downstream (notably Crickhowell Bridge), and flow depletion resulting from abstractions including Brecon canal and Prioress Mill public water supply abstraction.

2095. The status of river lamprey was assessed as favourable due to the high density and distribution of ammocoetes throughout the system (Countryside Council for Wales, 2008).

9.6.2 Appropriate Assessment

9.6.2.1 Assessment of potential effects of the Project alone, and in combination with other plans and projects

2096. The assessment for potential AEoI utilises the same evidence base and follows the same reasoning as that detailed for River Wye/ Afon Gwy SAC. This is not repeated here to avoid duplication. See **Section 9.5.2** for details on the assessment.

2097. In summary, the finding for all impacts and all phases of the Project, there is **no potential for the Project alone, or in combination with other plans and projects, to have an AEoI of the River Usk SAC**. The confidence in the assessment is high and is based on the assessment presented in **Chapter 11: Fish and Shellfish Ecology** of the Offshore ES.

9.7 Severn Estuary/ Môr Hafren SAC

9.7.1 Description of Designation

2098. The Severn Estuary (75km east northeast of the Offshore Development Area, and 150km east of the Windfarm Site) lies on the south west coast of Britain at the mouth of four major rivers (the Severn, Wye, Usk, and Avon). The immense tidal range (the second highest in the world) and classic funnel shape make the Severn Estuary unique in Britain and very rare worldwide. This tidal range creates strong tidal streams and high turbidity, producing communities characteristic of the extreme physical conditions of liquid mud and tide-swept sand and rocks. The estuary supports large populations of migratory fish, including sea lamprey, river lamprey, and Twaite shad.

9.7.1.1 Qualifying Features

2099. The site is designated under article 4(4) of the Directive (92/43/EEC) as it hosts the following migratory Annex II fish species:

- River lamprey
- Sea lamprey
- Twaite shad.

9.7.1.2 Conservation Objectives

2100. The conservation objectives of the SAC are to ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by ensuring that:

- The size of the population should be stable or increasing, allowing for natural variability, and sustainable in the long term
- The distribution of the population should be being maintained
- There should be sufficient habitat, of sufficient quality, to support the population in the long term
- Factors affecting the population or its habitat should be under appropriate control.

9.7.1.3 Condition Assessment

2101. The conservation status of features of the SAC were assessed by NRW in an indicative site level feature condition assessment (NRW, 2018a). The condition of sea lamprey, river lamprey, and Twaite shad was assessed as unfavourable for each species. This status was applied due water quality issues. In the case of Twaite shad, barriers to migration were also identified.

9.7.2 Appropriate Assessment

9.7.2.1 Assessment of potential effects of the Project alone, and in combination with other plans and projects

2102. The assessment for potential AEoI utilises the same evidence base and follows the same reasoning as that detailed for River Wye/ Afon Gwy SAC. This is not repeated here to avoid duplication. See **Section 9.5.2** for details on the assessment.

2103. In summary, the finding for all impacts and all phases of the Project, there is **no potential for the Project alone, or in combination with other plans and projects, to have an AEoI of the Severn Estuary/ Môr Hafren SAC**. The confidence in the assessment is high and is based on the assessment presented in **Chapter 11: Fish and Shellfish Ecology** of the Offshore ES.

9.8 Severn Estuary Ramsar

9.8.1 Description of Designation

2104. The estuary's classic funnel shape, unique in Britain, is a factor causing the Severn to have the second-largest tidal range in the world (after the Bay of Fundy, Canada). This tidal regime results in plant and animal communities typical of the extreme physical conditions of liquid mud and tide swept sand and rock. The Severn Estuary forms important habitat for a range of migratory fish species.

9.8.1.1 Qualifying Features

2105. The site is designated as a Natura 2000 site, and now part of the National Site Network, in part, for the following migratory fish species:

- River lamprey
- Sea lamprey
- Twaite shad
- Allis shad
- Atlantic salmon
- European eel Anguilla Anguilla.

9.8.1.2 Conservation Objectives

2106. The conservation objectives of the Severn Estuary Ramsar site are to ensure that (Natural England, 2009):

- the migratory passage of both adults and juveniles of the assemblage of migratory fish species through the Severn Estuary between the Bristol Channel and any of their spawning rivers is not obstructed or impeded by physical barriers, changes in flows, or poor water quality
- the size of the populations of the assemblage species in the Severn Estuary and the rivers which drain into it, is at least maintained and is at a level that is sustainable in the long term
- the abundance of prey species forming the principle food resources for the assemblage species within the estuary, is maintained
- Toxic contaminants in the water column and sediment are below levels which would pose a risk to the ecological objectives described above.

9.8.1.3 Condition Assessment

2107. Specific advice for the Ramsar site migratory fish assemblage is not given, as the advice overlaps with that of the Severn Estuary SAC (Natural England, 2009). In the case of the SAC (see **Section 9.7**), the condition of sea lamprey, river lamprey, and Twaite shad was assessed as unfavourable for each species (with no mention of Atlantic salmon or European eel). This status was applied due water quality issues. In the case of Twaite shad, barriers to migration were also identified (NRW, 2018).

9.8.2 Appropriate Assessment

2108. The assessment for potential AEoI utilises the same evidence base and follows the same reasoning as that detailed for River Wye/ Afon Gwy SAC. This is not repeated here to avoid duplication. See **Section 9.5.2** for details on the assessment.

2109. In summary, the finding for all impacts and all phases of the Project, there is **no potential for the Project alone, or in combination with other plans and projects, to have an AEoI of the Severn Estuary Ramsar**. The confidence in the assessment is high and is based on the assessment presented in **Chapter 11: Fish and Shellfish Ecology** of the Offshore ES.

9.9 River Camel SAC

9.9.1 Description of Designation

2110. The Rivers Camel, Allen and tributaries (66km south of the Offshore Development Area, and 67km southeast of the Windfarm Site), their associated woodlands, carr, fen, heath and wet meadows are of special interest for wildlife. The system is particularly important for fish such as the Atlantic salmon.

9.9.1.1 Qualifying Features

2111. The site is designated under article 4(4) of the Directive (92/43/EEC) as it hosts the following migratory Annex II fish species:

- Atlantic salmon.

9.9.1.2 Conservation Objectives

2112. The conservation objectives of the SAC are to ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by ensuring that:

- The size of the population should be stable or increasing, allowing for natural variability, and sustainable in the long term
- The distribution of the population should be being maintained
- There should be sufficient habitat, of sufficient quality, to support the population in the long term
- Factors affecting the population or its habitat should be under appropriate control.

9.9.1.3 Condition Assessment

2113. Whilst the condition of Atlantic salmon within the River Camel SAC has not been specifically assessed, the following pressures to site integrity have been identified through Natural England’s Site Improvement Plan, that may be of relevance to Atlantic salmon (Natural England, 2014a):

- water pollution
- inappropriate weirs, dams and other structures
- invasive species
- water abstraction.

9.9.2 Appropriate Assessment

9.9.2.1 Assessment of potential effects of the Project alone, and in combination with other plans and projects

2114. The assessment for potential AEoI utilises the same evidence base and follows the same reasoning as that detailed for River Wye/ Afon Gwy SAC. This is not repeated here to avoid duplication. See **Section 9.5.2** for details on the assessment.

2115. In summary, the finding for all impacts and all phases of the Project, there is **no potential for the Project alone, or in combination with other plans and projects, to have an AEoI of the River Camel SAC**. The confidence in the assessment is high and is based on the assessment presented in **Chapter 11: Fish and Shellfish Ecology** of the Offshore ES.

9.10 Dartmoor SAC

9.10.1 Description of Designation

2116. Dartmoor SAC sits within the southwest peninsula in the centre of Devon. It consists of three separate blocks of upland all lying within the Dartmoor National Park. Atlantic salmon are present in the watercourses of the SAC, including the River Dart and tributaries. The mouth of the river Dart lies on the south of the South West Peninsula, so 'as the fish swims', lies 286km from the Windfarm Site (located north of the South West Peninsula, which is the closest point of the Offshore Development Area. They migrate in from the sea to breed on the fringes of the SAC and mature within the watercourses before returning as smolts to the sea.

9.10.1.1 Qualifying Features

2117. The site is designated under article 4(4) of the Directive (92/43/EEC) as it hosts the following migratory Annex II fish species:

- Atlantic salmon.

9.10.1.2 Conservation Objectives

2118. The conservation objectives of the SAC are to ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by ensuring that:

- The size of the population should be stable or increasing, allowing for natural variability, and sustainable in the long term
- The distribution of the population should be being maintained

- There should be sufficient habitat, of sufficient quality, to support the population in the long term
- Factors affecting the population or its habitat should be under appropriate control.

9.10.1.3 Condition Assessment

2119. Whilst the condition of Atlantic salmon within the Dartmoor SAC has not been specifically assessed, the following pressures to site integrity have been identified through Natural England's Site Improvement Plan, that may be of relevance to Atlantic salmon (Natural England, 2014b; 2019):

- hydrological changes
- water pollution
- invasive species
- change in land management
- disease.

9.10.2 Appropriate Assessment

9.10.2.1 Assessment of potential effects of the Project alone, and in combination with other plans and projects

2120. The assessment for potential AEoI utilises the same evidence base and follows the same reasoning as that detailed for River Wye/ Afon Gwy SAC. This is not repeated here to avoid duplication. See **Section 9.5.2** for details on the assessment.

2121. In summary, the finding for all impacts and all phases of the Project, there is **no potential for the Project alone, or in combination with other plans and projects, to have an AEoI of the Dartmoor SAC**. The confidence in the assessment is high and is based on the assessment presented in **Chapter 11: Fish and Shellfish Ecology** of the Offshore ES.

9.11 Carmarthen Bay and Estuaries/ Bae Caerfyrddin ac Aberoedd SAC

9.11.1 Description of Designation

2122. The Carmarthen Bay and Estuaries SAC (42km northeast of the Offshore Development Area, and 65km northeast of the Windfarm Site) is a large site encompassing the estuaries of the Rivers Loughor, Tâf and Tywi (coastal plain estuaries) and the Gwendraeth (a bar-built estuary). There are extensive areas of intertidal mudflats and sandflats with large areas of these flats dominated by bivalves. Shad are found in the River Tywi adjoining the SAC where counts have recorded over 10,000 fish. The River Tywi is one of only four rivers in Wales where there is a known spawning population of shad. The estuary and the surrounding coastal waters are therefore extremely important for this species, as fish must migrate through this area to reach the spawning site. The SAC is also assumed to be an important migration route for river and sea lamprey, as evidenced by the presence of ammocoetes and juveniles in the rivers adjoining the SAC (Countryside Council for Wales, 2009).

9.11.1.1 Qualifying Features

2123. The site is designated under article 4(4) of the Directive (92/43/EEC) as it hosts the following migratory Annex II fish species:

- River lamprey
- Sea lamprey
- Twaite shad
- Allis shad.

9.11.1.2 Conservation Objectives

2124. The conservation objectives of the SAC are to ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by ensuring that:

- The size of the population should be stable or increasing, allowing for natural variability, and sustainable in the long term
- The distribution of the population should be being maintained
- There should be sufficient habitat, of sufficient quality, to support the population in the long term
- Factors affecting the population or its habitat should be under appropriate control.

9.11.1.3 Condition Assessment

2125. The conservation status of features of the SAC were assessed by NRW in an indicative site level feature condition assessment (NRW, 2018b). The condition of sea lamprey, river lamprey, and Twaite shad was assessed as unfavourable for each species. Allis shad condition is not assessed for this SAC. This status was applied due water quality issues.

9.11.2 Appropriate Assessment

9.11.2.1 Assessment of potential effects of the Project alone, and in combination with other plans and projects

2126. The assessment for potential AEoI utilises the same evidence base and follows the same reasoning as that detailed for River Wye/ Afon Gwy SAC. This is not repeated here to avoid duplication. See **Section 9.5.2** for details on the assessment.

2127. In summary, the finding for all impacts and all phases of the Project, there is **no potential for the Project alone, or in combination with other plans and projects, to have an AEoI of the Carmarthen Bay and Estuaries/ Bae Caerfyrddin ac Aberoedd SAC**. The confidence in the assessment is high and is based on the assessment presented in **Chapter 11: Fish and Shellfish Ecology** of the Offshore ES.

9.12 Afon Tywi/ River Tywi SAC

9.12.1 Description of Designation

2128. At 122km, the Afon Teifi is one of the longest rivers in Wales, with one of the most pristine river catchments in lowland Britain. The SAC lies 65km northeast of the Offshore Development Area, and 80km north of the Windfarm Site). The ecological structure and functions of the site are dependent on hydrogeomorphological, as well as the quality of riparian habitats and connectivity of habitats. Animals that move around and sometimes leave the site, such as migratory fish, may also be affected by factors operating outside the site. Many of the fish that spawn in the river are migratory, depending on the maintenance of suitable conditions on their migration routes to allow the adults to reach available spawning habitat and juvenile fish to migrate downstream.

9.12.1.1 Qualifying Features

2129. The site is designated under article 4(4) of the Directive (92/43/EEC) as it hosts the following migratory Annex II fish species:

- River lamprey
- Sea lamprey
- Twaite shad
- Allis shad
- Atlantic salmon.

9.12.1.2 Conservation Objectives

2130. The conservation objectives of the SAC are to ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by ensuring that:

- The size of the population should be stable or increasing, allowing for natural variability, and sustainable in the long term
- The distribution of the population should be being maintained
- There should be sufficient habitat, of sufficient quality, to support the population in the long term
- Factors affecting the population or its habitat should be under appropriate control.

9.12.1.3 Condition Assessment

2131. The conservation status of features of the SAC were assessed by NRW for developing the core management plan. For all Annex II fish species, the condition was assessed as unfavourable, un-classified. This status was applied to all species due to lower than target abundance of larvae (lamprey) and eggs (salmon), and due to the presence of adverse factors, in particular reduced habitat quality, water quality failures, and marine survival rates. A particularly significant downward trend has been observed for Atlantic salmon in the Teifi over recent years (NRW, 2022b).

9.12.2 Appropriate Assessment

9.12.2.1 Assessment of potential effects of the Project alone, and in combination with other plans and projects

2132. The assessment for potential AEoI utilises the same evidence base and follows the same reasoning as that detailed for River Wye/ Afon Gwy SAC. This is not repeated here to avoid duplication. See **Section 9.5.2** for details on the assessment.

2133. In summary, the finding for all impacts and all phases of the Project, there is **no potential for the Project alone, or in combination with other plans and projects, to have an AEoI of the Afon Tywi / River Tywi SAC**. The confidence in the assessment is high and is based on the assessment presented in **Chapter 11: Fish and Shellfish Ecology** of the Offshore ES.

9.13 River Slaney SAC

9.13.1 Description of Designation

2134. This site, located in Ireland 146km north northwest of the Offshore Development Area and Windfarm Site, comprises the freshwater stretches of the River Slaney as far as the Wicklow Mountains; a number of tributaries, the larger of which include the Bann, Boro, Glasha, Clody, Derry, Derreen, Douglas and Carrigower Rivers; the estuary at Ferrycarrig; and Wexford Harbour. The site flows through the Counties of Wicklow, Wexford and Carlow. The site provides important spawning habitat for a number of migratory Annex II species.

9.13.1.1 Qualifying Features

2135. The site is designated under article 4(4) of the Directive (92/43/EEC) as it hosts the following migratory Annex II fish species:

- River lamprey
- Sea lamprey
- Twaite shad
- Atlantic salmon.

9.13.1.2 Conservation Objectives

2136. The conservation objectives of the SAC are to ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by ensuring that:

- The size of the population should be stable or increasing, allowing for natural variability, and sustainable in the long term
- The distribution of the population should be being maintained
- There should be sufficient habitat, of sufficient quality, to support the population in the long term
- Factors affecting the population or its habitat should be under appropriate control.

9.13.1.3 Condition Assessment

2137. For all listed Annex II species in the River Slaney SAC, the condition status can be inferred by the Conservation Objective to “restore” the feature, rather than “maintain” (NPWS, 2011a).

9.13.2 Appropriate Assessment

9.13.2.1 Assessment of potential effects of the Project alone, and in combination with other plans and projects

2138. The assessment for potential AEoI utilises the same evidence base and follows the same reasoning as that detailed for River Wye/ Afon Gwy SAC. This is not repeated here to avoid duplication. See **Section 9.5.2** for details on the assessment.

2139. In summary, the finding for all impacts and all phases of the Project, there is **no potential for the Project alone, or in combination with other plans and projects, to have an AEoI of the River Slaney SAC**. The confidence in the assessment is high and is based on the assessment presented in **Chapter 11: Fish and Shellfish Ecology** of the Offshore ES.

9.14 River Barrow and River Nore SAC

9.14.1 Description of Designation

2140. This site, located in Ireland 158km north northwest of the Offshore Development Area and Windfarm Site, consists of the freshwater stretches of the Barrow and Nore River catchments as far upstream as the Slieve Bloom Mountains, and it also includes the tidal elements and estuary as far downstream as Creadun Head in Waterford. The site provides important spawning habitat for four migratory Annex II species.

9.14.1.1 Qualifying Features

2141. The site is designated under article 4(4) of the Directive (92/43/EEC) as it hosts the following migratory Annex II fish species:

- River lamprey
- Sea lamprey
- Twaite shad
- Atlantic salmon.

9.14.1.2 Conservation Objectives

2142. The conservation objectives of the SAC are to ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by ensuring that:

- The size of the population should be stable or increasing, allowing for natural variability, and sustainable in the long term

- The distribution of the population should be being maintained
- There should be sufficient habitat, of sufficient quality, to support the population in the long term
- Factors affecting the population or its habitat should be under appropriate control.

9.14.1.3 Condition Assessment

2143. For all listed Annex II species in the River Barrow and River Nore SAC, the condition status can be inferred by the Conservation Objective to "restore" the feature, rather than "maintain" (NPWS, 2011b).

9.14.2 Appropriate Assessment

9.14.2.1 Assessment of potential effects of the Project alone, and in combination with other plans and projects

2144. The assessment for potential AEoI utilises the same evidence base and follows the same reasoning as that detailed for River Wye/ Afon Gwy SAC. This is not repeated here to avoid duplication. See **Section 9.5.2** for details on the assessment.

2145. In summary, the finding for all impacts and all phases of the Project, there is **no potential for the Project alone, or in combination with other plans and projects, to have an AEoI of the River Barrow and River Nore SAC**. The confidence in the assessment is high and is based on the assessment presented in **Chapter 11: Fish and Shellfish Ecology** of the Offshore ES.

9.15 Lower River Suir SAC

9.15.1 Description of Designation

2146. This site, located in Ireland 169km north northwest of the Offshore Development Area and Windfarm Site, consists of the freshwater stretches of the River Suir immediately south of Thurles, the tidal stretches as far as the confluence with the Barrow/Nore immediately east of Cheekpoint in Co. Waterford, and many tributaries including the Clodiagh in Co. Waterford, the Lingaun, Anner, Nier, Tar, Aherlow, Multeen and Clodiagh in Co. Tipperary. The site provides important spawning habitat for four migratory Annex II species.

9.15.1.1 Qualifying Features

2147. The site is designated under article 4(4) of the Directive (92/43/EEC) as it hosts the following migratory Annex II fish species:

- River lamprey
- Sea lamprey
- Twaite shad
- Atlantic salmon.

9.15.1.2 Conservation Objectives

2148. The conservation objectives of the SAC are to ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by ensuring that:

- The size of the population should be stable or increasing, allowing for natural variability, and sustainable in the long term
- The distribution of the population should be being maintained
- There should be sufficient habitat, of sufficient quality, to support the population in the long term
- Factors affecting the population or its habitat should be under appropriate control.

9.15.1.3 Condition Assessment

2149. For all listed Annex II species in the Lower River Suire SAC, the condition status can be inferred by the Conservation Objective to "restore" the feature, rather than "maintain" (NPWS, 2017).

9.15.2 Appropriate Assessment

9.15.2.1 Assessment of potential effects of the Project alone, and in combination with other plans and projects

2150. The assessment for potential AEoI utilises the same evidence base and follows the same reasoning as that detailed for River Wye/ Afon Gwy SAC. This is not repeated here to avoid duplication. See **Section 9.5.2** for details on the assessment.

2151. In summary, the finding for all impacts and all phases of the Project, there is **no potential for the Project alone, or in combination with other plans and projects, to have an AEoI of the Lower River Suir SAC**. The confidence in the assessment is high and is based on the assessment presented in **Chapter 11: Fish and Shellfish Ecology** of the Offshore ES.

10. Conclusion of the Assessment

2152. A summary of the assessments presented within **Sections 6** to **9** is presented below in Table 10.1, which identifies the designated sites, their relevant features screened in for effect alone and in-combination, and the conclusion on AEoI.

Table 10.1 Summary of the Potential for Adverse Effect from White Cross Alone and In-Combination

Designated Site	Relevant Feature	Potential for Effect	Conclusion of Adverse Effect		
			Construction	Operation	Decommissioning
Lundy SAC	Reefs and Subtidal Sandbanks	Hydrodynamic Change	No AEoI	No AEoI	No AEoI
		Increase in Suspended Sediment	No AEoI	No AEoI	No AEoI
		Resuspension of Contaminated Sediments	No AEoI	No AEoI	No AEoI
	Grey Seal	Underwater Noise	No AEoI	No AEoI	No AEoI
		Collision Risk	No AEoI	No AEoI	No AEoI
		Entanglement	No AEoI	No AEoI	No AEoI
		Disturbance	No AEoI	No AEoI	No AEoI
		Barrier effect of infrastructure	No AEoI	No AEoI	No AEoI
		Electromagnetic Fields	No AEoI	No AEoI	No AEoI
		Prey availability	No AEoI	No AEoI	No AEoI
		Water Quality	No AEoI	No AEoI	No AEoI
Braunton Burrows SAC	Intertidal mud and muddy sand and Intertidal mud	Direct habitat loss	-	No AEoI	-
		Direct Disturbance	No AEoI	No AEoI	-
		Indirect Disturbance	No AEoI	No AEoI	-
		Alteration of habitats	-	No AEoI	-
Bristol Channel Approaches / Dynesfeydd Mor Hafren SAC	Harbour Porpoise	Underwater Noise	No AEoI	No AEoI	No AEoI
		Collision Risk	No AEoI	No AEoI	No AEoI
		Entanglement	No AEoI	No AEoI	No AEoI
		Barrier effect of infrastructure	No AEoI	No AEoI	No AEoI
		Electromagnetic Fields	No AEoI	No AEoI	No AEoI
		Prey availability	No AEoI	No AEoI	No AEoI
		Water Quality	No AEoI	No AEoI	No AEoI

Pembrokeshire Marine / Sir Benfro Forol SAC	Grey Seal	Underwater Noise	No AEoI	No AEoI	No AEoI
		Collision Risk	No AEoI	No AEoI	No AEoI
		Entanglement	No AEoI	No AEoI	No AEoI
		Disturbance	No AEoI	No AEoI	No AEoI
		Barrier effect of infrastructure	No AEoI	No AEoI	No AEoI
		Electromagnetic Fields	-	No AEoI	-
		Prey availability	No AEoI	No AEoI	No AEoI
		Water Quality	No AEoI	No AEoI	No AEoI
Cardigan Bay / Bae Ceredigion SAC	Bottlenose Dolphin	Underwater Noise	No AEoI	No AEoI	No AEoI
		Collision Risk	No AEoI	No AEoI	No AEoI
		Entanglement	No AEoI	No AEoI	No AEoI
		Barrier effect of infrastructure	No AEoI	No AEoI	No AEoI
		Electromagnetic Fields	No AEoI	No AEoI	No AEoI
		Prey availability	No AEoI	No AEoI	No AEoI
		Water Quality	No AEoI	No AEoI	No AEoI
Sgomer, Sgogwm a Moroedd Penfro / Skomer, Skokholm and the Seas off Pembrokeshire SPA	Manx Shearwater	Displacement and Disturbance	No AEoI	No AEoI	No AEoI
		Entanglement	-	No AEoI	-
		Habitat and Prey Availability	No AEoI	No AEoI	No AEoI
	Short Eared Owl	Collision Risk	-	No AEoI	-
Grassholm SPA	Gannet	Collision Risk	-	No AEoI	-
		Displacement and Disturbance	No AEoI	No AEoI	No AEoI
		Entanglement	-	No AEoI	-
Bury Inlet SPA and Ramsar Site	Curlew, Dunlin, Grey Plover, Knot,	Collision Risk	-	No AEoI	-

	Oystercatcher, Pintail, Redshank, Sheduck, Shoveler, Teal, Turstonen, Widgeon				
Tamar Estuaries Complex SPA	Avocet, Little egret	Collision Risk	-	No AEoI	-
Glannau Aberdaron ac Ynys Enlli / Aberdaron Coast and Bardsey Island SPA	Manx Shearwater	Displacement and Disturbance	No AEoI	No AEoI	No AEoI
		Entanglement	-	No AEoI	-
		Habitat and Prey Availability	No AEoI	No AEoI	No AEoI
Strangford Lough SPA	Sandwich Term	Collision Risk	-	No AEoI	-
Copeland Islands SPA	Manx Shearwater	Displacement and Disturbance	No AEoI	No AEoI	No AEoI
		Entanglement	-	No AEoI	-
		Habitat and Prey Availability	No AEoI	No AEoI	No AEoI
Larne Lough SPA and Ramsar Site	Sandwich Term	Collision Risk	-	No AEoI	-
Ailsa Craig SPA	Gannet	Collision Risk	-	No AEoI	-
		Displacement and Disturbance	No AEoI	No AEoI	No AEoI
		Entanglement	-	No AEoI	-
	Guillemot	Displacement and Disturbance	-	No AEoI	-
		Entanglement	-	No AEoI	-
Rathlin Island SPA	Guillemot	Displacement and Disturbance	-	No AEoI	-
		Entanglement	-	No AEoI	-
	Kittiwake	Collision Risk	-	No AEoI	-

	Razorbill	Displacement and Disturbance	-	No AEoI	-
		Entanglement	-	No AEoI	-
North Colonsay and Western Cliffs SPA	Guillemot	Displacement and Disturbance	-	No AEoI	-
		Entanglement	-	No AEoI	-
	Kittiwake	Collision Risk	-	No AEoI	-
Mingulay and Berneray SPA	Guillemot	Displacement and Disturbance	-	No AEoI	-
		Entanglement	-	No AEoI	-
	Kittiwake	Collision Risk	-	No AEoI	-
	Razorbill	Displacement and Disturbance	-	No AEoI	-
		Entanglement	-	No AEoI	-
Rum SPA	Manx Shearwater	Displacement and Disturbance	No AEoI	No AEoI	No AEoI
		Entanglement	-	No AEoI	-
		Habitat and Prey Availability	No AEoI	No AEoI	No AEoI
Canna and Sanday SPA	Guillemot	Displacement and Disturbance	-	No AEoI	-
		Entanglement	-	No AEoI	-
Shiant Islands SPA	Guillemot	Displacement and Disturbance	-	No AEoI	-
		Entanglement	-	No AEoI	-
	Razorbill	Displacement and Disturbance	-	No AEoI	-
		Entanglement	-	No AEoI	-
St Kilda SPA	Gannet	Collision Risk	-	No AEoI	-
		Displacement and Disturbance	-	No AEoI	-
		Entanglement	-	No AEoI	-

	Guillemot	Displacement and Disturbance	-	No AEoI	-
		Entanglement	-	No AEoI	-
	Manx Shearwater	Displacement and Disturbance	No AEoI	No AEoI	No AEoI
		Entanglement	-	No AEoI	-
Handa SPA	Guillemot	Displacement and Disturbance	-	No AEoI	-
		Entanglement	-	No AEoI	-
	Razorbill	Displacement and Disturbance	-	No AEoI	-
		Entanglement	-	No AEoI	-
Flannan Isles SPA	Guillemot	Displacement and Disturbance	-	No AEoI	-
		Entanglement	-	No AEoI	-
Cape Wrath SPA	Guillemot	Displacement and Disturbance	-	No AEoI	-
		Entanglement	-	No AEoI	-
	Kittiwake	Collision Risk	-	No AEoI	-
	Razorbill	Displacement and Disturbance	-	No AEoI	-
		Entanglement	-	No AEoI	-
Sul Skerry and Sule Stack SPA	Gannet	Collision Risk	-	No AEoI	-
		Displacement and Disturbance	-	No AEoI	-
		Entanglement	-	No AEoI	-
	Guillemot	Displacement and Disturbance	-	No AEoI	-
		Entanglement	-	No AEoI	-
North Rona and Sula Sgeir SPA	Gannet	Collision Risk	-	No AEoI	-
		Displacement and Disturbance	-	No AEoI	-

		Entanglement	-	No AEoI	-
	Guillemot	Displacement and Disturbance	-	No AEoI	-
		Entanglement	-	No AEoI	-
Saltee Islands SPA	Gannet	Collision Risk	-	No AEoI	-
		Displacement and Disturbance	No AEoI	No AEoI	No AEoI
		Entanglement	-	No AEoI	-
River Wye / Afon Gwy SAC **River Usk / Afon Wysg SAC** **Afon Tywi/ River Tywi SAC**	River lamprey Sea lamprey Twaite shad Allis shad Atlantic salmon	Temporary habitat loss	No AEoI	No AEoI	No AEoI
		Long term habitat loss	No AEoI	No AEoI	No AEoI
		Increase in suspended sediments	No AEoI	No AEoI	No AEoI
		Underwater noise	No AEoI	No AEoI	No AEoI
		Electromagnetic Fields	-	No AEoI	-
		Barrier Effects	No AEoI	No AEoI	No AEoI
		Ghost fishing	-	No AEoI	-
		Fish Aggregation	-	No AEoI	-
Severn Estuary / Môr Hafren SAC	River lamprey Sea lamprey Twaite shad	Temporary habitat loss	No AEoI	No AEoI	No AEoI
		Long term habitat loss	No AEoI	No AEoI	No AEoI
		Increase in suspended sediments	No AEoI	No AEoI	No AEoI
		Underwater noise	No AEoI	No AEoI	No AEoI
		Electromagnetic Fields	-	No AEoI	-
		Barrier Effects	No AEoI	No AEoI	No AEoI
		Ghost fishing	-	No AEoI	-
		Fish Aggregation	-	No AEoI	-

Severn Estuary Ramsar	River lamprey Sea lamprey Twaite shad Allis shad Atlantic salmon European eel	Temporary habitat loss	No AEoI	No AEoI	No AEoI
		Long term habitat loss	No AEoI	No AEoI	No AEoI
		Increase in suspended sediments	No AEoI	No AEoI	No AEoI
		Underwater noise	No AEoI	No AEoI	No AEoI
		Electromagnetic Fields	-	No AEoI	-
		Barrier Effects	No AEoI	No AEoI	No AEoI
		Ghost fishing	-	No AEoI	-
		Fish Aggregation	-	No AEoI	-
River Camel SAC **Dartmoor SAC**	Atlantic Salmon	Temporary habitat loss	No AEoI	No AEoI	No AEoI
		Long term habitat loss	No AEoI	No AEoI	No AEoI
		Increase in suspended sediments	No AEoI	No AEoI	No AEoI
		Underwater noise	No AEoI	No AEoI	No AEoI
		Electromagnetic Fields	-	No AEoI	-
		Barrier Effects	No AEoI	No AEoI	No AEoI
		Ghost fishing	-	No AEoI	-
		Fish Aggregation	-	No AEoI	-
Camarthen Bay and Estuaries / Bae Caerfyrddin ac Aberoedd SAC	River lamprey Sea lamprey Twaite shad Allis shad	Temporary habitat loss	No AEoI	No AEoI	No AEoI
		Long term habitat loss	No AEoI	No AEoI	No AEoI
		Increase in suspended sediments	No AEoI	No AEoI	No AEoI
		Underwater noise	No AEoI	No AEoI	No AEoI
		Electromagnetic Fields	-	No AEoI	-
		Barrier Effects	No AEoI	No AEoI	No AEoI

		Ghost fishing	-	No AEoI	-
		Fish Aggregation	-	No AEoI	-
River Slaney SAC **River Barrow SAC** **Lower River Suir SAC**	River lamprey Sea lamprey Twaite shad Atlantic salmon	Temporary habitat loss	No AEoI	No AEoI	No AEoI
		Long term habitat loss	No AEoI	No AEoI	No AEoI
		Increase in suspended sediments	No AEoI	No AEoI	No AEoI
		Underwater noise	No AEoI	No AEoI	No AEoI
		Electromagnetic Fields	-	No AEoI	-
		Barrier Effects	No AEoI	No AEoI	No AEoI
		Ghost fishing	-	No AEoI	-
		Fish Aggregation	-	No AEoI	-

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White Cross Offshore Windfarm Environmental Statement

Annex A: HRA Screening Report

Document Code:	FLO-WHI-REP-0016-06	
Contractor Document Number:	PC2978-RHD-ZZ-XX-RP-Z-0385	
Version Number:	00	
Date:	*16/08/2023*	
Prepared by:	RI, GS, KF, CS	*Electronic Signature*
Checked by:	PT	*Electronic Signature*
Owned by:	EF	*Electronic Signature*
Approved by Client:	OG	*Electronic Signature*

Version Number	**Reason for Issue / Major Changes**	**Date of Change**
00	For issue	16/08/2023

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Glossary of Acronyms

Term	Definition
AA	Appropriate Assessment
AC	Alternating Current
AfL	Agreement for Lease
AOD	Above Ordnance Datum
AoS	Area of Search
BAS	Burial Assessment Study
BDMP	Biologically Defined Minimum Population Scales
BEIS	Department for Business, Energy and Industrial Strategy
CBRA	Cable Burial Risk Assessment
CI	Confidence Interval
CIS	Celtic and Irish Seas
CSGRT	Cornwall Seal Group Research Trust
CV	Coefficient of Variation
DCO	Development Consent Order
DECC	Department for Energy and Climate Change
EEC	European Economic Community
EIA	Environmental Impact Assessment
EMF	Electromagnetic Field
EU	European Union
FPSO	Floating Production Storage and Offloading
GBS	Gravity Based Structure
GIS	Geographic Imaging Systems
ha	Hectare
HDD	Horizontal Directional Drilling
HRA	Habitats Regulation Assessment
HVAC	High Voltage Alternating Current
IAMMWG	Inter-Agency Marine Mammal Working Group
JNCC	Joint Nature Conservancy Council
kJ	Kilo Joule
km	Kilometre
kV	Kilo Volt
LSE	Likely Significant Effect
m	Metre
MLWS	Mean Low Water Springs
MMMP	Marine Mammal Mitigation Protocol
MPS	Marine Policy Statement
MSL	Mean Sea Level
MU	Management Units
MW	Mega Watt
O&M	Operation and Maintenance
OCSW	Offshore Channel and SW England
Ofgem	Office of Gas and Electricity Markets

Term	Definition
OFTO	Offshore Transmission Operator
OHL	Overhead Line
OS	Ordnance Survey
OWF	Offshore Wind Farm
WCOWL	White Cross Offshore Windfarm Limited
PINS	The Planning Inspectorate
PTS	Permanent Threshold Shift
RIGS	Regionally Important Geological Sites
RSPB	Royal Society for the Protection of Birds
SAC	Special Area of Conservation
SCANS	Small Cetaceans in the European Atlantic and North Sea
SMRU	Sea Mammal Research Unit
SNCB	Statutory Nature Conservation Body
SPA	Special Protection Area
SSC	Suspended Sediment Concentrations
TTS	Temporary Threshold Shift
UK	United Kingdom
UXO	Unexploded Ordnance
WTG	Wind Turbine Generator
ZOI	Zone of Influence

1. Introduction

1.1 Purpose of this document

1. White Cross Offshore Windfarm (the Project) is a proposed floating offshore windfarm located in the Celtic Sea (**Figure 1.1**) with a capacity of up to 100MW. The Project is being developed by White Cross Offshore Windfarm Ltd (WCOWL) a joint venture between Cobra Instalaciones Servicios, S.A., and Flotation Energy plc.

2. This document has been produced to inform the Habitats Regulations Assessment (HRA) process for the Project. It provides information to enable the screening of the project with respect to its potential to have a likely significant effect (LSE) on European and Ramsar sites of nature conservation importance. This step in the process and associated reporting requirements are further described in the following sections.

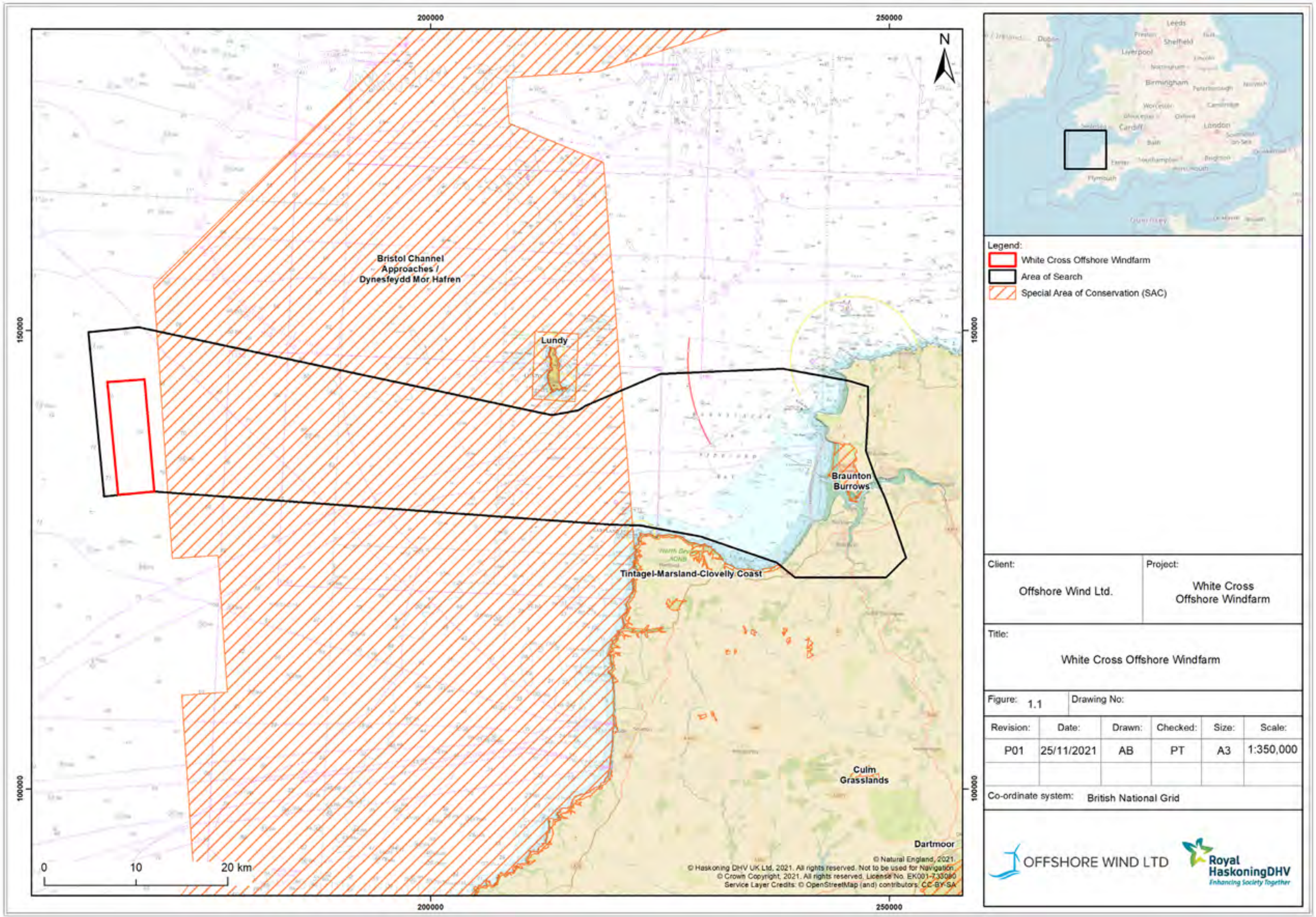
3. The assessment provided in this document is based on the understanding of the baseline environment (**Section 1**) and the scope and nature of the proposed project activities.

1.2 Structure of this document

4. This HRA Screening Report is set out in a number of stages as follow:

- A brief summary of the main components of the Project (**Section 2**)
- A brief summary of the Habitats Regulations Assessment Process (**Section 3**)
- A summary description of the environmental baseline relevant to the screening process (**Section 4**)
- Screening - an assessment of the potential for LSE to arise for the project alone with regard to the designated features of the European sites under consideration (**Section 5**)
- Screening in-combination assessment (**Section 6**)
- A summary of the European sites and features for which the screening process has identified potential for LSE (**Section 7**)
- References (**Section 8**)

Figure 1.1 White Cross Offshore Wind Farm



2. Description of the Project

2.1 Project overview

5. The White Cross Offshore Windfarm Site is located approximately 52km north of the Cornwall and Devon coast. The Offshore Export Cable will connect the Offshore Substation Platform to shore. Onshore, the grid connection is confirmed as East Yelland, see **Figure 2.1**. The Export Cable will come ashore at a landfall and then routed underground to the Onshore Substation where it connects into the National Grid Network. A more detailed description of the Project is provided within **Section 1.8** of the **Environmental Impact Assessment Scoping Report**.

6. The main components of the Project are detailed in **Table 2.1**.

Table 2.1 Project infrastructure

Component	Overview
Wind Turbine Generators (WTG)	The wind turbines convert wind energy to electricity. Key components include rotor blades, gearboxes (in some cases), transformers, power electronics and control equipment. Offshore turbine models are continuously evolving and improving. Therefore the exact wind turbine model will be selected post-consent from the range of models available at the point of procurement.
Transition Piece	The transition piece includes various functionalities such as access for maintenance, cable connection for the energy of the turbine and the corrosion protection of the entire foundation.
Mooring system	The mooring system is designed to address station-keeping issues (it does not need to contribute to the platform's stability) and enables simple connection-disconnection procedures that can be performed by widely available tug vessels.
Array cables	Array cables will connect the wind turbines to the Offshore Substation. Cables will be buried wherever possible.
Offshore Substation	One substation will convert the power to higher voltages to transmit the power more efficiently (reduced electrical losses) to shore.
Offshore Export Cable	Cable connecting the Offshore Substation to the landfall. The cable can be delivered in sections and jointed in-situ or be delivered in one length (factory joined).

Component	Overview
	If seabed conditions make burial unfeasible, as well as in the immediate proximity of turbine foundations, cable may be protected by a hard-protective layer such as rock or concrete mattresses.
Landfall	The location at which the offshore export cable will come ashore.
Onshore Export Cable	The buried cable will connect the landfall to the Onshore Substation. The cable will be delivered in sections and buried in trenches. Sections will be connected within jointing bays.
Onshore substation	The project will connect directly with an existing Western Power Distribution substation which is unused due to decommissioning of the attendant power station. The substation may require updating of the electrical and auxiliary equipment.
Grid connection	The Project will connect to the Western Power Distribution Network through the East Yelland substation.

2.2 Offshore

Lease area

7. The Agreement for Lease (AfL) area is illustrated in the map in **Figure 1.1**. The key characteristics of the AfL area are summarised in **Table 2.2**.

Table 2.2 White Cross Offshore Windfarm Site Overview

Area	Parameters	Values
AfL/windfarm site	Area	50km^2
	Closest distance to shore	52km
	Water depth	60m - 80m

Wind Turbine Generators

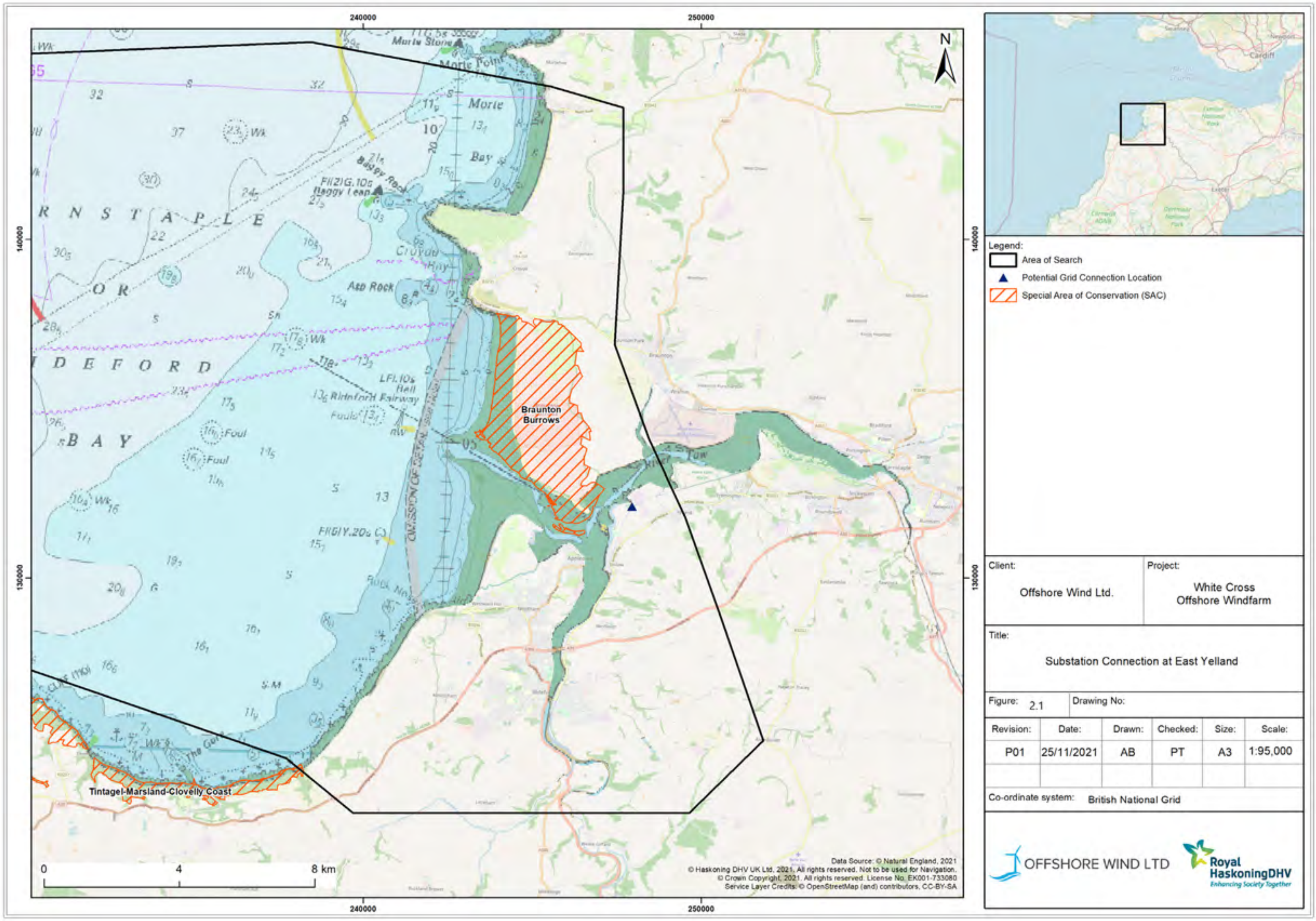
8. The size and capacity of the wind turbines will be decided at a later stage, prior to final investment decision. Technology develops rapidly and the available sizes of turbines are expected to increase over the coming years. The current wind turbine design envelope for the Project is outlined in **Table 2.3**.

Table 2.3 Wind Turbine Design Envelope

Wind Turbine Generator Parameter	Range to be considered
WTG capacity (MW)	12 – 24
Turbine type	3-bladed, with horizontal axis
Rotor Diameter (m)	220-300

Wind Turbine Generator Parameter	Range to be considered
Number of wind turbines	6 - 8
Individual Rotor swept area (m^2)	38,000 – 70,700
Total Rotor swept area (km^2)	~0.304km^2 (based on 8 x 220m diameter turbines)
Max Tip Height (m) above Mean Sea Level (MSL)	~345
Air Gap above MSL	22m
Indicative separation distance between turbines (inter-row)	~1000m (subject to yield assessment)

Figure 2.1 Substation Connection at East Yelland



Wind Turbine Floating Substructure

9. The floating substructure provides a base for the installation of the wind turbine. The substructure as defined here has three key components: (1) the mooring system, which anchors the structure to the seabed; (2) the substructure, a floating structure that supports the wind turbine; and (3) the transition, which provides the connection from the substructure to the wind turbine tower. Substructures are typically made of tubular steel columns.

10. Conventional fixed substructures are less suitable for deeper waters (>50m), and floating substructures, where water depth presents less of an issue, could be a viable option. In addition to allowing turbines to be installed in deeper waters further from shore, floating structures offer benefits in that their construction is largely yard based, with significantly less offshore construction activity, therefore reducing the impacts of offshore construction, the cost and scheduling uncertainties traditionally associated with more conventional windfarm construction.

11. The substructure is constructed and the turbine installed in a dry dock or inshore (tension leg/submersible only), thus reducing the high costs of assembly and installation at sea. Once complete it is towed to site where it is attached to the pre-installed moorings and interarray cables. The substructure is then fully ballasted (water), moorings are picked up and tensioned, the electrical cable head pulled-in and the Wind Turbine commissioned.

Tension leg platform (TLP)

12. A semi-submerged buoyant structure, anchored to the seabed with tensioned mooring lines, which provide stability (see illustration in **Plate 1**). The shallow draft and tension stability allows for a smaller and lighter structure, but this design increases stresses on the tendon and anchor system. There are also challenges with the installation process and increased operational risks if a tendon fails. Examples include: PelaStar (by Glosten); Blue H TLP (by Blue H Group); Eco TLP (by DBD Systems); GICON-SOF (by GICON).

Semi-submersible platform

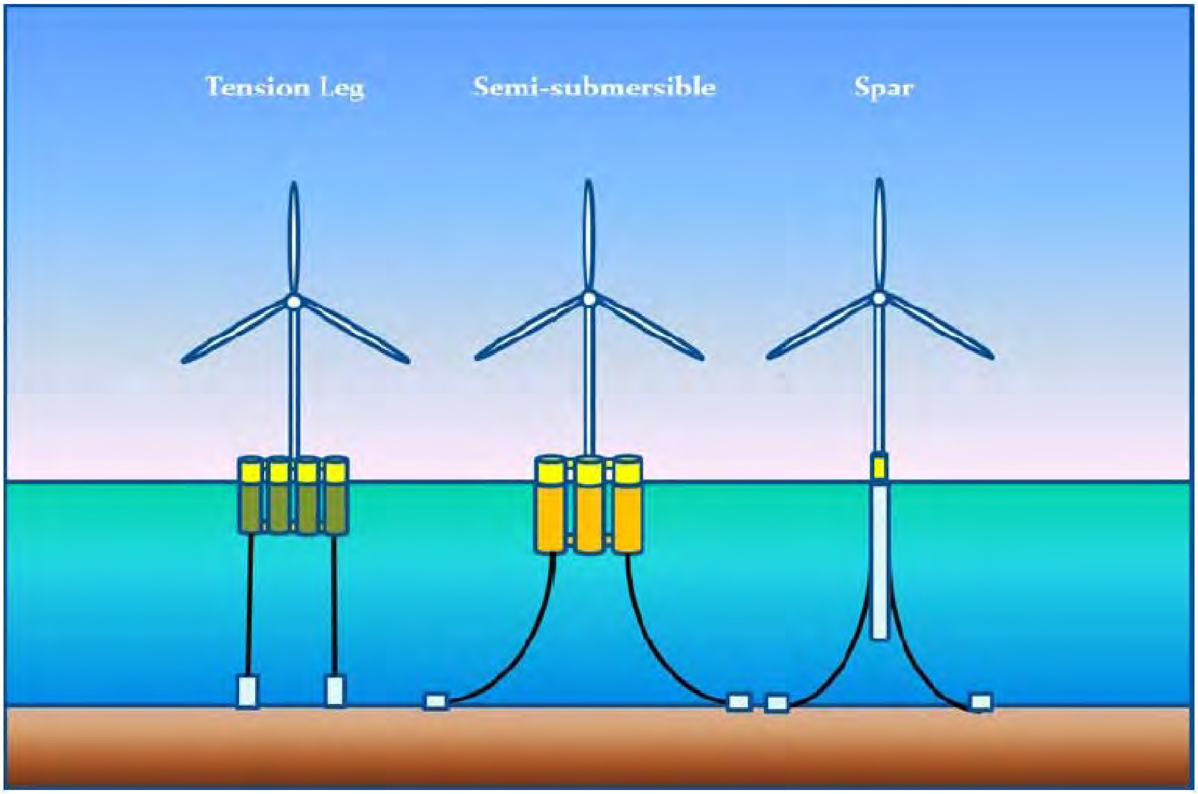
13. Buoyancy stabilised platform which floats semi-submerged on the surface of the ocean whilst anchored to the seabed with catenary mooring lines (see illustration in **Plate 1**). Often requires a large and heavy structure to maintain stability, but a low draft allows for more flexible application and simpler installation. Examples include: WindFloat (by Principle Power); Damping Pool (by IDEOL); SeaReed (by DCNS).

Spar-buoy

14. A cylindrical ballast-stabilised structure which gains its stability from having the centre of gravity lower in the water than the centre of buoyancy (see illustration in

Plate 1). Thus, while the lower parts of the structure are heavy, the upper parts are usually lighter, thereby raising the centre of buoyancy. The simple structure of the spar-buoy is typically easy to fabricate and provides good stability, but the large draft requirement can create logistical challenges during assembly, transportation, and installation (and decommissioning), and can constrain deployment to waters >100m depth. Examples include: Hywind (by Statoil); Sway (by Sway); Advanced Spar (by Japan Marine United).

Plate 1: Types of floating offshore windfarm systems - Tension leg, Semi-sub and Spar Buoy



15. Currently the selection of the floating substructure is defined by the water depths that each substructure requires for safe operation and the suitable construction ports/locations where the proposed development is located. The Carbon Trust (2015) document highlights the key strengths of each system (**Table 2.4**).

16. Given the depth of the Windfarm Site, WCOWL is likely to use the semi-submersible technology type.

Table 2.4 Key strengths and weaknesses of each substructure type

Technology	Strengths	Weaknesses
Tension Leg (water depth +100m)	- Low Structural mass. - Onshore turbine assembly. - Few moving parts (no active ballast required). - Stability.	- High loads on the mooring and anchoring system. - Challenging installation process. - Bespoke installation barge often required.
Semi-submersible (water depth +40m)	- Flexible application due to the ability to operate in shallow water depths. - Low vessel requirement- only basic tugboats required. - Onshore turbine assembly. - Amendable to port-side major repairs.	- High structural mass to provide sufficient buoyancy and stability. - Complex steel structures with many welded joints - can be difficult to fabricate. - Potentially costly active ballast systems.
Spar-buoy (water depth +120m)	- Simple design is amenable to serial fabrication processes. - Few moving parts (No active ballast required). - Excellent stability.	- High loads on the mooring and anchoring system. - Challenging installation process. - Bespoke installation barge often required. - Challenging manufacturing and assembly process.

17. **Table 2.5** presents the envelope for the floating substructure.

Table 2.5 Wind Turbine Floating Substructure Envelope

Turbine Floating Substructure Parameters*	Parameter
Overall length of each face (m)	~100
Water depth in operation (m)	12 – 18 (indicative range)
Freeboard (in operation) (m)	10 – 16 (indicative range)
Total substructure unit height (m)	22 – 34 (indicative range)

*The baseline assumption is that the type of floating substructure used will be **semi-submersible**. However, until sufficient engineering has been completed, other floating substructure types cannot be ruled out.

Wind Turbine Anchors and Mooring

18. The floating substructures described require moorings to anchor the turbine to the seabed in order to maintain position. The type and number of anchors and moorings used for the Project will depend on the type of floating substructure, loads imposed

on the mooring system by the substructure/WTG assembly in the metocean conditions prevailing on site, in addition to geotechnical and environmental considerations. The anchoring system options being considered are detailed in **Table 2.6** and **Table 2.7** presents the key parameters of the anchoring systems.

Table 2.6 Wind Turbine Anchoring Options

Wind Turbine Substructure Anchoring Options	Maximum (unless specified)
Sub-structure types	Tension Leg, Semi-sub and Spar-buoy
Number of mooring lines	Depends on sub structure type
Mooring types	Depends on sub structure type
Anchor types	Drag Embedment Anchors, Torpedo Anchors, Gravity Based Anchors, Suction Anchors and Micro-piling (if required for TLP)
Anchor mass	To be determined
Mooring line type	Anchor chain, Mooring cables, polyester mooring lines
Pennant wires/buoys	Temporary surface buoys during construction, Permanent submersible buoys at seabed for ROV recovery
Mooring line radius	To be determined

Table 2.7 Wind Turbine Anchoring Systems Parameters

Turbine Anchoring Options Parameters	Parameter
Weight (tonnes)	15 – 20 tonnes per anchor
Estimated length of mooring line	Up to 800m
No. of anchors and mooring lines per turbine	3 – 6 per turbine

Windfarm Site Layout

19. The wind turbines will be arranged subject to prevailing meteorological conditions in addition to geotechnical and environmental considerations. It may also be influenced by navigational and Search and Rescue safety requirements.

2.3 Electrical system

20. The electrical transmission system will collect the power produced at the wind turbines and transport it to the UK electricity transmission network. The transmission system will be constructed by WCOWL and the ownership will be transferred to an Offshore Transmission Operator (OFTO) in accordance with applicable rules and regulations in a transaction managed by the Office of Gas and Electricity Markets (Ofgem). The key components of the electrical infrastructure are described below.

Array cables

21. Array cables connect the turbines to each other and to the Offshore Substation. The array cables are expected to be 66KV to 132kV alternating current (AC). The length of each array cable will depend on the final layout. A realistic maximum distance of array cables will be defined for the purposes of the EIA and used as the basis for the assessments.

22. The inter-array cables will be buried in the seabed, typically to a depth of 1m, but may range from 0.5m - 3m, and can be buried via several techniques depending on the seabed conditions along the route. The depth will be determined by a Burial Assessment Study (BAS) and a Cable Burial Risk Assessment (CBRA). These techniques can be ploughing, jetting, trenching or post-lay burial. Where cable burial is not possible alternative cable protection measures could be used. This includes rock placement, grout / sandbags, concrete mattresses and polyethylene ducting, but no protection will also be considered.

Offshore Substation

23. It is assumed that the cables from turbines will be brought to an Offshore Substation Platform, located appropriately to optimise the array cable and export cable lengths. The current assumption for the Project is that one substation is required. This may change depending on the outcome of electrical studies. At the substation, the generated power will be stepped up to a higher AC voltage. This higher voltage will be determined by detailed studies, although it expected that the substation will step up the 66kV or 132kV array cable voltage to up to 220kV for the export cabling.

24. The Offshore Substation platform will typically include components including but not limited to transformers, batteries, generators, switchgear, fire systems, and modular facilities for operational and maintenance activities.

25. The Offshore Substation will comprise a topside platform installed on a foundation. The location of the offshore substation (if required) will be confirmed during the detailed design process. **Table 2.8** describes the Offshore Substation foundation parameters for jacket and GBS options as well as a number of other potential options. A floating substation option will also be investigated.

Table 2.8 Offshore Substation Foundation Options Parameters

Offshore Substation Foundation Options Parameters	Parameter	Maximum (unless specified)
Jacket with piling	Leg spacing	<30m
	Hammer size	<3000kJ

Offshore Substation Foundation Options Parameters	Parameter	Maximum (unless specified)
	Pile Diameter	3m - 5m per pile
Tripod	Leg spacing	<30m
	Hammer size	<3000kJ
	Pile Diameter	3m - 5m per pile
Suction bucket	Leg spacing	<35m
	Bucket diameter	<20m
Gravity based structure	Diameter	<50m
	Diameter of seabed levelling	100m
Monopile	Diameter	14m
	Hammer size	5000kJ

26. The typical footprint plan of the Offshore Substation will be in the region of 80m x 60m with the topsides comprised of several layers / decks stacked on top of another as required. The Offshore Substation foundation type will likely be a jacket or possibly a Gravity Based Structure (GBS) foundation. The jacket foundation will have 4 or 6 legs with up to three piles at each leg or one suction bucket at each leg. Leg spacing at the seabed will be up to 40m. In case of a GBS foundation the diameter of the foundation at seabed will be up to 50m.

Offshore export cable

27. Electricity from the Offshore Substation will be transmitted via one subsea export cable to shore. The export cable (up to 220kV AC) is likely to run from the Offshore Substation to a transition joint bay at the landfall. The transition joint bay connects the offshore cable and onshore export cable. The export cable will be installed in an individual trench and protected in line with good industry practice. **Table 2.9** describes the main cable parameters.

28. The cable will be buried where possible to ensure that the cable is protected from damage by external factors. Typical burial depth is 1m but may range from 0.5m - 3m. The depth will be determined by a BAS and a CBRA. Where cable burial is not possible alternative cable protection measures could be used. This includes rock placement, grout / sandbags, concrete mattresses and polyethylene ducting, but no protection option will also be considered. The appropriate level of protection will be

determined based on an assessment of the risks posed to the Project in specific areas.

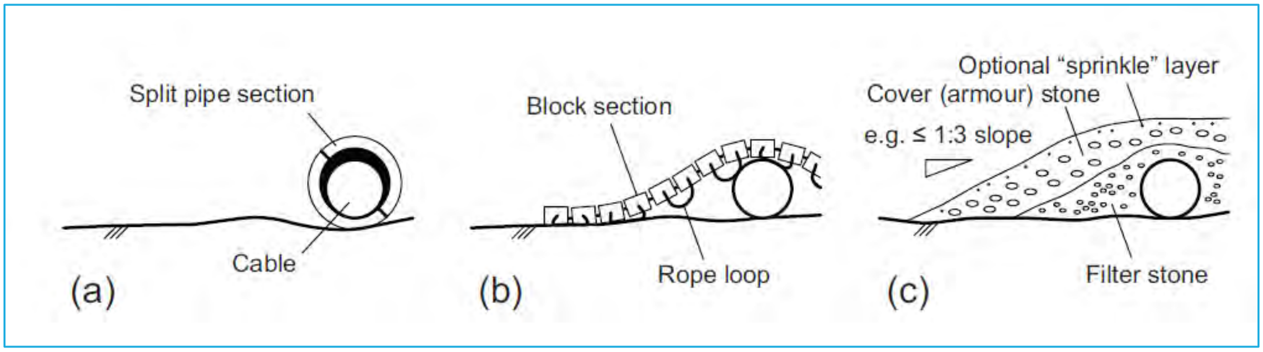
Table 2.9 Offshore cable parameters (based on an HVAC export cable system)

Item	Indicative parameters
Substation	1
Number of array cables	2 - 3 per wind turbine
Export cable/trench	1
Fibre optic cables	Bundled in export cable
Export cable route standard working width (cable corridor)	Minimum 22m, maximum 50m
Array cables length	Dependent upon distance between turbines
Export cable	70km

* The baseline assumption is that **one offshore substation** will be required. However, once sufficient engineering has been completed, WCOWL will consider options to remove the need for an offshore substation from the Project.

29. It is likely that the export cable will have to cross other cables and/or pipelines. Formal agreements with regards to existing cable crossings will be entered into by WCOWL and the existing owners / operators, with the installation techniques discussed and agreed to ensure integrity of the existing infrastructure and any new cables associated with the Project. Several techniques can be utilised, include tubular products, concrete mattresses, and rock placement as shown in **Plate 2**.

Plate 2: Cable protection: (a) tubular product; (b) concrete mattress; (c) rock placement



30. Pre-lay intervention activities may be required prior to the installation of cables including boulder removal, sandwave clearance, installation of equipment at crossings and the cutting and removal of any out-of-service cables.

31. There will be no separate cables for fibre optics. Fibre optics will be integrated with the export cable.

2.4 Landfall

32. **Table 2.10** shows the main construction parameters for the landfall site. Final landfall location will be selected during the route selection and subsequent EIA process. The configuration at the landfall will be location specific and will involve an onshore-offshore jointing pit.

Table 2.10 Landfall construction parameters

Landfall	Indicative parameters
Landfall installation method	Horizontal Directional Drilling (HDD) and/or open trench where no obstruction
Number of transition bays	1
Transition bay dimensions (length x width)	20 x 10m
Transition bay dimensions depth	2m
HDD compound area (length x width)	~200m x 200m

33. Cable installation methodology at the landfall will be selected based on a comparative assessment of impacts. It is assumed that suitable technologies will include a mix of open cut trenching and horizontal directional drilling (HDD). The offshore and onshore cable will be jointed in one transition bay onshore.

34. Open cut is a well-known installation methodology for underground cabling in relatively unconstrained areas. It can also be used to install a cable in a landfall and would require an open trench to be dug out before a cable is installed and the trench refilled.

35. If HDD is chosen as the appropriate installation methodology at the landfall, the HDD is drilled from an onshore construction compound and will exit the seabed in an exit pit at a suitable water depth. The length of the HDD will depend upon factors such as water depth, seabed topography, shallow geology/soil conditions and environmental constraints. The onshore construction compound will be temporary in nature and reinstated after completion of the Project.

36. The exit pit is likely to be 3m wide at the bottom to allow collection of drilling fluids. The total length will be approximately 10m, while the depth of the exit pit will reflect the depth at which the export cable will continue further offshore. However, it is likely that the exit pit depth will be less than 1m. The export cable is generally protected in the HDD exit pit and in the offshore export cable trench. However, additional permanent protection measures in the form of rock protection where the export cable is not naturally protected may be required. For the purposes of the EIA appropriate protective measures will be identified and discussed with key stakeholders prior to submission of the application.

37. The onshore transition bay will be located underground. A pit will be dug out and refilled once the transition bay(s) have been installed.

2.5 Onshore

Onshore Export System

38. **Table 2.11** shows the main parameters for the onshore cable and its construction. The standard temporary working width of the onshore cable corridor will typically be 50m and comprises the trench or trenches, storage of excavated material (split into segregated subsoil and topsoil) and a haul road. At specific locations along the onshore corridor the working width may require widening to accommodate access at crossings or specific specialist equipment associated with HDD or micro-tunnelling or indeed decreasing at pinch points to around 20m.

Table 2.11 Onshore cable parameters

Onshore cable corridor	Indicative parameters
Electrical connection	High Voltage Alternating Current (HVAC)
Number of cable circuits / trenches	1 circuit
Cable construction width (onshore corridor)	50m
Cable construction width at trenchless crossings	60m
Depth to top of buried infrastructure (ducts)	>1m
Trenchless (HDD) crossings	At least Sandy Lane and River Taw
Trenchless (HDD) crossings compound (length x width)	200 x 200m
Typical jointing bay frequency	Every ~300m – 1000m
Jointing bay dimensions (length x width x height)	20 x 10 x 1.5m
Depth to top of jointing bay (m)	>1m
Link box frequency	Every ~300m – 1000m
Link box (length x width)	2m x 2m

39. The onshore underground cable system will be installed in one trench with one circuit. The circuit consists of three high voltage cables and one fibre optical cable. The trench holding the circuit may be up to 2.5m wide.

40. Jointing bays will be used to pull the cable into the ducts and/or to join the cable lengths to each other. Link boxes are used for earthing cables and will be installed inside a protective concrete chamber. The jointing bays are subsurface structures, while the link boxes will require access (for inspections) from the surface during operations and will therefore be located at or above ground level. At each jointing location there will be one link box for the circuit. The frequency of jointing bays and link boxes will vary between 300m – 1,000m.

Onshore Substation and Grid Connection

41. The onshore cable would connect to an existing onshore substation at East Yelland where it would connect the Project to the transmission grid. The substation supported a previous power station which came to the end of its like and has been decommissioned and dismantled. The existing overhead power line (OHL) remains in place and is not required to be altered. It is not yet known whether the existing substation will require updating, if it does it would require the installation of necessary electrical and auxiliary equipment and components for transforming the power from the wind farm for connection to the distribution grid.

3. The Habitats Regulations Assessment Process

3.1 Legislative Context

42. The Conservation of Habitats and Species Regulations 2017 (2017 No. 1012) (as amended), The Conservation of Offshore Marine Habitats and Species Regulations 2017 (2017 No. 1013) (as amended) are the principal pieces of secondary legislation which, prior to the UK's departure from the European Union, transposed the terrestrial and offshore marine aspects of the EU Habitats Directive (Council Directive 92/43/EEC) and certain elements of the EU Wild Birds Directive (Directive 2009/147/EC) into the domestic law. Together, these regulations are collectively known as the "Habitats Regulations". The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019 (2019 No. 579) set out the changes that apply now that the UK has left the European Union. These confirmed that:

- All European protected sites and species retain the same level of protection
- Among other things, the requirement for HRA to be undertaken continues to apply

43. Unless the UK government implements further legislative changes, the obligations, process and terminology of the Habitats Regulations will, for the purposes of this report, remain as set out in existing legislation and regulations.

3.2 The HRA Process

Overview of HRA Process

44. The HRA process is carried out in a sequential manner by the MMO, acting on behalf of the Secretary of State for BEIS (the competent authority). The HRA process is informed and assisted by WCOWL as the Applicant. It is the responsibility of the Applicant to include 'sufficient information' within the application to inform the HRA.

45. The HRA process consists of up to four stages that are described in more detail below. For all plans and projects which are not wholly directly connected with, or necessary to the conservation management of a site's qualifying features, this will include formal screening for any LSE either alone or in-combination with other plans or projects. The role of the European Commission is now taken by UK Ministers.

Stage 1 – HRA Screening – this document

46. In the initial stage of the HRA process, we have undertaken an assessment to consider whether a HRA should be carried out in relation to the project. This document represents the initial screening assessment for the Project. The results of the initial year of aerial surveys at the site and desk-based data collection have been used to assess what can be scoped out prior to undertaking Stage 2 (Appropriate Assessment). WCOWL will seek advice from the appropriate bodies at this screening

stage. This will aim to enable an efficient assessment by the Competent Authority for this project.

Stage 2 – Appropriate Assessment

47. The Habitats Regulations require that wherever a project that is not directly connected to, or necessary for, the management of a National Site Network site is likely to have a significant effect on the conservation objectives of the site (directly, indirectly, alone or in- combination with other plans or projects) then an 'Appropriate Assessment' (AA) must be undertaken by the Competent Authority (Regulation 61 of the Habitats Regulations). The Appropriate Assessment must be carried out before consent or authorisation can be given for the project. To enable the Competent Authority to undertake this assessment, the following information will be provided:

- Identification of the area of the development and the possible receptors for the area (aerial data to be used to confirm bird and marine mammal activity at site)
- Identification of the possible impacts the development could have on birds e.g. collision risk, possible disturbance and displacement
- Identification of key species (from aerial survey data) that could be impacted by the development in a regional setting
- Identification of key onsite activities associated with the project development (construction, O&M and decommissioning)
- Identification of seasonal variations in designated features at the site
- Assess whether the impact from development would have an adverse impact on the interest features of National Site Network sites in the region

Stage 3 – Assessment of Alternatives

48. At Stage 3 WCOWL will investigate the alternatives that could be applied to reduce the potential for effects. Alternative solutions can include a proposal of a different scale, a different location and an option of not having the scheme at all – the 'do nothing' approach. Provided this test for alternatives is achieved, then the HRA will proceed to Stage 4.

Stage 4 – Assessment of Imperative Reasons of Overriding Public Interest (IROPI)

49. If it is demonstrated that there are no alternative solutions to the proposal that would have a lesser effect or avoid an adverse effect on the integrity of the site(s), then a case will be prepared that the scheme should be carried out for IROPI. The IROPI justification must relate to either:

- Human health, public safety or beneficial consequences of primary importance to the environment
- Having due regard to any opinion from the appropriate authority, any other imperative reasons of overriding public interest

50. If the conclusion of Stages 3 and 4 is that there is no alternative and that the project has demonstrated IROPI, then the Project may proceed with a requirement that appropriate compensatory measures are delivered.

3.3 Approach to Screening

51. Screening should provide the following (European Commission, 2001):

- Determine whether the project (or plan) is directly connected with or necessary for the management of Natura 2000 sites
- Describe the project (or plan) and describe and characterise any other plans or projects which, in combination, have the potential for having significant effects on Natura 2000 sites
- Identify the potential effects on Natura 2000 sites
- Assess the likely significance of any effects on Natura 2000 sites

52. HRA Screening needs to determine whether the project may have the potential for a significant effect on European sites and, therefore, if they will require an Appropriate Assessment. Judgements regarding significance should be made in relation to the qualifying interests for which the site is designated as being of international importance for and the achievement of its conservation objectives. In considering whether the project is likely to have a significant effect or has the potential for a likely significant effect (LSE) on a European site, the following precautionary approach has been adopted:

- The project has been considered 'likely' to have a significant effect if it is not possible (on the basis of objective information) to exclude the possibility that it could have significant effects on the European site or any of its qualifying features, either alone or in combination with other projects or plans
- An effect has been considered to be 'significant' in this context if it is judged that it could undermine the European site's conservation objectives. This judgement has been made in the light of factors such as the characteristics and specific environmental conditions of the European site(s) in question
- LSE is, in this context, any effect that may be reasonably predicted as a consequence of the project that may affect the conservation objectives of the features for which the site was designated, but excluding trivial or inconsequential effects. In determining significance the assessment should also take note of the Waddenzee Ruling in which the European Court of Justice (Case C-127/02) which states "…any *plan or project not directly connected with or necessary to the management of the site is to be subject to an appropriate assessment of its implications for the site in view of the site's conservation objectives if it cannot be excluded, on the basis of objective information, that it will have a significant effect on that site, either individually or in combination with other plans or projects*" [and

that a plan or project may only be authorised] "*where no reasonable scientific doubt remains as to the absence of such effects*"

- In order to undertake the HRA screening it is necessary to determine the range of likely effects that could arise as a result of the Project. This would then enable the distance and 'zone of influence' of the potential effects to be identified, within which the relevant European sites should then be considered. Therefore, an initial boundary extent has been determined on the basis of the potential range of physical disturbances and the nature of the habitats present and their ability to support species that are a designated feature of sites in the area. The fullest extent of any potential effects is estimated to be no more than 1km overland and 5km over water. In terms of potential terrestrial species that may exploit or use the site (mobile species) and assumed distance of 10km was used
- The different approaches to highly mobile species such as marine mammals and birds are described below

3.3.1 Marine mammals

53. For marine mammals, the approach to HRA screening primarily focuses on the potential for connectivity between individual marine mammals from designated populations and the offshore project area (i.e. demonstration of a clear source-pathway-receptor relationship). This is based on the distance of the Project site from the designated site(s), the range of each effect, and the potential for marine mammals from a designated site to be within range of an effect.

54. The HRA screening exercise therefore considers designated sites which meet the following criteria:

- The distance between the potential effect of the proposed Project and a designated site with marine mammals as a qualifying feature is within the range for which there could be an interaction (for example, the pathway is not too long for significant noise propagation and therefore the site is within the Zone of Influence (ZOI) for underwater noise effects)
- The distance between the proposed Project and resources on which the qualifying marine mammal feature depends (i.e. an indirect effect acting though prey or access to habitat) is within the potential ZOI (for example the pathway is not too long)
- The likelihood that a foraging area or a migratory route occurs within the ZOI of the proposed project (applies to mobile interest features when outside the designated site)

55. Designated sites that did meet these criteria have been screened out from further assessment.

56. The approach taken was informed by HRA screening reports for OWFs recently submitted to The Planning Inspectorate (PINS) (principally North Falls, Dudgeon and Sheringham Shoal Extensions, East Anglia ONE North and East Anglia TWO), along with corresponding stakeholder feedback.

57. Assessment of species-specific risk to potential effects of OWFs is informed by industry standard advice and guidance, relevant scientific papers, and representations from both applicants stakeholders during DCO examinations for OWFs.

58. Information on SACs with marine mammals as a qualifying features is taken from SAC citations/Natura 2000 forms, conservation objectives, and other relevant information as published by the relevant Statutory Nature Conservation Bodies (SNCBs). Advice on operations for Marine Protected Areas were not considered necessary for screening but will be referred to as required for appropriate assessment.

59. Distances between the Project and SAC sites were measured in GIS (the shortest straight-line distance) using shapefiles downloaded from SNCB websites.

3.3.2 Ornithology

60. Offshore ornithology receptors potentially affected by the construction, operation and decommissioning of the Project will be predominantly seabirds, defined for this report as auks, gulls, terns, gannets, skuas, shearwaters, petrels and divers. These species have the potential to be present during the breeding season and non-breeding season (including spring/autumn migration/passage periods). Other bird species that may be affected by the project include waterfowl (e.g. swans, geese, ducks and waders) and other bird species which may fly through the Project during spring and/or autumn migration/passage periods.

61. The HRA screening for offshore ornithology considers SPAs and Ramsar sites which meet at least one of the following criteria in relation to the Project (including the array areas and offshore export cable corridor to Mean Low Water Springs (MLWS) at the landfall):

- Part of the Project overlaps directly with an SPA/Ramsar site, or is located in close proximity to the boundary such that there may be an effect on one or more qualifying species within the SPA
- The Project is within a distance of an SPA/Ramsar site which means there could be an interaction between the Project and qualifying features of the SPA/Ramsar site (i.e. the pathway is not too long), discussed in further detail in **Section 4**

    - For seabirds during the breeding season this is informed by published information on the mean maximum foraging ranges from breeding colonies (Woodward *et al.*, 2019)
    - For seabirds during the non-breeding season, Biologically Defined Minimum Population Scales (BDMPS) from Furness (2015) have been used to produce estimates of the proportion of a given SPA population which is present at the Project and a 1% criterion is used for screening
    - For migratory birds other than seabirds, SPAs within 100km of the Project are considered
- The distance between the Project and resources on which the qualifying feature depends (i.e. an indirect effect acting through prey or access to habitat) is within the range for which there could be an interaction (i.e. the pathway is not too long), applying professional judgment.

62. The approach taken was informed by HRA screening reports for OWFs recently submitted to The Planning Inspectorate (PINS) (principally North Falls, Dudgeon and Sheringham Shoal Extensions, East Anglia ONE North and East Anglia TWO), along with corresponding stakeholder feedback.

63. Assessment of species-specific risk to potential effects of OWFs is informed by industry standard advice and guidance, relevant scientific papers, and representations from both applicants stakeholders during DCO examinations for OWFs.

64. Information on SPAs, Ramsar sites and their qualifying features is taken from SPA citations/Natura 2000 forms, conservation objectives, departmental briefs and Ramsar site lists and Information Sheets as published by the Statutory Nature Conservation Bodies (SNCBs), including Natural England's Designated Sites View1, NatureScot's Sitelink[2] and JNCC links to Ramsar Information Sheets[3]. Advice on operations for Marine Protected Areas were not considered necessary for screening but will be referred to as required for appropriate assessment.

65. Distances between the Project and SPAs/Ramsar sites were measured in GIS (the shortest straight-line distance) using shapefiles downloaded from SNCB websites.

66. The first 12 months of baseline survey data (July 2020 to June 2021) were available to inform this report. It is recognised that an update to this report will be required with the full 24 month baseline dataset once it is available.

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[1] https://designatedsites.naturalengland.org.uk/

[2] https://sitelink.nature.scot/home

[3] https://jncc.gov.uk/our-work/ramsar-sites/

3.3.3 Assessment of Likely Significant Effect

67. Following the identification of the distance within which to identify the European sites that should be considered in this screening, the consideration of whether the likely effects would be trivial or inconsequential (i.e. de minimis) would then be undertaken. For the purposes of this screening exercise, three categories of LSE are defined and have been utilised, as follows:

- No likely significant effect – based on the information that is currently available on the baseline environment, the activities proposed and their predicted effects, it is considered that there will be no likely significant effect with respect to the identified feature and site
- Potential for a likely significant effect – based on information available, the possibility of a likely significant effect cannot be ruled out
- Likely significant effect – based on information available it is apparent that the project activities could have an impact upon designated features and could lead to significant adverse temporary or long-term change

3.3.4 Assessment in relation to sites' conservation objectives

68. Judgements of likely significant effect need to be based upon assessment of potential effects on the features for which the European site was designated and taking into account their conservation objectives.

69. The conservation objectives set out what is needed to ensure Favourable Condition of the designated feature. The term 'favourable condition' is used to represent the concept of Favourable Conservation Status for the interest features of an individual SAC / SPA. Conservation objectives are used as the basis from which management measures and monitoring programmes may be developed for the designated sites. Conservation Objectives are also utilised to inform appropriate assessment under the Habitats Regulations and in this respect it is important to ensure that the assessment of potential project effects is undertaken with reference to available site objectives.

70. In order to deal with the large number of sites being assessed for LSE, a generic set of conservation objectives that typically apply to the types of features (Annex I habitats, Annex II species populations and SPA designated bird populations) have been used as a reference against which to determine whether LSE may arise. This approach also enables candidate SACs and potential SPAs, for which conservation objectives will not have been developed, to be screened. These objectives are as follows:

71. For SAC Annex I habitats and associated communities:

- Subject to natural change, maintain / restore the feature in / to favourable condition, such that the
    - Natural environmental quality is maintained
    - Natural environmental processes are maintained
    - The extent, physical structure, diversity, community structure and typical species representative of the feature are maintained / restored

72. For SAC Annex II species populations:

- Subject to natural change, maintain in favourable condition the species feature. Favourable condition for migratory / mobile species is normally based upon ensuring that specific conditions are met. These conditions relate to maintenance of migratory passage, population size, abundance / presence of prey species and other environmental parameters (e.g. water quality) where this may affect the designated features/populations

73. For designated bird populations of SPAs / Ramsar sites:

- Overall, it can be stated that the SPA conservation objective is aimed at maintaining bird populations or the diversity of species within a defined assemblage through the protection of habitats supporting them and management against negative impacts of disturbance. In respect of favourable condition, two key attributes of bird features are applied - population size of individual species or groups of species and extent of habitats used by the birds in the site for nesting, roosting, feeding etc. Attributes relating to the maintenance of habitat quality (e.g. food availability) and preventing / managing activities that may cause disturbance to designated populations are also generally applied

3.3.5 Screening for likely significant effect (LSE)

74. Consideration of the potential impacts of development in relation to these objectives for the screened features listed (site by site) has been undertaken at a high level and the outcomes are described in subsequent sections under three categories of sites and features (see below):

- SACs that contain coastal or offshore habitat interest features and / or non-mobile species interest features and SPA / Ramsar sites containing habitats supporting bird interest features
- SACs designated for mobile species populations (e.g. migratory fish, marine mammals)
- SPAs and Ramsar sites designated for bird populations

3.3.6 Consideration of In-Combination Effect

75. The findings of this stage would then need to be considered against other projects and plans within the area of influence for the identified European sites for inclusion in the screening process. It will therefore be necessary to look for plans or projects at the following stages:

- Applications lodged but not yet determined
- Projects subject to periodic review e.g. annual licences, during the time that their renewal is under consideration
- Refusals subject to appeal procedures and not yet determined
- Projects authorised but not yet started
- Projects started but not yet completed
- Known projects that do not require external authorisation
- Proposals in adopted plans
- Proposals in finalised draft plans formally published or submitted for final consultation, examination or adoption

76. Currently there are several offshore windfarm / aggregate projects either in consenting stages or early construction within the Celtic Sea and Bristol Channel. These are:

- Erebus Floating Wind Demonstrator Project
- South Pembrokeshire Demonstration Zone (floating offshore wind and wave)
- NOBEL Banks (aggregate extraction)
- Culver Extension (aggregate extraction)
- Area 470 Extension (aggregate extraction)
- North Bristol Deep (aggregate extraction)
- North Middle Ground (aggregate extraction)

77. Ongoing consultation during the EIA process will determine if there are other projects or plans with the potential for in-combination effects to be identified and considered.

4. Environmental Baseline

4.1.1 Introduction

78. The following sections describe the baseline characteristics of the study area on the basis of the information currently available.

4.1.2 Terrestrial Ecology

79. Large areas of the Project AoS (AoS) comprise urban and agricultural land interspersed with a range of habitats from mudflats, coastal sand dune, maritime cliffs and slopes, coastal and floodplain grazing marsh, semi-improved grassland, ancient woodland, lowland heathland, grass moorland, and blanket bog.

80. The following designated sites are within or overlap with the Onshore Development Area include the following:

- Braunton Burrows Special Area of Conservation (SAC)
- Trintagel-Marsland-Clovelly Coast SAC
- Bristol Channel Approaches/Dynesfeydd Mor Hafren SAC
- Hobby to Peppercombe Site of Special Scientific Interest (SSSI)
- Braunton Swanpool SSSI
- Saunton to Baggy Point Coast SSSI
- Taw-Torridge Estuary SSSI
- Braunton Burrows SSSI
- Northam Burrows SSSI
- Greenaways and Freshmarsh, Braunton SSSI
- Mill Rock SSSI
- Kenwith Valley Local Nature Reserve (LNR)
- Kynoch's Foreshore LNR
- Northam Burrows Country Park

81. There are additional designated sites that are outside the Onshore Development Area and these include:

- Lundy SAC
- Chapel Hill SSSI
- Caen Valley Bats SSSI
- Morte Point SSSI
- Fremington Quay Cliffs SSSI
- Marsland to Clovelly Coast SSSI
- Fremington LNR

4.1.3 Benthic and Intertidal Ecology

82. A review of EMODnet's EUSeaMAP (2021) broadscale predictive habitat map which uses EUNIS habitat classifications has been undertaken. This shows that the intertidal, infralittoral and shallow circalittoral area of the Project AoS are is predominantly sand, with small areas of mud and sandy mud or muddy sand. There are indications of Annex I bedrock and/or stony reef present along the coastline overlapping the Project AoS for the offshore cable corridor.

83. The EUSeaMAP (2021) shows that the subtidal environment is mainly circalittoral coarse sediment along the Project AoS, with deep circalittoral sand occurring further offshore along the Project AoS and overlapping the project boundary. There are discrete areas of mixed sediment, and rock or other hard substrate occurs around Lundy Island to the North of the Project AoS. EMODnet also shows discrete records of Annex I bedrock and/or stony reefs and Annex I sandbanks which overlap with the Project AoS for the offshore cable corridor. The sandbanks surround Lundy Island; and the Annex I bedrock and/or stony reef are present across the Project AoS in discrete locations.

84. Designated sites that are within a 10km radius of the project boundary and AoS for the Offshore Export Cable Corridor and designated to protect benthic and intertidal species or habitats are:

- Marine Conservation Zones
    - Bideford to Foreland Point MCZ
    - Hartland Point to Tintagel MCZ
    - Morte Platform MCZ
    - South West Approaches to Bristol Channel MCZ
    - North West of Lundy MCZ
- Special Areas of Conservation
    - Braunton Burrows SAC
    - Tintagel-Marsland-Clovelly Coast SAC
    - Lundy SAC
- Sites of Special Scientific Interest
    - Saunton to Baggy Point Coast SSSI
    - Braunton Burrows SSSI
    - Taw-Torridge Estuary SSSI
    - Northam Burrows SSSI
    - Hobby to Peppercombe SSSI
    - Morte Point SSSI
    - Marsland to Clovelly Coast SSSI
    - Lundy SSSI

4.1.4 Marine Mammals

85. Initial assessments of the distribution of marine mammals throughout the Irish Sea and Southwest England waters have identified three marine mammal species listed under Annex II that occur throughout the region and throughout the Project site and surrounding area. These include:

- Harbour porpoise (*Phocoena phocoena*);
- Bottlenose dolphin (*Tursiops truncates*); and
- Grey seal (*Halichoerus grypus*).

86. Harbour seal (*Phoca vitulina*) have very little to no presence recorded in the Southwest and Wales Management Units (MU) (SCOS, 2020; Carter *et al*., 2020), and no harbour seal were recorded within the first year of site-specific aerial surveys.

87. The typical and average foraging range for harbour seal is 50km to 80km (SCOS, 2017). Tracking studies have shown that harbour seals travel 50km to 100km offshore and can travel 200km between haul-out sites (Lowry *et al*., 2001; Sharples *et al*., 2012). The range of these trips varies depending on the location and surrounding marine habitat.

88. There are no designated sites where harbour seal is a listed feature within foraging distance of the Project site. As such, <u>harbour seal has been screened out</u> of further assessment within the HRA.

Harbour porpoise

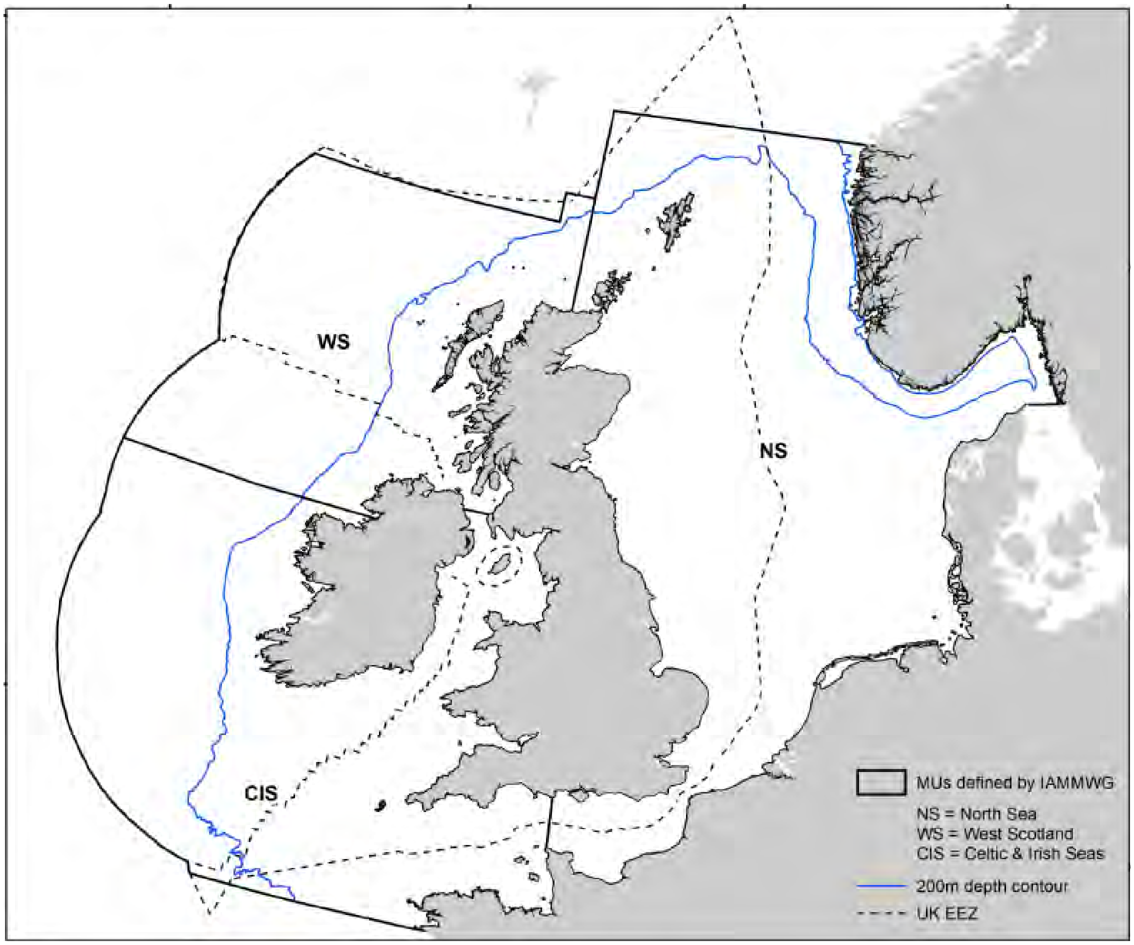
89. In the Irish Sea, the harbour porpoise is the most commonly observed odontocete. Harbour porpoise are widely distributed throughout the Celtic and Irish Seas during most months of the year (Reid *et al.,* 2003; Mackey *et al.,* 2004; Baines and Evans, 2012; Hammond *et al.,* 2013, 2017, 2021; Rogan *et al.,* 2018).

90. Harbour porpoise within the eastern North Atlantic are generally considered to be part of a continuous biological population that extends from the French coastline of the Bay of Biscay to northern Norway and Iceland (Tolley and Rosel, 2006; Fontaine *et al.,* 2007, 2014; IAMMWG, 2015, 2021). However, for conservation and management purposes, it is necessary to consider this population as smaller MUs. MUs provide an indication of the spatial scales at which effects of plans and projects alone, and in combination, need to be assessed for the key cetacean species (IAMMWG, 2015, 2021).

91. The Project area is located in the Celtic and Irish Seas (CIS) MU, which has an estimated harbour porpoise abundance of 62,517 (IAMMWG, 2021), based on the Small Cetaceans in the European Atlantic and North Sea (SCANS)-III survey

(Hammond *et al.*, 2021) and aerial surveys of cetaceans and seabirds in Irish waters (Rogan, *et al.*, 2018). The CIS MU for harbour porpoise is shown in .

Figure 4.1 The MU for harbour porpoise (Celtic and Irish Sea MU). (IAMWWG, 2021)



92. SCANS-III, a large-scale survey for cetaceans across European waters, was undertaken in the summer of 2016, and included areas from the Strait of Gibraltar in the south to 62°N in the north and extending west to the 200 nautical miles (nm) limits of all EU Member States (Hammond *et al.,* 2021). For the entire SCANS-III survey area, harbour porpoise abundance in the summer of 2016 was estimated to be 424,245 with an overall estimated density of 0.351/ km^2 (Coefficient of Variation CV = 0.172; 95% Confidence Interval (CI) CI = 313,151 - 596,827; Hammond *et al.*, 2021).

93. The SCANS-III survey estimated that the abundance of harbour porpoise in survey Block D, which is located in the Irish Sea and includes the proposed survey area, was 5,734 individuals and the density was estimated to be 0.118 harbour porpoise per km^2, with a mean group size of 1.35 (CV = 0.489; 95% CI = 1,697– 12,452; Hammond *et al.*, 2021).

Bottlenose dolphin

94. In the Irish Sea, bottlenose dolphin have a predominantly coastal distribution, with higher concentrations off west Wales (particularly Cardigan Bay) and off the coast of County Wexford in southeast Ireland. They are also regularly sighted in summer off the Galloway coast of southwest Scotland and around the Isle of Man (Hammond *et al.,* 2005, Baines and Evans, 2012; DECC, 2016).

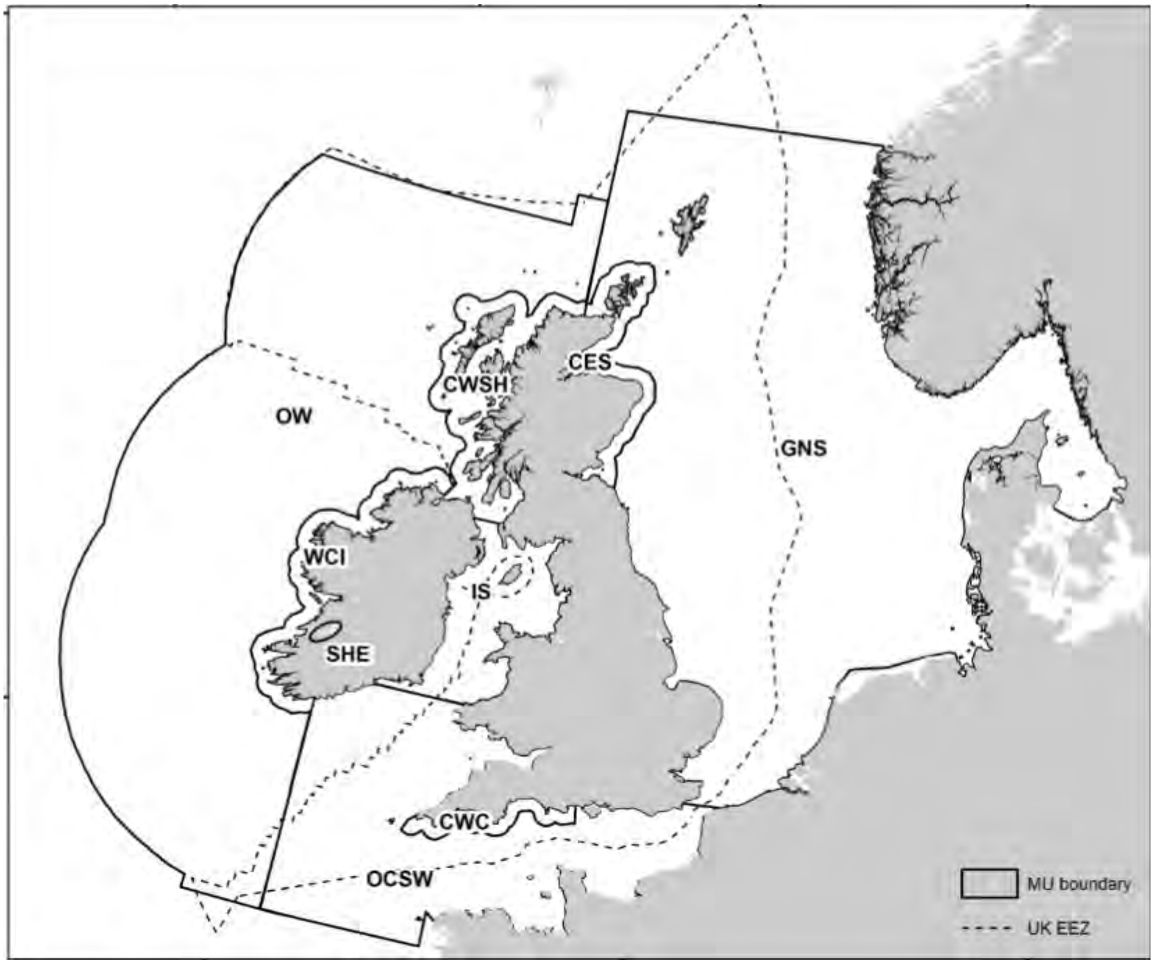
95. A number of inshore groups of bottlenose dolphin have been identified in UK and Irish waters and there appears to be limited interchange between these groups (Robinson *et al*., 2012; Cheney *et al*., 2013; ICES, 2014; IAMMWG, 2015).

96. The Project site is located in the Offshore Channel and SW England (OCSW) MU (see **Figure 4.2**), which has an estimated bottlenose dolphin abundance of 10,947 (CV = 0.25; 95% CI = 1,974 – 7,572; IAMMWG, 2021). The Project also borders the Irish Sea MU which has an estimated bottlenose dolphin abundance of 293 (CV = 0.54; 95% CI = 70 – 492; IAMMWG, 2021).

97. For the entire SCANS-III survey area, bottlenose dolphin abundance in the summer of 2016 was estimated to be 19,201 with an overall estimated density of 0.016/ km^2 (CV = 0.242; 95% CI = 11,404 – 29,670; Hammond *et al*., 2021).

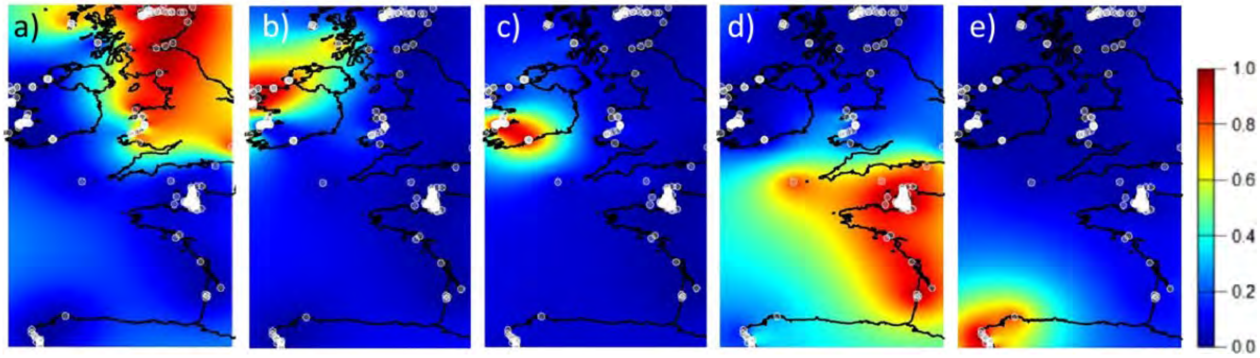
98. The SCANS-III survey estimated that the abundance of bottlenose dolphin in survey block D, which is located in the Irish Sea and includes the proposed survey area, was 2,938 individuals and the density was estimated to be 0.060 bottlenose dolphin per km^2, with a mean group size of 2.60 (CV = 0.447; 95% CI = 914 - 5,867; Hammond *et al*., 2021).

Figure 4.2 The MUs for bottlenose dolphin (Offshore Channel, Celtic Sea, & South West England, and Irish Sea MU). (IAMWWG, 2021)



99. The results of genetic analysis (Nykänen *et al.,* 2019) has revealed that there are five clusters of genetically distinct coastal bottlenose dolphin populations in the UK and the north of continental Europe (**Figure 4.3**). There is the potential for individuals within the Project AoS to be from two of those cluster: east and west Scotland, and English Channel.

Figure 4.3 Maps of individual assignment probabilities per population [scale bar indicates the assignment probabilities: (a) east and west Scotland, Wales and Galicia; (b) west Ireland; (c) Shannon estuary, Ireland; and (d) English Channel, France]



Grey seal

100. Grey seals only occur in the North Atlantic, Barents and Baltic Sea with their main concentrations on the east coast of Canada and United States of America and in north-west Europe (Special Committee on Seals (SCOS), 2019). Grey seals are present year-round on both the Irish and Welsh coasts and are known to move between the two, for example between the southeast coast of Ireland and the southwest coast of Wales (Kiely *et al.,* 2000).

101. Grey seals are wide ranging and can breed and forage in different areas (Russell *et al*., 2013). They generally travel between known foraging areas and back to the same haul-out site, but will occasionally move to a new site. For example, movements have been recorded between haul-out sites on the east coast of England and the Outer Hebrides (SCOS, 2018), and tags deployed on grey seals at Donna Nook and Blakeney Point in May 2015 indicated that they used multiple haul-outs sites; with one hauling out in the Netherlands and one in Northern France (Russell, 2016).

102. Marine Scotland commissioned Sea Mammal Research Unit (SMRU) to produce maps of grey seal distribution (Russell *et al*., 2017). These maps were produced by combining information about the movement patterns of electronically tagged seals with survey counts of seals at haul-out sites. The resulting maps show estimates of mean seal usage (seals per 5km x 5km grid cell). The maps indicate relatively higher usage in some areas of the Celtic and Irish Sea along coastal locations of Ireland, Wales and Cornwall, for example, the waters surrounding Lundy Island in the Bristol Channel and Llŷn Peninsula and West Hoyle Bank in Wales, as well as the south-east tip (Saltee Islands) of Ireland.

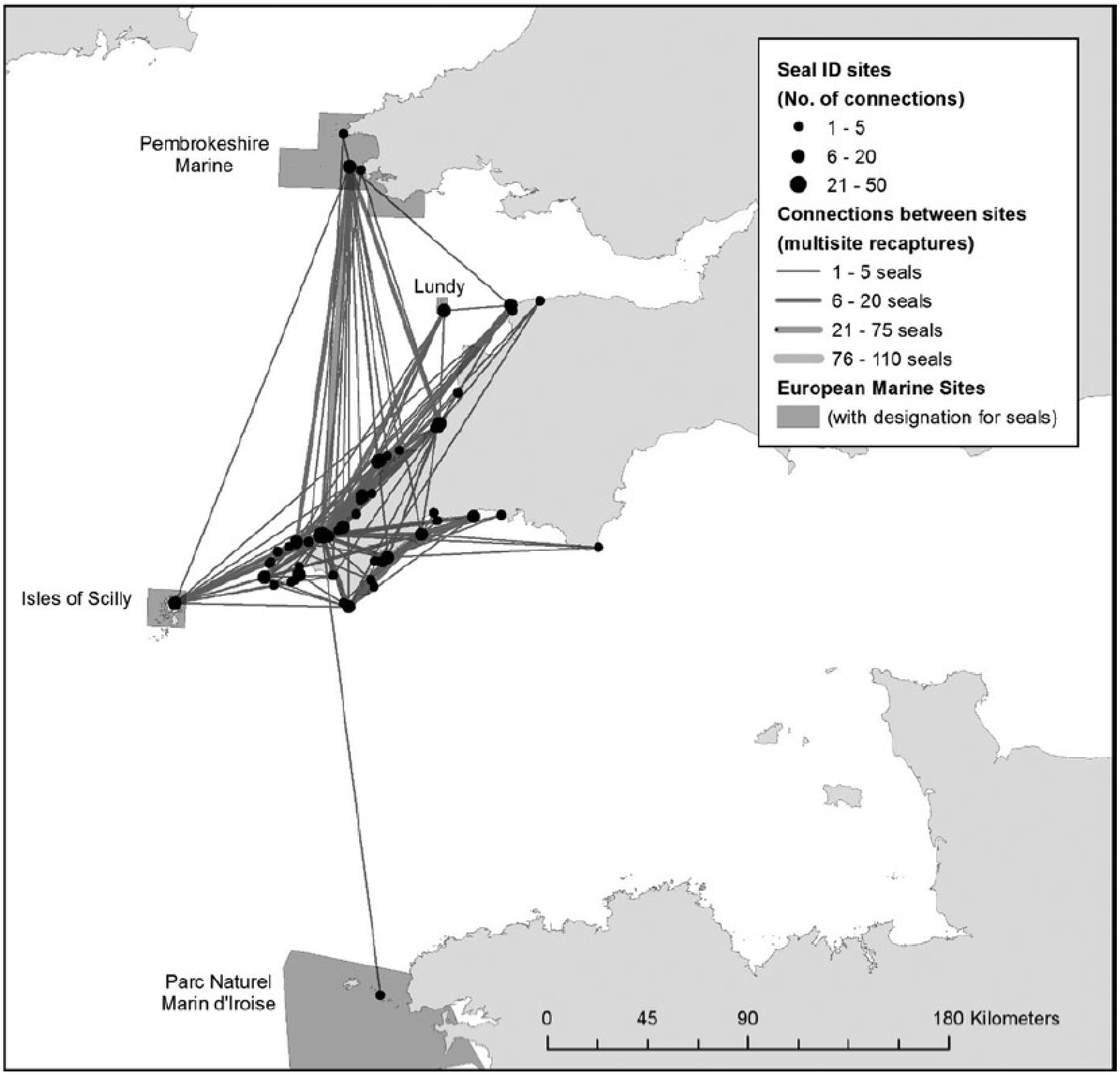
103. The Project site is located in the Southwest England which has August counts of grey seals of 500 seals for 2016-2019 period; monitoring of seals in this MU is primarily conducted by Cornwall Seal Group Research Trust (CSGRT) and the Lundy Company. The main breeding colony in Devon is on Lundy (43 pups in 2019; Jones,

2020), with only a few (5; Sayer and Witt, 2017) recorded on the mainland. The Project site also borders the Wales MU which is split into two areas: North Wales (Dee Estuary- Aberystwyth) and West Wales (Aberystwyth - Caldey Island). There are no or very few grey seals in south Wales (Caldey Island – Bristol Channel) (SCOS, 2020). The Wales MU has an August counts of grey seals 900 seals for recent count of 2016-2019 period (SCOS, 2020).

104. Grey seals will typically forage in the open sea and return regularly to land to haul-out, although they may frequently travel up to 100km between haul-out sites. Foraging trips generally occur within 100km of their haul-out sites, although grey seal can travel up to several hundred kilometres offshore to forage (SCOS, 2020).

105. The CSGRT has been undertaking a long-term research programme on grey seal in the south-west of the UK, to better understand their movements and abundances in the region (Sayer *et al.*, 2018). A Photo-ID catalogue was developed to locate and monitor the movements of individual seals over time. Photos of seals at 54 haul-out sites between south-west Wales and Britany (France), between 2004 and 2014, were analysed. The results of this movement analysis is shown in **Figure 4.4** below, which also shows the haul-out sites. Relevant to the Project site are grey seal movements between Pembrokeshire Marine SAC and north Cornwall, Lundy SAC, and north Devon. There are also extensive movements of grey seal from the north Devon coast, west to north Cornwall and Land’s End (Sayer *et al.*, 2018).

Figure 4.4 Photo-ID connections of grey seal in south-west UK (Sayer et al., 2018)



4.1.5 Offshore Ornithology

106. The offshore ornithology baseline will be largely informed through a programme of 24 monthly aerial digital surveys of the study area. This is being undertaken by APEM Ltd. Surveys commenced in July 2020, and will be completed in June 2022. A single survey comprised of nine transects. Survey data for July 2020 to June 2021 (i.e. 12 surveys) was available at the time of writing. It is proposed to review the second year of survey data once it has been collected and update this screening report as required.

107. In total, 12 offshore ornithology receptors were identified to species level. These are presented in **Table 4.1**, along with the published biologically relevant seasons for each species. These were taken from Furness (2015).

Table 4.1 Offshore ornithology receptors identified to species level during July 2020 to June 2021 baseline surveys

Species	**Season***				
	Full breeding	**Migration free breeding**	**Autumn migration**	**Winter / non-breeding**	**Spring migration**
Common tern	May - Aug	Jun - mid Jul	Late Jul - early Sep	n/a	Apr - May
Fulmar	Jan - Aug	Apr - Aug	Sep - Oct	Nov	Dec - Mar
Gannet	Mar - Sep	Apr - Aug	Sep - Nov	n/a	Dec - Mar
Great black-backed gull	Late Mar - Aug	n/a	n/a	Sep - Mar	n/a
Guillemot	Mar - Jul	n/a	n/a	Aug - Feb	n/a
Herring gull	Mar - Aug	n/a	n/a	Sep - Feb	n/a
Kittiwake	Mar - Aug	May - Jul	Aug - Dec	n/a	Jan - Apr
Lesser black-backed gull	Apr - Aug	May - Jul	Aug - Oct	Nov – Feb	Mar - Apr
Manx shearwater	Apr - Aug	Jun - Jul	Aug - early Oct	n/a	Late Mar - May
Puffin	Apr - early Aug	n/a	n/a	Mid Aug - Mar	n/a
Razorbill	Apr - Jul	Apr - Jun	Aug - Oct	Nov - Dec	Jan - Mar
Sandwich tern	Apr - Aug	Jun	Jul - Sep	n/a	Mar - May

Note: Seasons within which species were recorded are coloured in red

108. At the time of writing, data from 12 surveys (July 2020 to June 2021) was available and has been analysed to provide design-based density estimates. In total, 12 offshore ornithology receptors were identified to species level. The following paragraphs summarise the findings of the July 2020 to June 2021 surveys across the study area (i.e. the Project plus 4km buffer) for receptors identified to species level. The final assessment will undertake a systematic and thorough review of all survey findings to inform the baseline, including consideration of densities within the Project itself, and apportioning of seabirds (particularly during the HRA) to particular breeding and non-breeding populations using the best available methodologies and evidence.

109. One of the most abundant species groups at certain times of year was shearwaters. Birds were recorded in July and August 2020, and March to June 2021. Almost all of these birds were Manx shearwaters, which breed at Skomer, Skokholm and the Seas off Pembrokeshire SPA, located 33km to the west-northwest of the Project

site, or Lundy, located over 42.5km from the Project site (though the Project AoS runs 1km from the Lundy SAC). Based on the respective population sizes (349,663 pairs at Skokholm in 2018, and 5,505 pairs at Lundy in 2017), and at-sea distributions from a multi-colony tracking study (Dean *et al.*, 2015), it is anticipated that the majority of birds recorded will originate from Skomer, Skokholm and the Seas off Pembrokeshire SPA, of which Manx shearwater is a qualifying feature. Study area densities during the breeding season (April to August (Furness, 2015) ranged from 10 birds per km^2 to 100 birds per km^2, and were <5 birds per km^2 in September and March, which are months when migration is occurring. During the migration periods (August to early October and late March to May (Furness, 2015)), birds recorded belong to the UK Western Waters plus Channel BDMPS.

110. Auks (i.e. guillemots, razorbills and puffins) were recorded on each of the 12 surveys for which data were available. Peak guillemot densities (21 birds per km^2) were recorded across the study area in May 2021, though outside this survey, breeding season (March to August (Furness, 2015)), densities were lower; between 0 and 3 birds per km^2. This species breeds in similar numbers (circa 2,000-3,000 pairs) at Lundy (situated over 42.5km from the Project site, though the Project AoS runs 1km from the Lundy SAC) and Skomer, Skokholm and the Seas off Pembrokeshire SPA (located 33km to the west-northwest of the Project site), though it is not a qualifying feature. Modelled at-sea breeding season distribution for this species indicates that generally speaking the study area is unimportant for this species at this time of year, since it lies outside the 95% utilisation distribution (Cleasby *et al.*, 2018; Wakefield *et al.*, 2017), though clearly, relatively high densities in the study area are possible.

111. During the non-breeding season (September to February (Furness, 2015)), guillemot densities were <5 birds per km^2; birds recorded in the study area at this time of year form part of the UK Western Waters BDMPS (Furness, 2015), which the study area is within.

112. Razorbills were recorded at lower densities across the study area, with a clear peak during the non-breeding season (August to March (Furness, 2015)) in December 2020 and January 2021 of 2 to 2.5 birds per km^2. These birds belong to the UK Western Waters BDMPS (Furness, 2015). During the breeding season (April to July (Furness, 2015)), study area densities were low; <0.2 birds per km^2. It is possible that these birds were associated with colonies at Skomer, Skokholm and the Seas off Pembrokeshire SPA, or smaller colonies located on the north Cornwall coast. As per guillemot, modelled at-sea breeding season distribution for this species indicates that generally speaking the study area is unimportant for this species at this time of year, since it lies outside the 95% utilisation distribution (Cleasby *et al.*, 2018; Wakefield *et al.*, 2017).

113. Puffin densities within the study area were also low; maximum recorded densities were 0.3 birds per km^2 during the non-breeding season (mid-August to March (Furness, 2015)) in November 2020, and 0.13 birds per km^2 during the breeding season (April to early August (Furness, 2015)) in May 2021. During the non-breeding season, birds present belong to the UK Western Waters BDMPS (Furness, 2015). During the breeding season, birds are likely to originate from Lundy, where 375 individuals were recorded during the 2017 breeding season.

114. Gannets were encountered on all 12 surveys for which information was available. Peak densities were recorded during the breeding season (March to September (Furness, 2015)), with up to 3 birds per km^2 recorded across the study area. Outside the breeding season, densities fell to below 1 bird per km^2. Birds recorded during the breeding season will likely have been associated with the Grassholm SPA, for which gannet is a qualifying feature. This is based on modelled at-sea breeding season distribution (Wakefield *et al.*, 2013), as well as the relative proximity of known breeding colonies to the study area. Outside the breeding season, birds will belong to the UK Western Waters BDMPS (Furness, 2015).

115. Kittiwakes occurred in peak density in the early part of their spring migration (January 2021; 6 birds per km^2). Birds present during the non-breeding season (September to February (Furness, 2015)) form part of the UK Western waters plus Channel BDMPS (Furness, 2015). Peak kittiwake densities were substantially lower during the breeding season (March to August (Furness, 2015)), with a peak of 0.6 birds per km^2 in March 2021). This indicates that the study area is of limited importance for this species during the breeding season, which is supported by modelled at-sea breeding season distribution of this species showing that parts of the study area fall within the 95% utilisation distribution, but not within hotspot areas (Cleasby et al., 2018; Wakefield *et al.*, 2017).

116. Herring gull were recorded in peak densities of 0.69 birds per km^2 during the breeding season (March to August (Furness, 2015)) in June 2021, and 0.52 birds per km^2 during the non-breeding season (September to February (Furness, 2015)) in December 2020. During the breeding season, birds may have originated from a number of colonies including Lundy, smaller colonies on the north Devon and Cornwall coast, or the Skomer, Skokholm and the Seas off Pembrokeshire SPA. Herring gull is not a qualifying feature of this SPA. During the non-breeding season, birds recorded in the study area belong to the UK Western Waters BDMPS (Furness, 2015).

117. Two other gulls species were recorded in the study area during the breeding and non-breeding seasons at low density during the first year of baseline surveys:

- Great black-backed gull were present at densities of 0.1 birds per km^2 during the breeding season (late March to August (Furness, 2015)) in June 2021, and 0.4 birds per km^2 during the non-breeding season (September to March (Furness, 2015)) in December 2020
- Lesser black-backed gull were recorded at peak densities of 0.07 birds per km^2 during the breeding season (April to August (Furness, 2015)) in May 2021, and 0.4 birds per km^2 during the non-breeding season (September to March (Furness, 2015)) in December 2020. No lesser black-backed gulls were recorded within the Project itself; all records were located within the 4km buffer

118. Fulmars were recorded in the study area in seven of the 12 monthly surveys for which data were available, encompassing both breeding (January to August) and non-breeding (September to December) periods for this species (Furness, 2015). Densities were generally low; around 0.2 birds/km^2 or less for all months except one. During this month (December 2020), the density was 1.83 birds/km^2.

119. Sandwich tern and common tern were both recorded in the study area on a single occasion during the first 12 baseline surveys. The Sandwich tern record consisted of a single bird (density of 0.02 birds/km^2) recorded in September (autumn passage; (Furness, 2015)), whilst the common tern record consisted of four individuals and occurred in August (density of 0.09 birds/km^2. Whilst this is within the full breeding season for common tern, it also falls within the autumn passage period (Furness, 2015).

120. In addition to the offshore ornithology receptors identified to species level and reported above, a further nine species groups were identified. These were common or Arctic ("commic") tern, auk or shearwater, auk, black-backed gull, large gull, shearwater, small gull, storm-petrel and tern.

4.1.6 Migratory Fish

121. The variable seabed conditions across the southwest coast of England and Wales support a number of ecologically important fish and shellfish species. The Project area overlaps or is in close proximity to a number of fish spawning and nursery grounds for sandeel, sole (*Solea solea*), plaice (*Pleuronectes plattessa*), cod (*Gadhus morhua*), whiting (*Merlangius merlangus*), mackerel (*Scomber scombrus*), and ling (*Molva molva*). It is noted that herring spawning grounds, while not overlapping the Project site, are in the vicinity to the southwest of the Project (Coull *et al*. 1998). The wider Celtic Sea area also supports populations of elasmobranchs (sharks, skates and rays), including basking sharks and thornback ray.

122. The Devon and North Cornwall coast is a historically important nursery ground for juvenile edible crabs (Pawson and Robson, 1996). Alongside edible crab (*Cancer pagurus*), lobster (*Homarus gammarus*), and spider crabs (*Maja squinado*) are

found along most of the exposed or rocky shorelines of the region. Spiny lobster (*Palinurus elephas*) has been recorded around Lundy and the adults are likely to be associated with rocky and stony seabed habitats. Brown shrimp (*Crangon crangon*) are found in the area but are more common in sandier estuaries.

123. Mussels (*Mytilus edulis*) occur from the mid-shore to the sub-tidal zone on all areas exposed to currents along the costs of the region, attaching themselves to bedrock, sand, gravel or pebble substrata. Exploitable populations of mussel are recorded in the Taw-Torridge estuary (Pawson and Robson, 1996). Ocean quahog (*Arctica islandica*) may occur in the Project area; however, densities of the bivalve are much lower on the Devon and north Cornwall coast compared to the south Cornwall coast (Pawson and Robson, 1996). Cuttlefish (*Sepia officinalis*) are largely concentrated in the centre of the western channel over winter and move into coastal areas of the region to spawn during spring/summer. Squid are also found offshore seasonally moving into the coastal waters of the region to spawn during the spring (Pawson and Robson, 1996).

124. UK and European marine waters have been designated for or support populations of the following Annex II fish species:

- twaite shad *Alosa fallax*
- allis shad *Alosa alosa*
- Atlantic salmon *Salmo salar*
- sea lamprey *Petromyzon marinus*
- river lamprey *Lampetra fluviatilis*

125. Atlantic salmon have a widespread distribution in UK coastal seas and are present in the rivers which drain into the Bristol channel (Aprahamian and Robson, 1996). The Taw-Torridge estuary is also a known salmon and river (Environment Agency, 2019). The Bristol Channel and Severn Estuary also contain the only viable population of allis shad and twaite shad in UK waters, in addition to populations of river lamprey and sea lamprey (Aprahamian and Robson, 1996). However, it is noted that the only recent record of spawning allis shad was in the Tamar Estuary but rivers in the Severn catchment may no longer support viable breeding populations (Carstairs, 2000). It is possible therefore that these Annex II fish species may be present in the Project area.

126. European eel (*Anguilla anguilla*) have a widespread distribution in UK coastal seas and are present in the rivers which drain into the Bristol channel (Aprahamian and Robson, 1996). Although European eel are not designated under the Habitats Directive, they are protected species under the Ramsar Convention and European eel are therefore being considered within this HRA screening.

127. Sites designated for Annex II diadromous fish comprise estuaries, through which fish migrate and the freshwater reaches of rivers, which provide spawning grounds. There are no SACs designated for Annex II species surrounding the Project or within a 10km radius of the Project AoS. However, as there have been Annex II fish species recorded in the Bristol Channel and Severn Estuary, and the Taw-Torridge estuary which overlaps the site there is potentially for those migratory fish species to overlap with the Project. These species include Atlantic salmon, allis shad, twaite shad, river lamprey and sea lamprey.

5. Consideration of Likely Significant Effect (LSE)

5.1 Introduction

128. The following sub-sections present the consideration of LSE on the European sites, within the zones of influence of the Project, on the various habitats and species as described in **Section 3.3**.

5.2 Annex I Habitats (and associated designated floral or faunal species)

129. **Table 5.1** presents the European sites that are located within the Project AoS and a buffer zone of 10km offshore and 2km onshore, along with the designated features.

Table 5.1 European sites designated for Annex I habitat features (and Annex II species that are a designated feature of the site)

Designated site	Distance from Project	Designated features
Braunton Burrows SAC	0km. Overlaps the AoS for the offshore export cable corridor	2120 "Shifting dunes along the shoreline with *Ammophila arenaria* (""white dunes"")"; 2130 "Fixed coastal dunes with herbaceous vegetation (""grey dunes"")"; 2170 Dunes with *Salix repens* ssp. *argentea Salicion arenariae*; 2190 Humid dune slacks; 1140 Mudflats and sandflats not covered by seawater at low tide; 1395 Petalwort.
Tintagel-Marsland-Clovelly Coast SAC	0km. Overlaps the AoS for the offshore export cable corridor	1230 Vegetated sea cliffs of the Atlantic and Baltic Coasts; 91A0 Old sessile oak woods with Ilex and Blechnum in the British Isles; 4030 European dry heaths.
Lundy SAC	1km from AoS for the offshore export cable corridor	1170 Reefs; 1110 Sandbanks which are slightly covered by sea water all the time; 8330 Submerged or partially submerged sea caves; 1364 Grey seal (*Halichoerus grypus*).

5.2.1 Braunton Burrows SAC

Direct Habitat Loss

130. The Project AoS covers Braunton Burrows SAC. Any cable route or landfall within or through the SAC could result in presence of manmade structures (such as extant manhole covers) and therefore direct loss of habitat features (depending on location within the site) for which the site is designated. No structures are expected to be standing above the seabed thus limiting the potential for loss of or alteration to habitat in the nearshore during the operation phase. However, at this stage there is uncertainty over the potential exposure of buried cable during the lifetime of the project and consequently at this stage a potential remains for exposure of cable to occur and thus resulting loss of habitat. As such a likely significant effect could arise, therefore this site is screened in for this impact during operation on all of the designated features of the site.

Disturbance to Habitats

131. The Project AoS covers Braunton Burrows SAC. Any cable route or landfall within the SAC could result in disturbance and/or alteration to the habitats during construction, operation, and decommissioning phases, which could impact on the extent, physical structure, diversity, community structure and typical species representative of the habitat features for which the site is designated. As such a likely significant effect could arise, therefore this site is screened in for this impact during construction and operation on all of the designated features of the site.

Alteration to Habitats

132. The presence of construction (and decommissioning) infrastructure (such as jack-up barges, vessels and cable installation works) has the potential to result in temporary localised (i.e. within a few tens of metres) influences on the hydrodynamic regime. Whilst localised these influences could extend into the SAC and impact on the mudflat, sandflat, and shoreline dune habitats. This could impact on the extent, physical structure, diversity, community structure and typical species representative of these habitats. As such a likely significant effect could arise, therefore this site is screened in for this impact on these designated features of the site.

133. Whilst no structures are expected to be standing above the seabed within the SAC during operation, exposure of cable could result in further hydrodynamic change, which though localised could impact on or extend into the SAC and impact on the mudflat, sandflat, and over time the shoreline dune habitats. This could impact on the extent, physical structure, diversity, community structure and typical species representative of these habitats. As such a potential likely significant effect could arise, therefore this site is screened in for this impact on these designated features of the site.

134. Installation of the export cable (and any seabed disturbance works during decommissioning) will disturb the seabed and lead to an increase in suspended sediment concentrations in the water column. The scale of this disturbance will vary depending on the substrate and scale of the activity. However, this could result in changes within the mudflat and sandflat habitat in the nearshore. This could impact on the extent, physical structure, diversity, community structure and typical species representative of these habitats. As such a likely significant effect could arise, therefore this site is screened in for this impact on these designated features of the site.

135. During the operation phase, exposure of the cable and subsequent hydrodynamic change could result in localised increase in the re-suspension of sediments in the water column. Whilst the scale of this disturbance will vary depending on the substrate and scale of the erosion this could result in changes within the mudflat and sandflat habitat in the nearshore. This could impact on the extent, physical structure, diversity, community structure and typical species representative of these habitats. As such a potential likely significant effect could arise, therefore this site is screened in for this impact on these designated features of the site.

136. The construction process has the potential to result in the re-suspension into the water column of contaminated sediments or the release of chemicals used during the construction process. These could impact directly or indirectly on the habitats and result in changes to the extent, physical structure, diversity, community structure and typical species representative of these habitats for which the site is designated. As such a likely significant effect could arise, therefore this site is screened in for this impact on all of the designated features of the site.

5.2.2 Tintagel-Marsland-Clovelly Coast SAC

Direct Habitat Loss

137. The Project AoS covers part of the Tintagel-Marsland-Clovelly Coast SAC. Any cable route or landfall within or through the SAC could result in presence of manmade structures (such as extant manhole covers) and therefore direct loss of habitat features (depending on location within the site) for which the site is designated. As such a likely significant effect would arise, therefore this site is screened in for this impact on all of the designated features of the site.

Disturbance to Habitats

138. The Project AoS covers part of the Tintagel-Marsland-Clovelly Coast SAC. Any cable route or landfall within the SAC could result in disturbance and/or alteration to the habitats during construction and decommissioning, which could impact on the extent, physical structure, diversity, community structure and typical species representative of the habitat features for which the site is designated. As such a

likely significant effect could arise, therefore this site is screened in for this impact on all of the designated features of the site.

139. No disturbance activities will occur along the cable route in the operation phase as the cable will be buried, therefore no impact could occur on the habitats for which the site is designated. Therefore the site is screened out for operational disturbance to all of the designated features of the site.

Alteration to Habitats

140. There is a risk of accidental or incidental discharges of liquids or solids within the site during construction and decommissioning if the cable route and landfall occur within or adjacent to the site. These discharges could affect flora and fauna associated with the designated features of the site, resulting in the potential alteration to the extent, physical structure, diversity, community structure and typical species representative of these habitats. As such a potential likely significant effect could arise, therefore this site is screened in for this impact on all of the designated features of the site.

141. There are no identified activities that could result in the risk of accidental or incidental discharges of liquids or solids within the site during operation, and no impact could occur on the habitats for which the site is designated. Therefore the site is screened out for operational pollutant discharges to all of the designated features of the site.

142. The construction and decommissioning activities could result in changes to landform which could impact on drainage and surface water flow, resulting in the potential alteration to the extent, physical structure, diversity, community structure and typical species representative of these habitats. As such a potential likely significant effect could arise, therefore this site is screened in for this impact on all of the designated features of the site.

143. Ground disturbance during construction and (less so for) decommissioning could result in the remobilisation of contaminated sediments. Whilst unlikely within the site the potential remains as no evidence of absence has been identified. Re-mobilised contaminants could affect flora and fauna associated with the designated features of the site, resulting in the potential alteration to the extent, physical structure, diversity, community structure and typical species representative of these habitats. As such a potential likely significant effect could arise, therefore this site is screened in for this impact on all of the designated features of the site.

5.2.3 Lundy SAC

144. Grey seal are considered in **Section 5.2.3**, therefore this section considers the reefs, sandbanks which are slightly covered by sea water all the time, and submerged or partially submerged sea caves habitats and associated communities.

Direct Habitat Loss

145. The Project AoS is 1km from the site boundary. There will be no cable route or activity within or through the SAC therefore no habitat loss will occur for any of the designated features for which the site is designated. As such the site is screened out for construction operation, or decommissioning related habitat loss to all of the designated features of the site.

Disturbance to Habitats

146. The Project AoS is 1km from the site boundary. There will be no cable route or activity within or through the SAC therefore no direct or indirect physical disturbance to habitats will occur for any of the designated features for which the site is designated. As such the site is screened out for construction, operation, or decommissioning related habitat disturbance to all of the designated features of the site.

Alteration to Habitats

147. The presence of construction (and decommissioning) infrastructure (such as jack-up barges, vessels and cable installation works) has the potential to result in temporary localised (i.e. within a few tens of metres) influences on the hydrodynamic regime. It is not likely given the highly localised scale of these influences that an impact could extend into the SAC 1km away (as a minimum) and impact on the habitat features for which the site is designated. As such the site is screened out for alteration to habitat from hydrodynamic change during construction or during and after decommissioning for all of the designated features of the site.

148. Whilst no structures are expected to be standing above the seabed, exposure of cable or rock protection (or other forms of protection) could result in hydrodynamic change, which though localised could potentially extend into the SAC and impact on the habitats for which the site is designated. This could impact on the extent, physical structure, diversity, community structure and typical species representative of these habitats. As such a potential likely significant effect could arise, therefore this site is screened in for this impact on these designated features of the site.

149. Installation of the export cable, or any seabed disturbance during decommissioning, will disturb the seabed and lead to an increase in suspended sediment concentrations in the water column. The scale of this disturbance will vary depending on the substrate and scale of the activity, and thus whether they will extend into the SAC. However, this could result in changes within the habitats for

which the site is designated. This could impact on the extent, physical structure, diversity, community structure and typical species representative of these habitats. As such a likely significant effect could arise, therefore this site is screened in for this impact on all of the designated features of the site.

150. During the operation phase, exposure of the cable or presence of rock armour or other forms of cable protection could result in hydrodynamic change and subsequent localised increase in the re-suspension of sediments in the water column. Whilst the scale of this disturbance will vary depending on the substrate and scale of the erosion this could extend into and result in changes within the habitats for which the site is designated. This could impact on the extent, physical structure, diversity, community structure and typical species representative of these habitats. As such a potential likely significant effect could arise, therefore this site is screened in for this impact on these designated features of the site.

151. The construction and decommissioning process have the potential to result in the re-suspension into the water column of contaminated sediments or the release of chemicals used during the construction process. These could extend into and impact indirectly (where they are driven across the site by tidal currents and waves) on the habitats for which the site is designated and result in changes to the extent, physical structure, diversity, community structure and typical species representative of these habitats. As such a potential likely significant effect could arise, therefore this site is screened in for this operational phase impact on all of the designated features of the site.

5.2.4 Transboundary European sites

152. Given that the Project AoS and a conservative buffer zone to account for indirect pathways to transboundary European sites designated for Annex I habitats and associated Annex II species (excluding ornithology, marine mammals, and migratory fish) are in excess of 30km distance, all other possible sites in other countries are considered to be too geographically distant for a potential LSE to arise on their qualifying features. Therefore, transboundary impacts sites designated for Annex I habitats have been screened out.

5.3 Annex II Species - Marine mammals

153. The key factors that will be considered during the HRA screening process for marine mammals are:

- Potential effects (source)
- Proximity of source to feature (distance between the proposed development and SACs, migration routes) (pathway and receptor)

5.3.1 Potential Effects (Source)

154. The potential effects during the construction, operation, maintenance and decommissioning phases are outlined below, and summarised in **Table 5.2**.

Table 5.2 Summary of potential effects to marine mammals screened into HRA

Potential Effects	Construction	O&M	Decommissioning
Underwater noise including barrier effects (all potential sources during operation, O&M and decommissioning)	✓	✓	✓
Collision risk with vessels	✓	✓	✓
Entanglement	x	✓	x
Disturbance at seal haul-out sites	✓	✓	✓
Barrier effects due to the physical presence of offshore infrastructure	x	✓	x
Changes in water quality	x	x	x
Changes to prey availability	✓	✓	✓
EMF (direct effects)	x	x	x
In-combination effects from underwater noise	✓	✓	✓
In-combination effects from collision risk and entanglement	✓	✓	✓
In-combination effects from disturbance at seal haul-out sites	✓	✓	✓
In-combination effects to prey availability (including habitat loss)	✓	✓	✓
Transboundary effects	✓	✓	✓

155. In addition, the potential for cumulative and transboundary effects between effects for the Project will also be determined and assessed.

156. **Table 5.2** presents potential effects during construction, operation and maintenance (O&M), and decommissioning considered in the HRA process.

Potential effects during construction

157. The potential effects for marine mammals during construction that are screened in for Likely Significant Effect (LSE) are:

- Underwater noise
- Vessel interaction
- Disturbance at seal haul-out sites

- Change to water quality
- Changes to prey resources

Underwater noise

158. The key potential effects during construction for marine mammals are expected to be those from underwater noise, which has the potential for the following effects:

- Physical injury
- Permanent auditory injury / permanent loss of hearing sensitivity (Permanent Threshold Shift (PTS))
- Temporary auditory injury / temporary loss in hearing sensitivity (Temporary Threshold Shift (TTS))
- Disturbance and behavioural effects
- Effects on prey species
- Barrier effects

159. Activities that have the potential to generate underwater noise associated with the construction of the Project are:

  - Clearance of unexploded ordnance (UXO), if required, at the Project site and along the cable route
  - Piling of the pin-piles for the Offshore Substation
  - Installation of foundations (depending on method used) for the Offshore Substation
  - Other construction activities such as seabed preparation, cable laying and rock placement
  - Vessels

160. Site specific underwater noise modelling will be undertaken for all potential noise sources that could affect marine mammals.

161. The potential effects associated with underwater noise are screened in and will be assessed in the HRA, taking into account the most recent and robust research, guidance and information available.

162. A Marine Mammal Mitigation Protocol (MMMP) will be produced to reduce the risk of physical injury or permanent auditory injury (PTS) in marine mammals from underwater noise.

Vessel Interaction

163. Despite the potential for marine mammals to detect and avoid vessels, ship strikes are known to occur (Wilson *et al.,* 2007). An increase in vessels could potentially lead to an increase in vessel collision risk. Therefore, the potential for interactions / an increase in collision risk with construction vessels during the construction phase is also screened in for LSE.

164. The increased risk of collision with marine mammals will be assessed further in the HRA, taking into account the most recent and robust research, guidance and information available.

Disturbance at Seal Haul-Out Sites

165. Increased activity near to land, including vessel and human activity, could have the potential to disturb seals at nearby haul-out sites, particularly during sensitive periods, such as the breeding season and moult period.

166. Disturbance from vessel transits to and from the Project and the local port also has the potential to disturb seals at haul-out sites, depending on the route and proximity to the haul-out sites. Depending on the landfall selected and the vessel routes, there is the potential for disturbance at seal haul-out sites (i.e. at the nearby Lundy Island). The potential for disturbance at seal haul-out sites has been screened in and will therefore be assessed further in the HRA, taking into account finalised export cable corridors.

167. The potential for any disturbance of seals from haul-out sites foraging at sea has also been screened in and will be assessed further in the HRA.

Changes to Water Quality

168. The increases in suspended sediments and for the accidental release of contamination during construction has the potential to effect marine mammals and their prey. Any changes to water quality would be localised and short lived, and the potential for any effects from changes in water quality on marine mammals or their prey is expected not to be significant.

169. Potential effects related to changes in water quality have the potential for LSE, and are therefore screened in for assessment. The assessment will be based on the assessments for potential water quality changes, including the potential for suspended sediments, and the release of contaminants, including the management measures that will be put in place.

Changes to Prey Resource

170. The potential effects on fish species and therefore the prey resource for marine mammals during construction can result from:

- Physical disturbance and temporary habitat loss of seabed habitat, spawning or nursery grounds or migration
- Permanent habitat loss
- Increased suspended sediments and sediment re-deposition
- Re-mobilisation of contaminated sediment
- Underwater noise effects to hearing sensitive species during pile driving and other activities (vessels, seabed preparation, cable installation etc)

- Introduction of anchors, foundations, scour protection and hard substrate and associated fish aggregation
- Cumulative effects from underwater noise, permanent habitat loss, and changes to seabed habitat

171. Therefore, the potential for any changes to the prey resource for marine mammals during construction will screened in.

Potential effects during operation

172. The potential effects for marine mammals during operation and maintenance (O&M) with the potential for LSE:

- Underwater noise
- Entanglement
- Vessel interaction
- Disturbance at seal haul-out sites
- Physical barrier effects
- Changes to water quality
- Electromagnetic Fields (EMFs)
- Changes to prey resources

Underwater Noise

173. Potential sources of underwater noise during the operation and maintenance phase include:

- Operational noise from WTGs and from movement of floating turbine moorings on the seabed
- Maintenance activities, such as cable re-burial and any additional rock placement
- Operation and maintenance vessel activity

174. The potential for disturbance from underwater noise during the operation and maintenance phase will be based on the underwater noise modelling and assessment of similar activities for the construction phase. If suitable underwater noise data is not available for noise levels associated with the underwater noise from the floating operational turbines, then a suitable proxy such as dredging will be used.

175. The potential effects associated with underwater noise during operation and maintenance (including PTS, TTS, disturbance and behavioural effects, effects on prey species and barrier effects) have the potential for LSE, and will be considered further in the HRA, taking into account the most recent and robust research, guidance and information available.

Entanglement

176. Depending on the method used, there is the perceived potential for entanglement in the mooring systems for floating offshore wind turbines. To date, there have been no recorded instances of marine mammal entanglement from mooring systems of renewable devices (Sparling *et al.,* 2013; Isaacman and Daborn, 2011), or for anchored FPSO vessels in the oil and gas industry (Bejamins *et al.,* 2014) with similar mooring lines as proposed for floating turbine structures.

177. The level of risk to become entangled varies with species (Benjamins *et al.,* 2014), these varying factors include body size, flexibility of movement, the ability to detect mooring lines, and the feeding ecology of the species.

178. Toothed whales have a lower risk than baleen whales, primarily due to their small size and manoeuvrability. Seal species have a similar risk level to small, toothed cetaceans, with an increase in manoeuvrability.

179. Given the size and physical characteristics of the mooring systems required for floating OWF, it is unlikely that upon encountering them, a marine mammal of any size would become directly entangled in the moorings themselves (note that the mooring system will be under enough tension that no loops could be formed, as seen in fishing gear, will ever be formed to allow entanglement with the mooring system). Mooring systems in the offshore renewables industry typically have greater diameter (Benjamins *et al.,* 2014), compared to fishing gear, which has been identified as a major entanglement risk for whales (NMFS, 2018).Therefore, the greatest risk is most likely to be from indirect entanglement in anthropogenic debris, such as the lost, abandoned or discarded fishing gear and other marine debris, caught in the mooring lines.

180. The potential for entanglement has been screened in with the potential for LSE, taking into account the risk to each marine mammal species and the worst-case parameters for the mooring lines of the floating turbines.

Vessel Interaction

181. It is anticipated that the effects associated with vessel activities during operation and maintenance would be similar to, or less than those during the construction phase, due to the presence of a lower number of vessels. Therefore, as outlined for construction, the increased risk of collision with marine mammals will be given further consideration in the HRA, as there is the potential for LSE.

Disturbance at Seal Haul-Out Sites

182. As outlined for construction, depending on the vessel routes, there is the potential for disturbance at seal haul-out sites (i.e. at Lundy). As for construction, once the final offshore cable corridor and landfall locations are known, the potential for disturbance to seal haul-out sites will be reconsidered. If seal haul-out sites are not

identified within close proximity to the landfall, once the final landfall is selected, disturbance at seal haul-out sites will be screened out of further assessment.

183. However, it is anticipated that the effects associated with vessel activities during operation and maintenance would be similar to those during the construction phase, although the magnitude of effect (number of vessels) is likely to be lower, and there is the potential for LSE as a result of disturbance to seal haul-out sites.

Physical Barrier Effects

184. The presence of a windfarm could be seen as having the potential to create a physical barrier, preventing movement or migration of marine mammals between important feeding and / or breeding areas, or potentially increasing swimming distances if marine mammals circumvent the site.

185. Data from operational windfarms show no evidence of exclusion of marine mammals, including harbour porpoise and seals (for example, Diederichs *et al.,* 2008; Lindeboom *et al.,* 2011; Marine Scotland, 2012; McConnell *et al.,* 2012; Russell *et al*., 2014; Scheidat *et al.,* 2011; Teilmann *et al.,* 2006; Tougaard *et al.,* 2005, 2009a, 2009b). In addition, marine mammal species, including harbour porpoise and seals, have been known to forage within operational windfarm sites (with fixed foundation) (e.g. Lindeboom *et al.,* 2011; Russell *et al.,* 2014) indicating no restriction to movements.

186. As the spacing between moorings of the wind turbines is expected to be 1km, this would allow animals to move between devices and through the operational windfarm. In addition, the Project is not located on any known marine mammal migration routes.

187. However, as a precautionary approach, it is considered that there is the potential for LSE to marine mammals as a result of the physical presence of the windfarms. Note that the potential for any acoustic barrier effects as a result of underwater noise during construction will be included as part of the underwater noise assessment.

Changes to Water Quality

188. Potential effects related to changes in water quality have the potential for LSE. The assessment of effects will be based on the assessments for water quality changes, and the release of contaminants, including the management measures that would be put in place.

Direct effects of EMF

189. Studies indicate that magnetic fields decrease rapidly with vertical and horizontal distance from subsea cables and that the reduction is greater the deeper cables are buried (Normandeau *et al.,* 2011).

190. Although it is assumed that marine mammals are capable of detecting small differences in magnetic field strength, this is unproven and is based on circumstantial information. There is also, at present, no evidence to suggest that existing subsea cables influence cetacean movements.

191. Harbour porpoise are known to move in and out of the Baltic Sea, over several operating subsea cables in the Skagerrak and western Baltic Sea with no apparent effect to their migratory movements. There is also no evidence to suggest that seal species respond to EMF (Gill *et al.,* 2005). In addition, as outlined above, data from a number of operational windfarms show no evidence of exclusion of marine mammals, including harbour porpoise and seals. However, cables within a floating wind farm would not all be buried (with some floating), and therefore these studies may not be representative for the Project.

192. Therefore, as a precautionary approach, it is considered that there is the potential for LSE on marine mammal species as a result of EMF, and this will be screened in for further assessment in the HRA.

Changes to Prey Resource

193. There is the potential for LSE to marine mammal species, as a result of effects on prey species. The potential effects on fish species (therefore the prey resource for marine mammals) during operation and maintenance can result from:

- Permanent loss of habitat
- Introduction of hard substrate
- Underwater noise
- Maintenance activities
- EMF

194. The potential for any changes to the prey resource for marine mammals during operation and maintenance will be assessed further in the HRA.

Potential effects during decommissioning

195. It is anticipated that the decommissioning effects would be similar in nature to those of construction, although the magnitude of effect is likely to be lower depending on the method used during decommissioning.

196. Potential effects during decommissioning screened in for further assessment include:

- Physical and auditory injury and behavioural effects resulting from underwater noise
- Disturbance from vessels and barrier effects due to underwater noise
- Disturbance at seal haul-out sites and to foraging at sea
- Increase in risk of collision due to vessel interaction

- Changes to prey resource
- Changes to water quality

Potential in-combination effects

197. The in-combination assessment will identify where the predicted effects of the construction, operation, maintenance and decommissioning of the Project could interact with effects from different plans or projects within the same region and affect marine mammals.

198. The types of plans and projects to be taken into consideration are as listed in **Section 3.3.6**. Screening of the plans and projects will be considered based on the following key points:

- They are located in the relevant marine mammal MU
- There is the potential for cumulative effects during the construction, operational or decommissioning of the proposed Project

199. The marine mammal in-combination assessment will consider projects, plans and activities which have sufficient information available to undertake the assessment, and will include the potential effects of:

- Underwater noise
- Vessel interaction
- Changes to prey resources (including habitat loss)

Potential transboundary effects

200. There is a significant level of marine development being undertaken or planned by Ireland in the Irish Sea, and in the English Channel (by France). Populations of marine mammals are highly mobile and there is potential for transboundary effects especially when considering noise impacts.

201. Transboundary effects will be assessed, where possible, in consultation with developers in other Member States to obtain up to date project information to feed into the assessment.

202. The potential for transboundary effects will be addressed by considering the reference populations (MUs) and potential linkages to international designated sites as identified through telemetry studies for seals and ranges and movements of cetacean species.

203. The assessment of the effect on the integrity of the transboundary European sites as a result of effects on the designated marine mammal populations will be undertaken and presented in the information for the HRA.

204. Transboundary effects will also be considered within the in-combination assessment.

5.3.2 Connectivity with Designated Sites for Marine Mammals

205. The following sections describe the process used to define the list of sites for which there is possible connectivity and therefore potential for a source – pathway – receptor relationship for marine mammal qualifying SAC features, i.e. harbour porpoise, bottlenose dolphin, and grey seal.

Harbour Porpoise

206. For harbour porpoise, connectivity is considered potentially possible between the Project and any designated sites within the CIS MU (IAMMWG, 2021) where harbour porpoise are listed as a qualifying feature. Therefore, all designated sites outwith the CIS MU have been screened out from further consideration.

207. This HRA screening considers any designated sites within the harbour porpoise CIS MU, where the species is considered as a grade A, B or C feature. Grade D indicates a non-significant population (JNCC, 2009) and have therefore not been considered further.

208. **Appendix 1** provides the list of designated sites for harbour porpoise considered in the HRA screening.

209. As harbour porpoise are wide-ranging, no discrete population can be assigned to an individual designated site. It is, therefore, assumed that at any one time, harbour porpoise within or in the vicinity of the Project area are associated with the nearest SAC, the Bristol Channel Approaches SAC (as they cannot simultaneously be part of the population of multiple designated sites, although all are part of the larger MU population).

Bottlenose Dolphin

210. For bottlenose dolphin, connectivity is considered potentially possible between the Project site and any designated sites within the OCSW and IS MUs (**Figure 4.2;** IAMMWG, 2021) where bottlenose dolphin are listed as a qualifying feature. Therefore, all designated sites outwith these MUs have been screened out from further consideration.

211. This HRA screening considers any designated sites where bottlenose dolphin is considered as a grade A, B or C feature. Grade D indicates a non-significant population (JNCC, 2009) and have therefore not been considered further.

212. **Appendix 1** provides the list of designated sites for bottlenose dolphin considered in the HRA screening.

213. As a precautionary approach, it is assumed that all bottlenose dolphin in the vicinity of the Project are from the Cardigan Bay SAC, as this is the closest designated site within the relevant MUs.

Grey Seal

214. To take into account the wide range and movements of grey seal, all designated sites where grey seal are a qualifying feature in the Irish and Celtic Sea area, as well as the south coast of the Republic of Ireland, north-west coast of France, were considered. All designated sites out with this region were screened out from further consideration. For grey seal, the screening process includes any designated site where the species is a grade A, B or C feature.

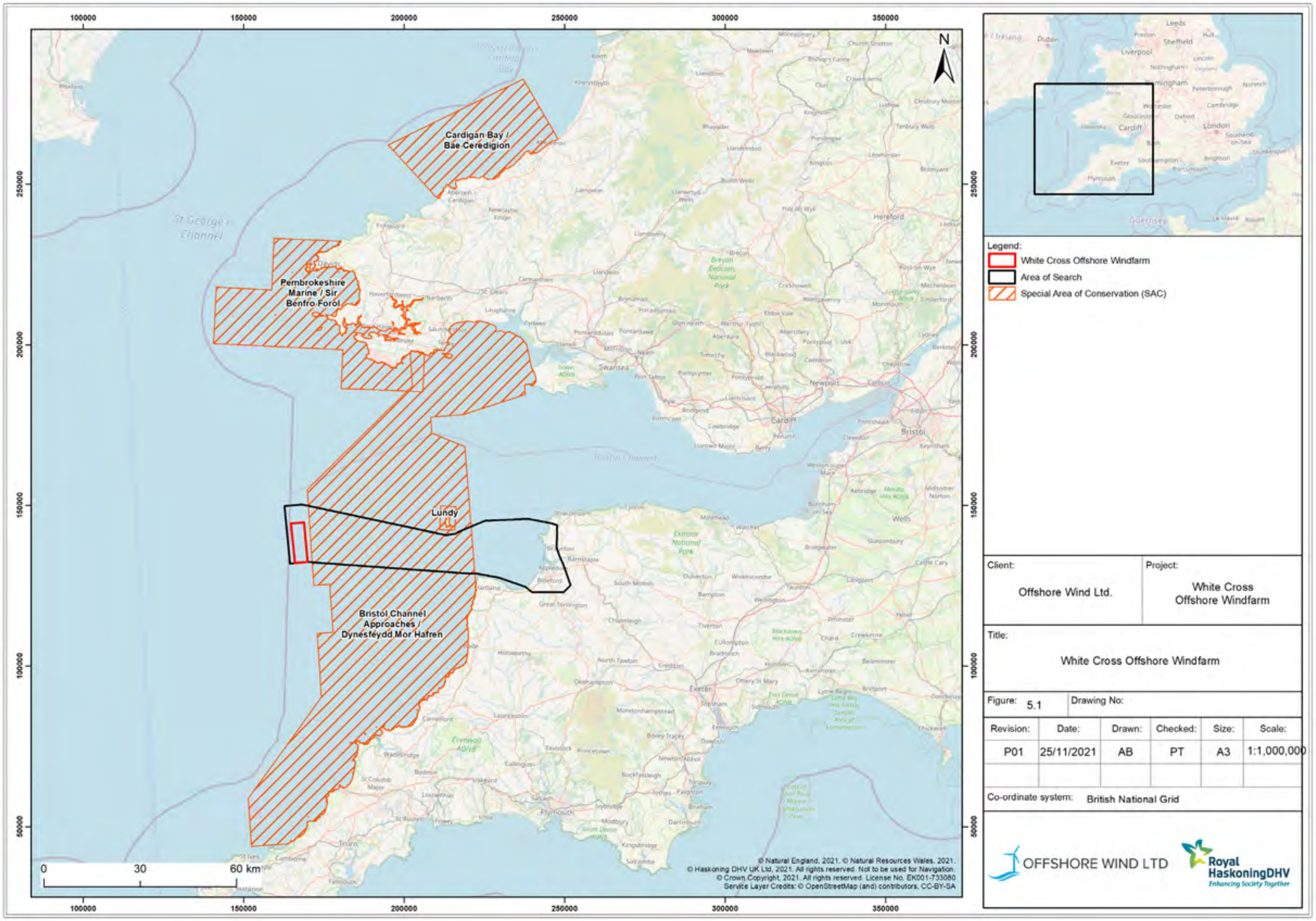
215. Grey seals could come from any of the designated sites considered to have potential connectivity, due to their large foraging ranges and movements (i.e. within the 100km foraging range of grey seals). As a result, it will be assumed within the assessments that any grey seal within the Project area, or within the potential disturbance ranges of the Project, could be from a designated site. Therefore, any potential effects to grey seal will be assessed based on them being from the nearest designated site, and they have travelled away from the site in order to forage.

216. The Lundy SAC and Pembrokeshire Marine SAC, both designated for grey seal, have been screened in for further assessment, taking into account the movements and forging ranges of grey seal, (see **Appendix 1**).

Sites Screened In for Marine Mammals

217. **Appendix 1** provides the screening assessment for all designated sites in the Celtic Sea area, with either harbour porpoise, bottlenose dolphin or grey seal listed as a qualifying feature with a population grade of A, B, or C, within the relevant screening areas. The sites screened in are shown on **Figure 5.1**.

Figure 5.1 European sites screened in for consideration with respect to Annex II marine mammals



5.4 Annex II Species - Ornithology

5.4.1 Potential Impacts

218. Screening of SPAs and Ramsar sites takes account of the potential effect(s) of the project on each qualifying feature, as listed below. Direct or indirect effects to offshore ornithology receptors in offshore waters may arise from temporary and permanent infrastructure and activities associated with the construction, operation and decommissioning of the project. Where an SPA/Ramsar site and qualifying species are screened in for LSE, the potential effect(s) that are relevant (e.g. where a species is considered vulnerable to collision) are also stated.

- In the construction phase
  - Impact 1: Disturbance and displacement covering work activity, vessel movements and lighting, as well as barrier effects due to presence of turbines and infrastructure (from erection of first turbines)
  - Impact 2: Indirect impacts through effects on habitats and prey species
- In the operational phase
  - Impact 3: Displacement and barrier effects due to presence of turbines and infrastructure, as well as disturbance and displacement covering work activity, vessel movements and lighting
  - Impact 4: Collision risk
  - Impact 5: Entanglement with lost fishing gear caught around mooring lines and cables
  - Impact 6: Indirect impacts through effects on habitats and prey species
- In the decommissioning phase
  - Impact 7: Disturbance and displacement covering work activity, vessel movements, lighting, as well as barrier effects due to presence of turbines and infrastructure (until final turbine is removed)
  - Impact 8: Indirect impacts through effects on habitats and prey species

5.4.2 Identification of Sites and Features for Screening

Seabirds: Breeding Season

219. The breeding season is the time of year when breeding adult seabirds are constrained to habitat within the foraging ranges of their colony. For offshore ornithology receptors within the foraging range of the Project, this is the time of year when they are most likely to be susceptible to effects due to the construction, operation and decommissioning of the Project. For SPAs for breeding seabirds, published information on breeding season foraging ranges (Woodward et al., 2019)

were used to establish the likelihood of connectivity between the qualifying features of the SPA and the Project. The published foraging ranges for the breeding seabird species considered by the HRA Screening, along with whether they were recorded in the study area (i.e. the Project plus 4km buffer) during the baseline surveys for which data were available are presented in **Table 5.3**.

Table 5.3 Mean maximum and maximum foraging ranges (Woodward et al., 2019) from breeding colonies for seabird species considered in the HRA screening for the Project

Species	**Recorded in study area during July 2020 to June 2021 baseline surveys**	**Mean maximum foraging range (km ± standard deviation)[1]**	**Maximum foraging range (km)**
Arctic skua *Stercorarius parasiticus*	No	N/A	N/A
Arctic tern *Sterna paradisaea*	No	25.7±14.8	46
Black-throated diver *Gavia arctica*	No	N/A	N/A
Common scoter *Melanitta nigra*	No	N/A	N/A
Common tern *Sterna hirundo*	Yes	18.0 (± 8.9)	30
Cormorant *Phalacrocorax carbo*	No	25.6±8.3	35
Fulmar *Fulmarus glacialis*	Yes	542.3 (± 657.9)	2,736
Gannet *Morus bassanus*	Yes	315.2 (± 194.2)	709
Great black-backed gull *Larus marinus*	Yes	73 (no s.d.)	73
Great skua *Stercorarius skua*	No	443.3±487.9	1,003
Guillemot *Uria aalge*	Yes	73.2 (± 80.5)	338
Herring gull *Larus argentatus*	Yes	58.8 (± 26.8)	92
Kittiwake *Rissa tridactyla*	Yes	156.1 (± 144.5)	770
Leach's petrel *Oceanodroma leucorhoa*	No	N/A	N/A
Lesser black-backed gull *Larus fuscus*	Yes	127.0 (± 109)	533
Little tern *Sternula albifrons*	No	5 (no s.d.)	5
Manx shearwater *Puffinus puffinus*	Yes	1,346.8 (± 1,018.7)	2,890
Puffin *Fratercula arctica*	Yes	137.1 (± 128.3)	383
Razorbill *Alca torda*	Yes	88.7 (± 75.9)	313
Red-throated diver *Gavia stellata*	No	9 (no s.d.)	9

Species	Recorded in study area during July 2020 to June 2021 baseline surveys	Mean maximum foraging range (km ± standard deviation)[1]	Maximum foraging range (km)
Roseate tern *Sterna dougallii*	No	12.6±10.6	24
Sandwich tern *Thalasseus sandvicensis*	Yes	34.3 (± 23.2)	80
Shag *Phalacrocorax aristotelis*	No	13.2±10.	46
Storm Petrel *Hydrobates pelagicus*	No	336 (no s.d.)	336
[1]the mean maximum foraging range is the mean of the maximum foraging ranges recorded from each breeding colony for which foraging range data were available (Woodward *et al.*, 2019).			

220. The mean maximum foraging range for a species is generally considered to be the most appropriate measure in identifying spatial overlap between an OWF and the probable foraging grounds of a breeding seabird colony. It is therefore used to establish whether there is connectivity between the colony and the habitat where the OWF is located. Breeding seabird species which are qualifying features of SPAs and Ramsar sites within the species-specific mean maximum foraging range of the Project, and which were recorded in the survey area during the breeding season, are screened in. The exception is where there is a justifiable biological reason for them being screened out. The primary reason for this is the availability of information which suggests that kittiwakes, gannets and guillemots from a given colony would be unlikely to occur at the Project due to parapatric competition. This means that the foraging areas of birds from different colonies do not tend to overlap (Cleasby *et al*., 2020, 2018; Wakefield *et al.*, 2017, 2013). Any qualifying feature screened in for breeding season impacts is automatically screening in for non-breeding season impacts.

221. The AoS for SPAs for which connectivity with the Project could exist during the breeding season was the area roughly covered by Western Waters BDMPS's; from around the Isles of Scilly, up the west coast of the UK, as far north and east as the Orkney Isles.

222. Whilst species within the mean maximum foraging range which were not recorded during the first 12 months of surveys are currently screened out, these conclusions will be assessed again once the full baseline dataset is available.

223. Several species that are breeding qualifying features of several SPAs under consideration are highly unlikely to be at risk of impacts as a result of the Project during construction, operation, or decommissioning. This may be because regular

migration is not undertaken by either the entire population, or the majority of it, and/or because the feature is simply considered highly unlikely to occur at the Project in sufficient numbers for LSE to be possible. These are chough *Pyrrhocorax pyrrhocorax*, Dartford warbler *Sylvia undata*, Fair Isle wren *Troglodytes troglodytes fridariensis*, golden eagle *Aquila chrysaetos*, peregrine *Falco peregrinus*, short-eared owl *Asio flammeus* (with the exception of the qualifying feature of the Sgomer, Sgogwm a Moroedd Penfro / Skomer, Skokholm and the Seas off Pembrokeshire, which is located near enough to the Project for the feature to be screened in), and red kite *Milvus milvus*. As a result, there is no mechanism by which the Project could impact these species. For this reason, they are not considered further by the assessment and do not appear in the main screening tables (**Appendix 2** and **Appendix 3**).

Seabirds: Non-breeding Season

224. Outside the breeding season seabirds are unconstrained by requirements to attend nests, and disperse over much greater distances than breeding season foraging ranges from their colonies allow. During the non-breeding season, breeding adults from SPA colonies which are more distant from the Project may utilise habitats in and around the Project, meaning that they are at risk of impacts during construction, operation and/or decommissioning, which would not have presented such a risk during the breeding season. These breeding adults are assumed to mix evenly with non-breeding birds which may be immature or sub-adults (most seabirds take several years to reach breeding age so that large proportions of the populations are sub-adult). In turn, this population is then assumed to mix evenly with seabirds from other colonies. BDMPS and total population estimates for UK seabirds outside the breeding season are described by Furness (2015), along with approximate seasonal movement patterns. BDMPS areas are extensive and overall population sizes for individual species are generally large, consisting of the combined populations of many seabird colonies from both the UK and overseas.

225. For most seabird species, there are two general BDMPS regions defined within UK waters, the main division being between the North Sea and western waters. For some species, however, there are up to five BDMPS regions (Furness, 2015).

226. For seabird species covered by Furness (2015), the non-breeding season BDMPS region was used to identify the AoS for UK SPAs and Ramsar sites with potential connectivity with the Project. For these species, the contributions of UK (SPA and non-SPA) and overseas populations to the relevant BDMPS, from Furness (2015), was used to estimate the proportion of the peak seasonal population at the Project that would comprise breeding adults from a given SPA, and the percentage of the SPA population estimated to be present at the Project during the non-breeding season. These are presented in **Table 5.4**. BDMPS region totals for some species

differ seasonally (e.g. some species have different totals for autumn and spring passage periods and winter periods); therefore, where the contribution of a given SPA population towards the BDMPS total varies by season, the highest value is reported.

227. As a conservative approach, potential connectivity has been assumed for any SPA population which contributes to 1% or more of the BDMPS region total, and therefore 1% or more of the birds recorded at the Project during all or part of the non-breeding season. These populations, which are coloured in red in the table, are included in the main screening table (see **Appendix 2**), and for completeness, are assessed during the breeding and non-breeding season, along with other qualifying features of the SPA in question. Those populations where the 1% threshold is not met are not considered further by the assessment and do not appear in the main screening table (see **Appendix 2**).

Migratory birds other than seabirds

228. In addition to seabirds, other offshore ornithology receptors that migrate across areas of open sea may encounter the Project and be at risk of collision if they fly through the turbine array, or barrier effects if they avoid the turbine array. No such species were detected during the first 12 baseline surveys. However, as with surveys at all OWFs in UK waters, the design of the baseline surveys is such that the numbers of a given migratory species passing through a site may be underestimated or undetected. This is because non-seabird species may migrate across offshore areas in large numbers over relatively restricted time periods (a few days or weeks), at high altitude and/or at night. It is therefore likely that the majority of migratory species passing through an offshore area will not be captured by monthly surveys during daylight hours.

Table 5.4 SPA population contributions to the relevant BDMPS population total (%)

SPA	Manx shearwater	Guillemot	Razorbill	Puffin	Gannet	Lesser black-backed gull	Herring gull	Great black-backed gull	Kittiwake	Fulmar	Sandwich tern	Common tern
Ailsa Craig		1.6			16.4	0.2	0.2		0.2			
Alde-Ore Estuary						0.1	0.0					
Bowland Fells						5.2						
Breydon Water												0.1
Buchan Ness to Collieston Coast							0.0		1.7	0.1		
Calf of Eday		0.1							0.1	0.1		
Canna and Sanday		1.1		0.1			0.1		0.3			
Cape Wrath		7.8	1.1	0.2					3.4	0.8		
Carlingford Loch												0.5
Copinsay		0.1							0.1	0.1		
Coquet Island				0.7								1.4
Cromarty Firth												0.1
Dungeness to Pett Level												0.1
East Caithness Cliffs			0.2	0.0			0.0		5.6	1.1		
Fair Isle		0.1	0.0	0.7	0.6		0.0		0.1	2.4		
Farne Islands				2.4					0.5			0.1
Fetlar										0.7		
Flamborough and Filey Coast			0.1	0.1	1.8				5.2	0.1		
Flannan Isles		2.8	0.6	2.1					0.5	2.6		
Forth Islands			0.0	3.7	9.1	0.1	0.0		0.4	0.1		0.0
Foula		0.2	0.0	1.5					0.0	1.6		
Foulness												0.0
Fowlsheugh			0.1				0.0		1.3	0.0		

SPA	Manx shearwater	Guillemot	Razorbill	Puffin	Gannet	Lesser black-backed gull	Herring gull	Great black-backed gull	Kittiwake	Fulmar	Sandwich tern	Common tern
Glannau Aberdaron ac Ynys Enlli / Aberdaron Coast and Bardsey Island	3.3											
Glas Eileanan												0.1
Grassholm					23.7							
Handa		10.8	2.8						0.6	0.7		
Hermaness, Saxavord and Valla Field		0.0		1.6	4.0				0.1	0.6		
Hoy		0.1		0.2					0.0	1.6		
Imperial Dock Lock Leith												1.1
Isles of Scilly						5.4		18.1				
Larne Lough											6.9	0.9
Lough Neagh and Loch Beg						0.6						0.3
Marwick Head		0.1							0.1			
Mingulay and Berneray		3.8	5.5	0.4					0.7	3.3		
Morecambe Bay and Duddon Estuary						5.7	3.1				0.1	
Morwenoliaid Ynys Môn / Anglesey Terns												0.7
North Caithness Cliffs		0.5	0.0	0.1					1.4	1.1		
North Colonsay and Western Cliffs		4.0							1.9			
North Norfolk Coast												0.3
North Rona and Sula Sgeir		1.4	0.6	0.7	5.0			0.3	0.4	1.8		
Noss		0.1		0.1	1.6				0.1	0.4		

SPA	Manx shearwater	Guillemot	Razorbill	Puffin	Gannet	Lesser black-backed gull	Herring gull	Great black-backed gull	Kittiwake	Fulmar	Sandwich tern	Common tern
Poole Harbour												0.2
Rathlin Island		26.1	8.4	0.1		0.1	0.1		2.6	0.5		
Ribble and Alt Estuaries						9.4						0.4
Rousay		0.1							0.2	0.1		
Rum	24.1	0.5							0.3			
Sgomer, Sgogwm a Moroedd Penfro / Skomer, Skokholm and the Seas off Pembrokeshire	70.3	4.3	3.3	3.2		11.5			0.3			
Shiant Isles		1.5	2.3	8.6					0.2	1.6		
Solent and Southampton Water												0.4
St Abbs to Fast Castle			0.0				0.0		0.5			
St Kilda	1.0	4.5	0.9	18.8	32.0				0.3	23.9		
Strangford Loch											20.6	1.4
Sule Skerry and Sule Stack		2.2		7.8	2.5							
Sumburgh		0.0							0.0	0.0		
The Dee Estuary												0.7
The Wash												0.3
Troup, Pennan and Lion's Head			0.0				0.0		2.1	0.1		
West Westray		0.3	0.0						1.7	0.1		
Ythan Estuary, Sands of Forvie												0.0

Note: Red text indicates where the SPA population exceeds 1% of the BDMPS population total.

229. Screening considered qualifying features of coastal, wetland and marine SPAs and Ramsar sites within 100km of the Project array (not the export cable AoS, since no impacts on migratory species are anticipated due to the construction, operation and decommissioning of the export cable). It was considered that 100km represents a reasonable cut-off point. The probability that a large enough number of waders, wildfowl or other migrants, from a particular SPA located in excess of 100km from the Project could pass through the site in numbers sufficient to result in an LSE is considered to be highly remote, based on the expert opinion of the authors of this document.

Transboundary European sites

230. As well as UK SPAs and Ramsar sites, Screening considered Transboundary European sites designated by other European countries for birds, where the distance between the Transboundary site and the Project was such that an effect might be possible based on the criteria identified above. Given the location of the Project, SPAs in the Republic of Ireland have been considered. All other sites in other countries are considered to be too geographically distant for LSE on their qualifying features to be a realistic possibility at any time of the year.

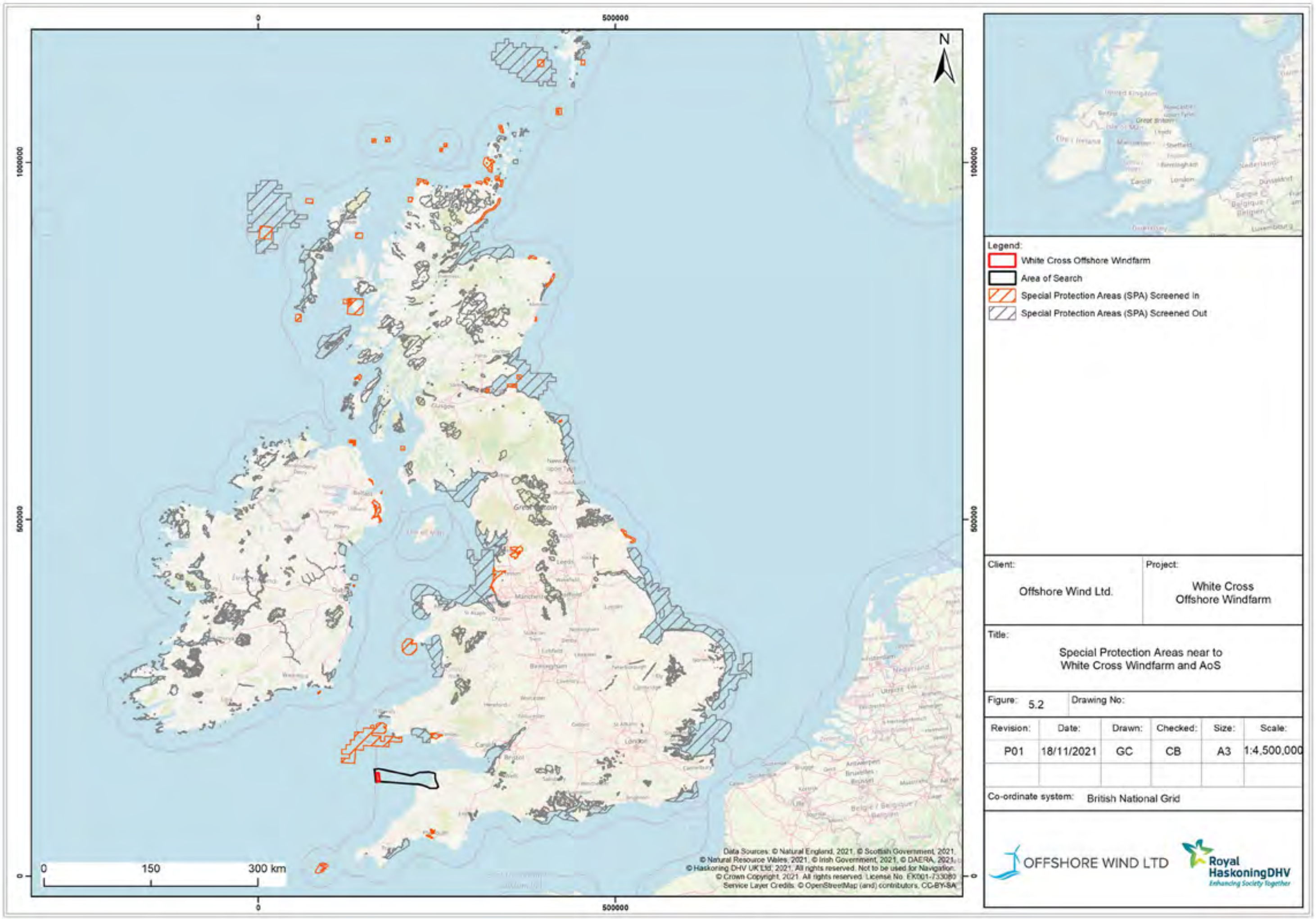
5.4.3 Screening

231. The list of SPAs and Ramsar sites considered in screening for LSE is included in **Appendix 2** for UK sites and **Appendix 3** for Transboundary sites. These SPAs and Ramsar sites are listed in order of increasing distance from the Project.

232. SPAs and Ramsar sites are screened in where LSE cannot be ruled out for one or more qualifying features and screened out where LSE can be ruled out for all qualifying features. A rationale is given for each SPA or Ramsar site and qualifying feature to explain the screening decision. **Figure 5.2** shows the sites screened in and out from further assessment.

233. It should be noted that the relatively small area occupied by the Project, when considered alongside the foraging ranges of the offshore ornithology features under consideration (**Table 5.3**), suggest that LSE due to indirect effects within the array areas or offshore export cable corridor on these features is highly unlikely for foraging birds. These are therefore not included in the assessment tables in **Appendix 2** and **Appendix 3**, although they have been considered and screened out.

Figure 5.2 European sites screened in or out for consideration with respect to seabirds



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5.5 Annex II Species – Migratory Fish

234. As stated in **Section 4** there are a number of Annex II fish species that have been recorded in the vicinity of The Project and therefore have the potential to be impacted during the construction, operation and decommissioning phases of The Project. the development. The Annex II species recorded in the areas surrounding the Development, including in the Bristol Channel, Severn Estuary and Taw-Torridge estuary include (Atlantic salmon, allis shad, twaite shad, river lamprey, and sea lamprey). Furthermore, migratory European eel are recorded within and migrating through the Severn Estuary and Bristol Channel.

235. Although the SACs overlapping and surrounding the Project AoS are not designated for Annex II fish species the fish species could be present and may constitute qualifying species of other SACs beyond the boundaries of The Project.

236. The potential impacts of The Project on these Annex II fish species include the following:

- Temporary habitat loss and physical disturbance (during construction, operation and decommissioning)
- Long term/ permanent habitat loss (during operation and decommissioning)
- Increased SSC and sediment re-deposition (including mobilisation of contaminated sediments) during all project phases
- Underwater noise and vibration (particularly during construction phase due to pile driving)
- Electromagnetic fields from cables (during the operational phase)
- Barrier effects (during all project phases)
- Ghost fishing (during operational phase)
- Fish aggregation (during the operational phase)
- Deterioration of water quality (during all project phases)

237. Due to the potential for Atlantic salmon, allis shad, twaite shad, river lamprey and sea lamprey to be present in the vicinity of the Project AoS, there is potential for these Annex II species to be impacted by The Project. Therefore it is proposed these Annex II fish species are screened into Appropriate Assessment. The following designated sites (shown on **Figure 5.3**) connect to the Bristol Channel and the Celtic Sea and thus have a connection with the Project AoS and any potential for impacts (as listed above) on migratory fish populations associated with these sites, and as such have been screened in for further consideration:

- Atlantic salmon
    - River Wye/ Afon Gwy SAC

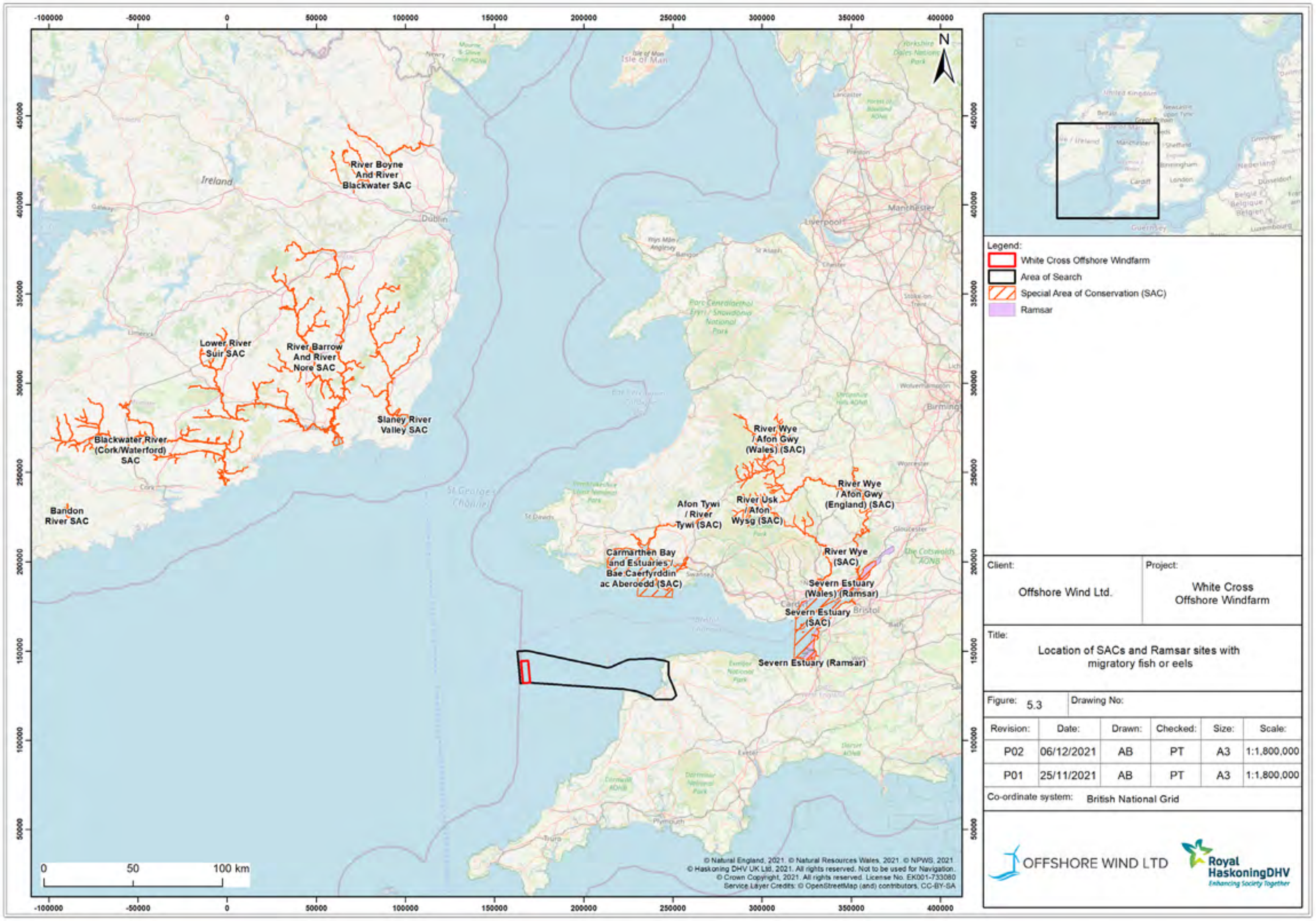
  - River Usk/ Afon Wysg SAC
  - Severn Estuary Ramsar
- Sea lamprey
  - River Wye/ Afon Gwy SAC
  - River Usk/ Afon Wysg SAC
  - Severn Estuary/ Môr Hafren SAC
  - Severn Estuary Ramsar
  - Carmarthen Bay and Estuaries/ Bae Caerfyrddin ac Aberoedd SAC
  - Afon Tywi/ River Tywi SAC
- River lamprey
  - River Wye/ Afon Gwy SAC
  - River Usk/ Afon Wysg SAC
  - Severn Estuary/ Môr Hafren SAC
  - Severn Estuary Ramsar
  - Carmarthen Bay and Estuaries/ Bae Caerfyrddin ac Aberoedd SAC
  - Afon Tywi/ River Tywi SAC
- Twaite shad
  - River Wye/ Afon Gwy SAC
  - River Usk/ Afon Wysg SAC
  - Severn Estuary/ Môr Hafren SAC
  - Severn Estuary Ramsar
  - Carmarthen Bay and Estuaries/ Bae Caerfyrddin ac Aberoedd SAC
  - Afon Tywi/ River Tywi SAC
- Allis shad
  - River Wye / Afon Gwy SAC
  - River Usk/ Afon Wysg SAC
  - Severn Estuary Ramsar
  - Carmarthen Bay and Estuaries/ Bae Caerfyrddin ac Aberoedd SAC
  - Afon Tywi/ River Tywi SAC
- European eel
  - Severn Estuary Ramsar

5.5.1 Transboundary Sites

238. The nearest sites within the nearest country (Ireland) that are designated for Atlantic salmon, sea lamprey, river lamprey, and twaite shad are in excess of 148km from the Project AoS. There is currently no evidence to discount the connectivity of the following sites with the Project AoS, therefore these transboundary sites have been screened in for further assessment:

- Atlantic salmon
  - River Slaney SAC
  - River Barrow and River Nore SAC
  - Lower River Suir SAC
  - Blackwater River (Cork/Waterford SAC)
- sea lamprey
  - River Slaney SAC
  - River Barrow and River Nore SAC
  - Lower River Suir SAC
  - Blackwater River (Cork/Waterford SAC)
- river lamprey
  - River Slaney SAC
  - River Barrow and River Nore SAC
  - Lower River Suir SAC
  - Blackwater River (Cork/Waterford SAC)
- Twaite shad
  - River Slaney SAC
  - River Barrow and River Nore SAC
  - Lower River Suir SAC
  - Blackwater River (Cork/Waterford SAC)

Figure 5.3 European sites screened in for consideration with respect to Annex II migratory fish



6. The Screening Process for the Project In-combination

6.1 Annex I Habitats (and associated Annex II species)

239. **Section 3.3.6** identifies the current known projects within the Celtic Sea but there are likely to be many others to be determined during the stakeholder engagement being carried out. Consequently, this section provides an initial discussion of those impacts that were screened out for sites designated for their Annex I habitats (and associated Annex II species) in **Section 5.2** to determine whether any of the impacts screened out will need to be considered in-combination with the current known projects. Grey seal are considered within the Annex II Marine Mammals in **Section 6.2**.

6.1.1 Braunton Burrows SAC

240. All potential impacts were screened in for Braunton Burrows SAC therefore any current or identified projects will be screened for in-combination in the next stage (appropriate assessment). The projects will be screened and considered on basis of distance in particular and whether there is a potential for impacts from those projects to extend to the site. If any do, they will be considered and assessed in detail.

6.1.2 Tintagel-Marsland-Clovelly Coast SAC

241. The potential impacts of habitat disturbance during the operational phase of the Project were screened out for the Project alone. As it will not result in any disturbance during operation and none of the projects identified occur anywhere near to the site (and all are tens of km offshore) there would be no in-combination impacts relating to habitat disturbance in the operational phase. Therefore the site is screened out for operational habitat disturbance to all of the designated features of the site alone and in-combination with other projects.

242. The potential impacts associated with the risk of accidental or incidental discharges of liquids or solids within or adjacent to the site during operation were screened out for the Project alone. As it will not result in any habitat alteration during operation and none of the projects identified occur anywhere near to the site (and all are tens of km offshore) there would be no in-combination impacts relating to habitat alteration in the operational phase. Therefore the site is screened out for operational habitat alteration to all of the designated features of the site alone and in-combination with other projects.

6.1.3 Lundy SAC

Direct Habitat Loss

243. The potential impacts of habitat loss during the construction operation, or decommissioning phase of the Project were screened out for the Project alone due to any Project activities or elements being some distance from the site. As it will not result in any habitat loss during construction or operation and none of the projects identified occur anywhere near to the site (and all are tens of km offshore) there would be no in-combination impacts relating to direct habitat loss in the construction or operation phase. Therefore the site is screened out for habitat loss to all of the designated features of the site alone and in-combination with other projects for all stages of the Project.

Disturbance to Habitats

244. The potential impacts of habitat loss during the construction operation, or decommissioning phase of the Project were screened out for the Project alone due to any Project activities or elements being some distance from the site. As it will not result in any habitat disturbance during construction or operation and none of the projects identified occur anywhere near to the site (and all are tens of km offshore) there would be no in-combination impacts relating to habitat disturbance in the construction or operation phase. Therefore the site is screened out for habitat disturbance to all of the designated features of the site alone and in-combination with other projects for all stages of the Project.

Alteration to Habitats

245. The potential impacts of changes to the hydrodynamic regime extending into the site during the construction, operation, or decommissioning phase of the Project were screened out for the Project alone due to distance from the site and very localised nature of any potential effects. As it will not result in any habitat alteration during construction or operation and none of the projects identified occur anywhere near to the site (and all are tens of km offshore) there would be no in-combination impacts relating to habitat alteration in the construction or operation phase. Therefore the site is screened out for habitat alteration to all of the designated features of the site alone and in-combination with other projects for all stages of the Project.

6.2 Annex II Species - Marine Mammals

246. The in-combination assessment will consider plans or projects where the predicted effects have the potential to interact with effects from the proposed construction, operation and maintenance or decommissioning of the Project.

247. The in-combination assessment considers potential effects from all stages of any plan or project where there is the potential for any in-combination effects with the proposed Project.

248. The plans and projects assessed for potential in-combination effects are located within (i) the relevant MU boundary for harbour porpoise, bottlenose dolphin or grey seal and (ii) there is the potential for connectivity and clear pathway for the in-combination effect and marine mammals from the designated sites, e.g. the distance between the potential effect and a designated site with marine mammals as a qualifying feature is within the range for which there could be an interaction.

249. The types of plans and projects to be taken into consideration are:

- Offshore windfarms
- Marine renewable energy (MRE) developments
- Aggregate extraction and dredging
- Licenced disposal sites
- Shipping and navigation
- Planned construction sub-sea cables and pipelines
- Potential port/harbour development
- Oil and gas development, operation and decommissioning, including seismic surveys
- UXO clearance

250. The projects identified for potential in-combination assessment will be agreed during meetings with relevant stakeholders.

6.3 Annex II Species - Offshore Ornithology

251. All of the potential projects identified within the Celtic Sea and offshore wind farm projects from a much wider area are expected to fall within migratory route for the designated sites and their qualifying species identified in **Section 5.4**. Therefore the in-combination assessment will consider the projects listed in **Section 3.3.6**, and more following consultation, against those in **Section 5.4**.

6.4 Annex II Species - Migratory Fish

252. All of the potential projects identified within the Celtic Sea area are expected to fall within the zone of influence or areas of supporting habitat for the migratory fish species and sites listed in **Section 5.5**. Therefore the in-combination assessment will consider the projects listed in **Section 3.3.6** against those in **Section 5.5**.

7. Summary of the Potential for Likely Significant Effect (LSE)

253. The following sub-sections summarise the qualifying features and designated sites that have been screened in for further assessment for any potential adverse effects resulting from the project alone or in-combination with other projects or activities. The potential for adverse effects on the integrity of the sites have been considered in relation to the conservation objectives of each site.

7.1 Annex I Habitats (and associated Annex II species)

254. The sites designated for Annex I habitats and associated Annex II species (excluding marine mammals, ornithology, and migratory fish) qualifying features that have been screened in for further assessment are listed in **Table 7.1**. The potential adverse effects on the integrity of the sites resulting from the project alone or in-combination with other projects or activities are considered in relation to the conservation objectives of each site.

Table 7.1 Designated sites where Annex I habitats and associated Annex II species screened into the HRA for further assessment

Designated site	Features	Reason for screening in
Braunton Burrows SAC	Shifting dunes along the shoreline with *Ammophila arenaria* ("white dunes") Fixed coastal dunes with herbaceous vegetation ("grey dunes") Dunes with *Salix repens* ssp. *argentea Salicion arenariae* Humid dune slacks Mudflats and sandflats not covered by seawater at low tide Petalwort	Habitat loss (operation)
		Disturbance to habitats (construction and operation)
		Alteration to habitats (disturbance to contaminants and accidental / incidental discharges during construction)
		in-combination effects regarding all the above.
	Shifting dunes along the shoreline with *Ammophila arenaria* ("white dunes") Mudflats and sandflats not covered by seawater at low tide	Alteration to habitats (coastal process change during construction)
		Alteration to habitats (coastal process change during operation)
	Mudflats and sandflats not covered by seawater at low tide	Alteration to habitats (suspended sediment and deposition during construction)
		Alteration to habitats (suspended sediment and deposition during operation)
		Habitat loss (operation)

Designated site	Features	Reason for screening in
Tintagel-Marsland-Clovelly Coast SAC	Vegetated sea cliffs of the Atlantic and Baltic Coasts Old sessile oak woods with Ilex and Blechnum in the British Isles European dry heaths	Disturbance to habitats (during construction)
		Alteration to habitats (accidental / incidental pollution discharges during construction)
		Alteration to habitats (topography change resulting in drainage and surface water flow alteration)
		Alteration to habitats (mobilisation of contaminants during construction)
		in-combination effects regarding all the above.
Lundy SAC	Reefs Sandbanks which are slightly covered by sea water all the time Submerged or partially submerged sea caves	Alteration to habitats (coastal process change during operation)
		Alteration to habitats (suspended sediment and deposition during construction)
		Alteration to habitats (suspended sediment and deposition during operation)
		Alteration to habitats (disturbance to contaminants and accidental / incidental discharges during construction)
		in-combination effects regarding all the above.
	Grey seal	See **Table 7.2**

7.2 Annex II Species - Marine Mammals

255. The designated sites and the specific marine mammal qualifying features that have been screened in for further assessment to determine the potential for any adverse effects on the integrity of the sites in relation to the conservation objectives as result of the project alone or in-combination with other projects and activities are listed in **Table 7.2**.

Table 7.2 Designated sites where marine mammals are a qualifying feature (or feature of interest) screened into the HRA for further assessment

Designated site	Species	Reason for screening in
Bristol Channel Approaches SAC **Roaring water Bay and Islands SAC** **Blasket Islands SAC** **Rockabill to Dalkey Island SAC** **Quessant-Molène**	Harbour porpoise	Potential effects from: • underwater noise • vessel interactions • entanglement

Designated site	Species	Reason for screening in
Nord Bretagne DH **Mers Celtiques -Talus du golfe de Gascogne** **Abers -Côte des legends** **Baie de Morlaix** **Côte de Granit rose-Sept-Iles** **Tregor Goëlo** **Chaussée de Sein**		• Barrier effects due to the physical presence of offshore infrastructure • changes to prey resources • changes to water quality • EMF • In-combination effects
Cardigan Bay SAC **Ouessant-Molène** **Nord Bretagne DH** **Mers Celtiques -Talus du golfe de Gascogne** **Abers -Côte des legends** **Côte de Granit rose-Sept-Iles** **Tregor Goëlo** **Côte de Cancale à Paramé** **Chausey** **Baie du Mont Saint-Michel** **Banc et récifs de Surtainville** **Anse de Vauville** **Récifs et landes de la Hague** **Récifs et marais arrière-littoraux du Cap Lévi à la Pointe de Saire** **Baie de Seine occidentale**	Bottlenose dolphin	Potential effects from: • underwater noise • vessel interactions • entanglement • Barrier effects due to the physical presence of offshore infrastructure • changes to prey resources • changes to water quality • in-combination effects
Lundy SAC **Pembrokeshire Marine SAC**	Grey seal	Potential effects from: • underwater noise • vessel interactions • entanglement • Barrier effects due to the physical presence of offshore infrastructure • disturbance at seal haul-out sites • changes to prey resources • changes to water quality • in-combination effects

7.3 Annex II Species - Offshore Ornithology

256. The designated sites and the specific ornithological qualifying features that have been screened in for further assessment to determine the potential for any adverse effects on the integrity of the sites in relation to the conservation objectives as result of the project alone or in-combination with other projects and activities are listed in **Table 7.3**.

Table 7.3 Designated sites where bird species are a qualifying feature (or feature of interest) screened into the HRA for further assessment. Suffixes at the end of the species name indicate either breeding qualifying feature (b) or non-breeding qualifying feature (nb).

Site	Qualifying feature(s) screened in
Sgomer, Sgogwm a Moroedd Penfro / Skomer, Skokholm and the Seas off Pembrokeshire	Lesser black-backed gull, b Manx shearwater, b Puffin, b Seabird assemblage, b
Grassholm	Gannet, b
Burry Inlet	Arctic tern, passage Black tern, passage Common tern, passage Curlew, nb Dunlin, nb Greenshank, passage Grey plover, nb Knot, nb Little tern, passage Oystercatcher, nb Pintail, nb Redshank, nb Sandwich tern, passage Shelduck, nb Shoveler, nb Teal, nb Turnstone, nb Whimbrel, passage Wigeon, nb
Tamar Estuaries Complex	Avocet, nb Little egret, nb
Isles of Scilly	Great black-backed gull, b Lesser black-backed gull, b
Glannau Aberdaron ac Ynys Enlli / Aberdaron Coast and Bardsey Island	Manx shearwater, b
Ribble and Alt Estuaries	Lesser black-backed gull, b
Strangford Loch	Sandwich tern, b
Bowland Fells	Lesser black-backed gull, b
Copeland Islands	Manx shearwater, b
Larne Lough	Sandwich tern, b
Ailsa Craig	Gannet, b Guillemot, b
Rathlin Island	Guillemot, b Kittiwake, b Razorbill, b
Flamborough and Filey Coast	Gannet, b Kittiwake, b
North Colonsay and Western Cliffs	Guillemot, b

Site	Qualifying feature(s) screened in
	Kittiwake, b
Farne Islands	Puffin, b
Forth Islands	Gannet, b Puffin, b
Mingulay and Berneray	Guillemot, b Kittiwake, b Razorbill, b
Rum	Manx shearwater, b
Canna and Sanday	Guillemot, b
Fowlsheugh	Kittiwake, b
Buchan Ness to Collieston Coast	Kittiwake, b
Shiant Isles	Fulmar, b Guillemot, b Puffin, b Razorbill, b
Troup, Pennan and Lion's Heads	Kittiwake, b
St Kilda	Fulmar, b Gannet, b Guillemot, b Manx shearwater, b Puffin, b
East Caithness Cliffs	Fulmar, b Kittiwake, b
Handa	Guillemot, b Razorbill, b
Flannan Isles	Fulmar, b Guillemot, b Puffin, b
Cape Wrath	Guillemot, b Kittiwake, b Razorbill, b
North Caithness Cliffs	Fulmar, b Kittiwake, b
Hoy	Fulmar, b
Sule Skerry and Sule Stack	Gannet, b Guillemot, b Puffin, b
North Rona and Sula Sgeir	Fulmar, b Gannet, b Guillemot, b
West Westray	Kittiwake, b
Fair Isle	Fulmar, b
Foula	Fulmar, b Puffin, b
Noss	Gannet, b
Hermaness, Saxavord and Valla Field	Gannet, b

Site	Qualifying feature(s) screened in
	Puffin, b
Saltee Islands	Fulmar, b Gannet, b
Lambay Island	Fulmar, b

7.4 Annex II Species - Migratory Fish

257. The designated sites and the specific migratory fish qualifying features that have been screened in for further assessment in relation to the impacts listed in **Section 5.5** to determine the potential for any adverse effects on the integrity of the sites in relation to the conservation objectives as result of the project alone or in-combination with other projects and activities are listed in **Table 7.4**.

Table 7.4 Designated sites where Annex II migratory fish species are a qualifying feature screened into the HRA for further assessment

Site	Qualifying feature(s) screened in
River Wye/ Afon Gwy SAC	• Atlantic salmon • Sea lamprey • River lamprey • Twaite shad
River Usk/ Afon Wysg SAC	• Atlantic salmon • Sea lamprey • River lamprey • Twaite shad
Severn Estuary/ Môr Hafren SAC	• Sea lamprey • River lamprey • Twaite shad
Severn Estuary Ramsar	• Atlantic salmon • Sea lamprey • River lamprey • Twaite shad • Allis shad • European eel
Carmarthen Bay and Estuaries/ Bae Caerfyrddin ac Aberoedd SAC	• Twaite shad
Afon Tywi/ River Tywi SAC	• Twaite shad
Transboundary	
River Slaney SAC	• Atlantic salmon • Sea lamprey • River lamprey

Site	Qualifying feature(s) screened in
	Twaite shad
River Barrow and River Nore SAC	Atlantic salmon Sea lamprey River lamprey Twaite shad
Lower River Suir SAC	Atlantic salmon Sea lamprey River lamprey Twaite shad
Blackwater River (Cork/Waterford) SAC	Atlantic salmon Sea lamprey River lamprey Twaite shad

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Appendix 1 Screening of European Sites for Marine Mammal features

Site Code	Designated Site	Country	Qualifying Species	Distance to closest point of project (km)	Screened In / Out	Rationale
UK0012712	Cardigan Bay SAC	United Kingdom	Bottlenose Dolphin	120km	In	Potential connectivity. It is assumed that Bottlenose dolphin in the Project area, or areas of potential effect, could be from this designated site.
UK0013114	Lundy SAC	United Kingdom	Grey seal	1km	In	Potential connectivity. It is assumed that grey seal in the Project area, or areas of potential effect, could be from this designated site.
UK0013116	Pembrokeshire Marine SAC	United Kingdom	Grey seal	60km	In	Potential connectivity. It is assumed that grey seal in the Project area, or areas of potential effect, could be from this designated site.
UK0030396	Bristol Channel Approaches	United Kingdom	Harbour porpoise	Within site	In	Potential connectivity. It is assumed that harbour porpoise in the Project area, or areas of potential effect, could be from this designated site.
IE0000101	Roaring water Bay and Islands SAC	Ireland	Grey seal	279km	Out	The distance between the potential effect range of the Project and this designated site is beyond that of potential for direct or indirect effects, alone or in-combination.
IE0000101	Roaring water Bay and Islands SAC	Ireland	Harbour porpoise	279km	In	Potential for connectivity. It is assumed that harbour porpoise in the Project area, or areas of

Site Code	Designated Site	Country	Qualifying Species	Distance to closest point of project (km)	Screened In / Out	Rationale
						potential effect, could be also have connectivity to the Project.
IE0002172	Blasket Islands SAC	Ireland	Grey seal	361km	Out	The distance between the potential effect range of the Project and this designated site is beyond that of potential for direct or indirect effects, alone or in-combination.
IE0002172	Blasket Islands SAC	Ireland	Harbour porpoise	361km	In	Potential for connectivity. It is assumed that harbour porpoise in the Project area, or areas of potential effect, could be also have connectivity to the Project.
IE0003000	Rockabill to Dalkey Island SAC	Ireland	Harbour porpoise	231km	In	Potential for connectivity. It is assumed that harbour porpoise in the Project area, or areas of potential effect, could be also have connectivity to the Project.
IE0000204	Lambay Island SAC	Ireland	Grey seal	257km	Out	The distance between the potential effect range of the Project and this designated site is beyond that of potential for direct or indirect effects, alone or in-combination.
E0000707	Saltee Islands SAC	Ireland	Grey seal	123km	Out	The distance between the potential effect range of the Project and this designated site is beyond that of potential for direct or indirect effects, alone or in-combination.

Site Code	Designated Site	Country	Qualifying Species	Distance to closest point of project (km)	Screened In / Out	Rationale
FR5300018	Ouessant-Molène	France	Harbour porpoise	280km	In	Potential for connectivity. It is assumed that harbour porpoise in the Project area, or areas of potential effect, could be also have connectivity to the Project.
FR5300018	Ouessant-Molène	France	Grey seal	280km	Out	The distance between the potential effect range of the Project and this designated site is beyond that of potential for direct or indirect effects, alone or in-combination.
FR5300018	Ouessant-Molène	France	Bottlenose Dolphin	280km	In	Potential for connectivity. It is assumed that bottlenose dolphin in the Project area, or areas of potential effect, could be also have connectivity to the Project.
FR2502022	Nord Bretagne DH	France	Harbour porpoise	164km	In	Potential for connectivity. It is assumed that harbour porpoise in the Project area, or areas of potential effect, could be also have connectivity to the Project.
FR2502022	Nord Bretagne DH	France	Bottlenose Dolphin	164km	In	Potential for connectivity. It is assumed that bottlenose dolphin in the Project area, or areas of potential effect, could be also have connectivity to the Project.
FR5302015	Mers Celtiques - Talus du golfe de Gascogne	France	Harbour porpoise	219 km	In	Potential for connectivity. It is assumed that harbour porpoise in the Project area, or areas of

Site Code	Designated Site	Country	Qualifying Species	Distance to closest point of project (km)	Screened In / Out	Rationale
						potential effect, could be also have connectivity to the Project.
FR5302015	Mers Celtiques - Talus du golfe de Gascogne	France	Bottlenose Dolphin	219 km	In	Potential for connectivity. It is assumed that bottlenose dolphin in the Project area, or areas of potential effect, could be also have connectivity to the Project.
FR5300017	Abers - Côte des légendes	France	Harbour porpoise	260km	In	Potential for connectivity. It is assumed that harbour porpoise in the Project area, or areas of potential effect, could be also have connectivity to the Project.
FR5300017	Abers - Côte des légendes	France	Bottlenose Dolphin	260km	In	Potential for connectivity. It is assumed that bottlenose dolphin in the Project area, or areas of potential effect, could be also have connectivity to the Project.
FR5300017	Abers - Côte des légendes	France	Grey seal	260km	Out	The distance between the potential effect range of the Project and this designated site is beyond that of potential for direct or indirect effects, alone or in-combination.
FR5300015	Baie de Morlaix	France	Harbour porpoise	243km	In	Potential for connectivity. It is assumed that harbour porpoise in the Project area, or areas of potential effect, could be also have connectivity to the Project.
FR5300015	Baie de Morlaix	France	Grey seal	243km	Out	The distance between the potential effect range of the

Site Code	Designated Site	Country	Qualifying Species	Distance to closest point of project (km)	Screened In / Out	Rationale
						Project and this designated site is beyond that of potential for direct or indirect effects, alone or in-combination.
FR5300009	Côte de Granit rose-Sept-Iles	France	Grey seal	220km	Out	The distance between the potential effect range of the Project and this designated site is beyond that of potential for direct or indirect effects, alone or in-combination.
FR5300009	Côte de Granit rose-Sept-Iles	France	Harbour porpoise	220km	In	Potential for connectivity. It is assumed that harbour porpoise in the Project area, or areas of potential effect, could be also have connectivity to the Project.
FR5300009	Côte de Granit rose-Sept-Iles	France	Bottlenose Dolphin	220km	In	Potential for connectivity. It is assumed that bottlenose dolphin in the Project area, or areas of potential effect, could be also have connectivity to the Project.
FR5300010	Tregor Goëlo	France	Grey seal	228km	Out	The distance between the potential effect range of the Project and this designated site is beyond that of potential for direct or indirect effects, alone or in-combination.
FR5300010	Tregor Goëlo	France	Harbour porpoise	228km	In	Potential for connectivity. It is assumed that harbour porpoise in the Project area, or areas of

Site Code	Designated Site	Country	Qualifying Species	Distance to closest point of project (km)	Screened In / Out	Rationale
						potential effect, could be also have connectivity to the Project.
FR5300010	Tregor Goëlo	France	Bottlenose Dolphin	228km	In	Potential connectivity. It is assumed that bottlenose dolphin in the Project area, or areas of potential effect, could be from this designated site.
FR5300052	Côte de Cancale à Paramé	France	Bottlenose Dolphin	307km	In	Potential for connectivity. It is assumed that bottlenose dolphin in the Project area, or areas of potential effect, could be also have connectivity to the Project.
FR2500079	Chausey	France	Grey seal	282km	Out	The distance between the potential effect range of the Project and this designated site is beyond that of potential for direct or indirect effects, alone or in-combination.
FR2500079	Chausey	France	Bottlenose Dolphin	282km	In	Potential for connectivity. It is assumed that bottlenose dolphin in the Project area, or areas of potential effect, could be also have connectivity to the Project.
FR2500077	Baie du Mont Saint-Michel	France	Grey seal	310km	Out	The distance between the potential effect range of the Project and this designated site is beyond that of potential for direct or indirect effects, alone or in-combination.

Site Code	Designated Site	Country	Qualifying Species	Distance to closest point of project (km)	Screened In / Out	Rationale
FR2500077	Baie du Mont Saint-Michel	France	Bottlenose Dolphin	310km	In	Potential for connectivity. It is assumed that bottlenose dolphin in the Project area, or areas of potential effect, could be also have connectivity to the Project.
FR2502018	Banc et récifs de Surtainville	France	Bottlenose Dolphin	237km	In	Potential for connectivity. It is assumed that bottlenose dolphin in the Project area, or areas of potential effect, could be also have connectivity to the Project.
FR2502019	Anse de Vauville	France	Bottlenose Dolphin	222km	In	Potential for connectivity. It is assumed that bottlenose dolphin in the Project area, or areas of potential effect, could be also have connectivity to the Project.
FR2500084	Récifs et landes de la Hague	France	Bottlenose Dolphin	217km	In	Potential for connectivity. It is assumed that bottlenose dolphin in the Project area, or areas of potential effect, could be also have connectivity to the Project.
FR2500085	Récifs et marais arrière-littoraux du Cap Lévi à la Pointe de Saire	France	Bottlenose Dolphin	244km	In	Potential for connectivity. It is assumed that bottlenose dolphin in the Project area, or areas of potential effect, could be also have connectivity to the Project.
FR2500085	Récifs et marais arrière-littoraux du Cap Lévi à la Pointe de Saire	France	Grey seal	244km	Out	The distance between the potential effect range of the Project and this designated site is beyond that of potential for

Site Code	Designated Site	Country	Qualifying Species	Distance to closest point of project (km)	Screened In / Out	Rationale
						direct or indirect effects, alone or in-combination.
FR2502020	Baie de Seine occidentale	France	Bottlenose Dolphin	270km	In	Potential for connectivity. It is assumed that bottlenose dolphin in the Project area, or areas of potential effect, could be also have connectivity to the Project.
FR2500088	Marais du Cotentin et du Bessin - Baie des Veys	France	Grey seal	270km	Out	The distance between the potential effect range of the Project and this designated site is beyond that of potential for direct or indirect effects, alone or in-combination.
FR5302007	Chaussée de Sein	France	Harbour porpoise	336km	In	Potential for connectivity. It is assumed that bottlenose dolphin in the Project area, or areas of potential effect, could be also have connectivity to the Project.
FR5302007	Chaussée de Sein	France	Grey seal	336km	Out	The distance between the potential effect range of the Project and this designated site is beyond that of potential for direct or indirect effects, alone or in-combination.

Appendix 2 Screening outcome for UK SPA and Ramsar Sites with offshore ornithology qualifying features

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
UK9014051	Sgomer, Sgogwm a Moroedd Penfro / Skomer, Skokholm and the Seas off Pembrokeshire	33	32	Lesser black-backed gull, b	IN	Project is within the published mean maximum foraging range, and feature was recorded during baseline surveys during the breeding season. Therefore, screened in for potential impacts during the breeding season. Non-breeding season impacts will also be considered.
UK9014051	Sgomer, Sgogwm a Moroedd Penfro / Skomer, Skokholm and the Seas off Pembrokeshire	33	32	Manx shearwater, b	IN	Project is within the published mean maximum foraging range, and feature was recorded during baseline surveys during the breeding season. Therefore, screened in for potential impacts during the breeding season. Non-breeding season impacts will also be considered.
UK9014051	Sgomer, Sgogwm a Moroedd Penfro / Skomer, Skokholm and the Seas off Pembrokeshire	33	32	Puffin, b	IN	Project is within the published mean maximum foraging range, and feature was recorded during baseline surveys during the breeding season. Therefore, screened in for potential

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						impacts during the breeding season. Non-breeding season impacts will also be considered.
UK9014051	Sgomer, Sgogwm a Moroedd Penfro / Skomer, Skokholm and the Seas off Pembrokeshire	33	32	Seabird assemblage, b	IN	Project is within the published mean maximum foraging range of several qualifying features of the assemblage, and several features were recorded during baseline surveys during the breeding season. Therefore, screened in for potential impacts during the breeding season. Non-breeding season impacts will also be considered.
UK9014051	Sgomer, Sgogwm a Moroedd Penfro / Skomer, Skokholm and the Seas off Pembrokeshire	33	32	Short-eared owl, b	IN	Potential risk of collision with the Project during migratory flights to and from the site.
UK9014051	Sgomer, Sgogwm a Moroedd Penfro / Skomer, Skokholm and the Seas off Pembrokeshire	33	32	Storm petrel, b	OUT	Project is within the published mean maximum foraging range. However, species not recorded during baseline surveys to date during any season. There is no evidence for

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						connectivity between this feature and the Project at any time of year.
UK9014041	Grassholm	63	57	Gannet, b	IN	Project is within the published mean maximum foraging range, and feature was recorded during baseline surveys during the breeding season. Therefore, screened in for potential impacts during the breeding season. Non-breeding season impacts will also be considered.
UK9014091	Bae Caerfyrddin / Carmarthen Bay	70	41	Common scoter, *Melanitta nigra*, nb	OUT	Site boundary encompasses core areas used during the non-breeding season. Extensive distance between the site boundary and the Project. No evidence for connectivity between this feature and the Project.
UK9020323	Falmouth Bay to St Austell Bay	88	76	Black-throated diver, nb	OUT	Site boundary encompasses core areas used during the non-breeding season. Extensive distance between the site boundary and the Project. No

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						evidence for connectivity between this feature and the Project.
UK9020323	Falmouth Bay to St Austell Bay	88	76	Great northern diver, *Gavia immer*, nb	OUT	Site boundary encompasses core areas used during the non-breeding season. Extensive distance between the site boundary and the Project. No evidence for connectivity between this feature and the Project.
UK9020323	Falmouth Bay to St Austell Bay	88	76	Slavonian grebe, *Podiceps auritus*, nb	OUT	Site boundary encompasses core areas used during the non-breeding season. Extensive distance between the site boundary and the Project. No evidence for connectivity between this feature and the Project at any time of year.
UK9015011	Burry Inlet	88	48	Arctic tern, passage	IN	Potential risk of collision with the Project during migratory flights to and from the site in numbers sufficient for LSE to be a possibility.

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
UK9015011	Burry Inlet	88	48	Black tern, *Childonias niger*, passage	IN	Potential risk of collision with the Project during migratory flights to and from the site in numbers sufficient for LSE to be a possibility.
UK9015011	Burry Inlet	88	48	Common tern, passage	IN	Potential risk of collision with the Project during migratory flights to and from the site in numbers sufficient for LSE to be a possibility.
UK9015011	Burry Inlet	88	48	Curlew, Numenius arquata, nb	IN	Potential risk of collision with the Project during migratory flights to and from the site in numbers sufficient for LSE to be a possibility.
UK9015011	Burry Inlet	88	48	Dunlin, Calidris alpina, nb	IN	Potential risk of collision with the Project during migratory flights to and from the site in numbers sufficient for LSE to be a possibility.
UK9015011	Burry Inlet	88	48	Greenshank, *Tringa nebularia*, passage	IN	Potential risk of collision with the Project during migratory flights to and from the site in numbers sufficient for LSE to be a possibility.

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
UK9015011	Burry Inlet	88	48	Grey plover, Pluvialis squatarola, nb	IN	Potential risk of collision with the Project during migratory flights to and from the site in numbers sufficient for LSE to be a possibility.
UK9015011	Burry Inlet	88	48	Knot, Calidris canutus, nb	IN	Potential risk of collision with the Project during migratory flights to and from the site in numbers sufficient for LSE to be a possibility.
UK9015011	Burry Inlet	88	48	Little tern, passage	IN	Potential risk of collision with the Project during migratory flights to and from the site in numbers sufficient for LSE to be a possibility.
UK9015011	Burry Inlet	88	48	Oystercatcher, Haematopus ostralegus, nb	IN	Potential risk of collision with the Project during migratory flights to and from the site in numbers sufficient for LSE to be a possibility.
UK9015011	Burry Inlet	88	48	Pintail, *Anas acuta*, nb	IN	Potential risk of collision with the Project during migratory flights to and from the site in numbers sufficient for LSE to be a possibility.

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
UK9015011	Burry Inlet	88	48	Redshank, *Tringa totanus*, nb	IN	Potential risk of collision with the Project during migratory flights to and from the site in numbers sufficient for LSE to be a possibility.
UK9015011	Burry Inlet	88	48	Sandwich tern, passage	IN	Potential risk of collision with the Project during migratory flights to and from the site in numbers sufficient for LSE to be a possibility.
UK9015011	Burry Inlet	88	48	Shelduck, Tadorna tadorna, nb	IN	Potential risk of collision with the Project during migratory flights to and from the site in numbers sufficient for LSE to be a possibility.
UK9015011	Burry Inlet	88	48	Shoveler, *Anas clypeata*, nb	IN	Potential risk of collision with the Project during migratory flights to and from the site in numbers sufficient for LSE to be a possibility.
UK9015011	Burry Inlet	88	48	Teal, Anas crecca, nb	IN	Potential risk of collision with the Project during migratory flights to and from the site in numbers sufficient for LSE to be a possibility.

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
UK9015011	Burry Inlet	88	48	Turnstone, Arenaria interpres, nb	IN	Potential risk of collision with the Project during migratory flights to and from the site in numbers sufficient for LSE to be a possibility.
UK9015011	Burry Inlet	88	48	Whimbrel, *Numenius phaeopus*, passage	IN	Potential risk of collision with the Project during migratory flights to and from the site in numbers sufficient for LSE to be a possibility.
UK9015011	Burry Inlet	88	48	Wigeon, Anas penelope, nb	IN	Potential risk of collision with the Project during migratory flights to and from the site in numbers sufficient for LSE to be a possibility.
UK9010141	Tamar Estuaries Complex	97	57	Avocet, Recurvirostra avosetta, nb	IN	Potential risk of collision with the Project during migratory flights to and from the site in numbers sufficient for LSE to be a possibility.
UK9010141	Tamar Estuaries Complex	97	57	Little egret, *Egretta garzetta*, nb	IN	Potential risk of collision with the Project during migratory flights to and from the site in numbers sufficient for LSE to be a possibility.

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
UK9020288	Isles of Scilly	135	137	Great black-backed gull, b	IN	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Screened in for non-breeding season impacts as species was recorded during this season, and >1% of birds at the Project during this period will originate from this population.
UK9020288	Isles of Scilly	135	137	Lesser black-backed gull, b	IN	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Screened in for non-breeding season impacts as species was recorded during this season, and >1% of birds at the Project during this period will originate from this population.
UK9020288	Isles of Scilly	135	137	Seabird assemblage, b	OUT	Project is beyond the published mean maximum foraging range of the majority of qualifying features of this site, therefore no connectivity

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						during the breeding season. Not screened in for non-breeding season impacts as it is considered very unlikely that sufficient numbers of the assemblage would be present at the Project for LSE to occur.
UK9020288	Isles of Scilly	135	137	Shag, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season. Therefore there is no evidence for connectivity between this feature and the Project at any time of year.
UK9020288	Isles of Scilly	135	137	Storm petrel, b	OUT	Project is within the published mean maximum foraging range. However, species not recorded during baseline surveys to date during any season. There is no evidence for connectivity between this feature and the Project at any time of year.

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
UK9020327	Gogledd Bae Ceredigion / Northern Cardigan Bay	154	133	Red-throated diver, nb	OUT	Site boundary encompasses core areas used during the non-breeding season. Extensive distance between the site boundary and the Project. No evidence for connectivity between this feature and the Project.
UK9013121	Glannau Aberdaron ac Ynys Enlli / Aberdaron Coast and Bardsey Island	170	165	Manx shearwater, b	IN	Project is within the published mean maximum foraging range, and feature was recorded during baseline surveys during the breeding season. Therefore, screened in for potential impacts during the breeding season. Non-breeding season impacts will also be considered.
UK9013061	Morwenoliaid Ynys Môn / Anglesey Terns	223	214	Arctic tern, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season. Therefore there is no evidence for connectivity

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						between this feature and the Project at any time of year.
UK9013061	Morwenoliaid Ynys Môn / Anglesey Terns	223	214	Common tern, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as species not recorded.
UK9013061	Morwenoliaid Ynys Môn / Anglesey Terns	223	214	Roseate tern, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season. Therefore there is no evidence for connectivity between this feature and the Project at any time of year.
UK9013061	Morwenoliaid Ynys Môn / Anglesey Terns	223	214	Sandwich tern, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						recorded during this season, <1% of birds at the Project during this period will originate from this population.
UK9020294	Liverpool Bay / Bae Lerpwl	251	232	Common scoter, nb	OUT	Site boundary encompasses core areas used during the non-breeding season. Extensive distance between the site boundary and the Project. No evidence for connectivity between this feature and the Project.
UK9020294	Liverpool Bay / Bae Lerpwl	251	232	Common tern, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as species not recorded.
UK9020294	Liverpool Bay / Bae Lerpwl	251	232	Little gull, Hydrocoloeus minutus, nb	OUT	Site boundary encompasses core areas used during the non-breeding season. Extensive distance between the site boundary and the Project. No evidence for connectivity

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						between this feature and the Project.
UK9020294	Liverpool Bay / Bae Lerpwl	251	232	Little tern, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season. Therefore there is no evidence for connectivity between this feature and the Project at any time of year.
UK9020294	Liverpool Bay / Bae Lerpwl	251	232	Red-throated diver, nb	OUT	Site boundary encompasses core areas used during the non-breeding season. Extensive distance between the site boundary and the Project. No evidence for connectivity between this feature and the Project.
UK9020285	Ynys Seiriol / Puffin Island	255	237	Cormorant, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						during any season. Therefore there is no evidence for connectivity between this feature and the Project at any time of year.
UK9013011	The Dee Estuary	276	240	Common tern, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as species not recorded.
UK9013011	The Dee Estuary	276	240	Little tern, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season. Therefore there is no evidence for connectivity between this feature and the Project at any time of year.
UK9013011	The Dee Estuary	276	240	Sandwich tern, passage	OUT	Qualifying feature of this site unlikely to be present at Project in sufficient numbers for LSE to occur.

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
UK9020328	Irish Sea Front	284	279	Manx shearwater, b	OUT	Site boundary encompasses core areas used during the breeding season. Extensive distance between the site boundary and the Project. No evidence for connectivity between this feature and the Project.
UK9020287	Mersey Narrows and North Wirral Foreshore	287	255	Common tern, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as species not recorded.
UK9005103	Ribble and Alt Estuaries	300	267	Lesser black-backed gull, b	IN	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Screened in for non-breeding season impacts as species was recorded during this season, and >1% of birds at the Project during this period will originate from this population.
UK9020161	Carlingford Lough	322	317	Common tern, b	OUT	Project is beyond the published mean maximum

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as species not recorded.
UK9020161	Carlingford Lough	322	317	Sandwich tern, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, <1% of birds at the Project during this period will originate from this population.
UK9020326	Morecambe Bay and Duddon Estuary	340	309	Common tern, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as species not recorded.
UK9020326	Morecambe Bay and Duddon Estuary	340	309	Herring gull, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						screened in for non-breeding season impacts as whilst species was recorded during this season, <1% of birds at the Project during this period will originate from this population.
UK9020326	Morecambe Bay and Duddon Estuary	340	309	Lesser black-backed gull, b, nb	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, <1% of birds at the Project during this period will originate from this population.
UK9020326	Morecambe Bay and Duddon Estuary	340	309	Little tern, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, <1% of birds at the Project during this

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						period will originate from this population.
UK9020326	Morecambe Bay and Duddon Estuary	340	309	Sandwich tern, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, <1% of birds at the Project during this period will originate from this population.
UK9020326	Morecambe Bay and Duddon Estuary	340	309	Seabird assemblage, b	OUT	Project is beyond the published mean maximum foraging range of all qualifying features of this site, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as it is considered very unlikely that sufficient numbers of the assemblage would be present at the Project for LSE to occur.
UK9020111	Strangford Loch	350	345	Arctic tern, b	OUT	Project is beyond the published mean maximum

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season. Therefore there is no evidence for connectivity between this feature and the Project at any time of year.
UK9020111	Strangford Loch	350	345	Common tern, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as species not recorded.
UK9020111	Strangford Loch	350	345	Sandwich tern, b	IN	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Screened in for non-breeding season impacts as species was recorded during this season, and >1% of birds at the Project during this period will originate from this population.

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
UK9020271	Outer Ards	354	349	Arctic tern, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season. Therefore there is no evidence for connectivity between this feature and the Project at any time of year.
UK9005151	Bowland Fells	355	321	Lesser black-backed gull, b	IN	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Screened in for non-breeding season impacts as species was recorded during this season, and >1% of birds at the Project during this period will originate from this population.
UK9020091	Lough Neagh and Lough Beg	377	372	Common tern, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						breeding season impacts as species not recorded.
UK9020101	Belfast Lough	388	383	Arctic tern, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season. Therefore there is no evidence for connectivity between this feature and the Project at any time of year.
UK9020101	Belfast Lough	388	383	Common tern, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as species not recorded.
UK9020290	Belfast Lough Open Water	389	383	Great crested grebe, nb	OUT	Site boundary encompasses core areas used during the non-breeding season. Extensive distance between the site boundary and the Project. No evidence for connectivity

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						between this feature and the Project.
UK9020291	Copeland Islands	391	386	Arctic tern, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season. Therefore there is no evidence for connectivity between this feature and the Project at any time of year.
UK9020291	Copeland Islands	391	386	Manx shearwater, b	IN	Project is within the published mean maximum foraging range, and feature was recorded during baseline surveys during the breeding season. Therefore, screened in for potential impacts during the breeding season. Non-breeding season impacts will also be considered.
UK9020042	Larne Lough	403	398	Common tern, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						screened in for non-breeding season impacts as species not recorded.
UK9020042	Larne Lough	403	398	Roseate tern, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season. Therefore there is no evidence for connectivity between this feature and the Project at any time of year.
UK9020042	Larne Lough	403	398	Sandwich tern, b	IN	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Screened in for non-breeding season impacts as species was recorded during this season, and >1% of birds at the Project during this period will originate from this population.
UK9003091	Ailsa Craig	454	448	Gannet, b	IN	Project is beyond the published mean maximum foraging range, therefore

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						no connectivity during the breeding season. Screened in for non-breeding season impacts as species was recorded during this season, and >1% of birds at the Project during this period will originate from this population.
UK9003091	Ailsa Craig	454	448	Guillemot, b	IN	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Screened in for non-breeding season impacts as species was recorded during this season, and >1% of birds at the Project during this period will originate from this population.
UK9003091	Ailsa Craig	454	448	Herring gull, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						season, <1% of birds at the Project during this period will originate from this population.
UK9003091	Ailsa Craig	454	448	Kittiwake, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, <1% of birds at the Project during this period will originate from this population.
UK9003091	Ailsa Craig	454	448	Lesser black-backed gull, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, <1% of birds at the Project during this period will originate from this population.

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
UK9003091	Ailsa Craig	454	448	Seabird assemblage, b	OUT	Project is beyond the published mean maximum foraging range of all qualifying features of this site, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as it is considered very unlikely that sufficient numbers of the assemblage would be present at the Project for LSE to occur.
UK9005103	Ribble and Alt Estuaries	460	454	Common tern, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as species not recorded.
UK9020011	Rathlin Island	460	454	Guillemot, b	IN	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Screened in for non-breeding season impacts as species was recorded during this season, and

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						>1% of birds at the Project during this period will originate from this population.
UK9020011	Rathlin Island	460	454	Kittiwake, b	IN	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Screened in for non-breeding season impacts as species was recorded during this season, and >1% of birds at the Project during this period will originate from this population.
UK9020011	Rathlin Island	460	454	Razorbill, b	IN	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Screened in for non-breeding season impacts as species was recorded during this season, and >1% of birds at the Project during this period will originate from this population.
UK9020021	Sheep Island	461	455	Cormorant, b	OUT	Project is beyond the published mean maximum

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season. Therefore there is no evidence for connectivity between this feature and the Project at any time of year.
UK9006101	Flamborough and Filey Coast	478	424	Gannet, b	IN	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Screened in for non-breeding season impacts as species was recorded during this season, and >1% of birds at the Project during this period will originate from this population.
UK9006102	Flamborough and Filey Coast	478	424	Guillemot, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						recorded during this season, <1% of birds at the Project during this period will originate from this population.
UK9006101	Flamborough and Filey Coast	478	424	Kittiwake, b	IN	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Screened in for non-breeding season impacts as species was recorded during this season, and >1% of birds at the Project during this period will originate from this population.
UK9006101	Flamborough and Filey Coast	478	424	Razorbill, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, <1% of birds at the Project during this period will originate from this population.

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
UK9006101	Flamborough and Filey Coast	478	424	Seabird assemblage, b	OUT	Project is beyond the published mean maximum foraging range of all qualifying features of this site, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as it is considered very unlikely that sufficient numbers of the assemblage would be present at the Project for LSE to occur.
UK9003301	Knapdale Lochs	523	530	Black-throated diver, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season. Therefore there is no evidence for connectivity between this feature and the Project at any time of year.
UK9006031	Coquet Island	528	495	Arctic tern, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						breeding season. Species not recorded during baseline surveys to date during any season. Therefore there is no evidence for connectivity between this feature and the Project at any time of year.
UK9006031	Coquet Island	528	495	Common tern, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as species not recorded.
UK9006031	Coquet Island	528	495	Roseate tern, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season. Therefore there is no evidence for connectivity between this feature and the Project at any time of year.
UK9006031	Coquet Island	528	495	Sandwich tern, b	OUT	Project is beyond the published mean maximum

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, <1% of birds at the Project during this period will originate from this population.
UK9006031	Coquet Island	528	495	Seabird assemblage, b	OUT	Project is beyond the published mean maximum foraging range of all qualifying features of this site, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as it is considered very unlikely that sufficient numbers of the assemblage would be present at the Project for LSE to occur.
UK9003171	North Colonsay and Western Cliffs	551	545	Guillemot, b	IN	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Screened in for non-

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						breeding season impacts as species was recorded during this season, and >1% of birds at the Project during this period will originate from this population.
UK9003171	North Colonsay and Western Cliffs	551	545	Kittiwake, b	IN	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Screened in for non-breeding season impacts as species was recorded during this season, and >1% of birds at the Project during this period will originate from this population.
UK9003171	North Colonsay and Western Cliffs	551	545	Seabird assemblage, b	OUT	Project is beyond the published mean maximum foraging range of all qualifying features of this site, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as it is considered very unlikely that sufficient numbers of the

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						assemblage would be present at the Project for LSE to occur.
UK9006021	Farne Islands	553	522	Arctic tern, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season. Therefore there is no evidence for connectivity between this feature and the Project at any time of year.
UK9006021	Farne Islands	553	522	Common tern, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as species not recorded.
UK9006021	Farne Islands	553	522	Guillemot, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						recorded during this season, <1% of birds at the Project during this period will originate from this population.
UK9006021	Farne Islands	553	522	Puffin, b	IN	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Screened in for non-breeding season impacts as species was recorded during this season, and >1% of birds at the Project during this period will originate from this population.
UK9006021	Farne Islands	553	522	Sandwich tern, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, <1% of birds at the Project during this period will originate from this population.

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
UK9006021	Farne Islands	553	522	Seabird assemblage, b	OUT	Project is beyond the published mean maximum foraging range of all qualifying features of this site, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as it is considered very unlikely that sufficient numbers of the assemblage would be present at the Project for LSE to occur.
UK9004171	Forth Islands	554	542	Arctic tern, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season. Therefore there is no evidence for connectivity between this feature and the Project at any time of year.
UK9004171	Forth Islands	554	542	Common tern, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						breeding season. Not screened in for non-breeding season impacts as species not recorded.
UK9004171	Forth Islands	554	542	Cormorant, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season. Therefore there is no evidence for connectivity between this feature and the Project at any time of year.
UK9004171	Forth Islands	554	542	Gannet, b	IN	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Screened in for non-breeding season impacts as species was recorded during this season, and >1% of birds at the Project during this period will originate from this population.
UK9004171	Forth Islands	554	542	Guillemot, b	OUT	Project is beyond the published mean maximum

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, <1% of birds at the Project during this period will originate from this population.
UK9004171	Forth Islands	554	542	Herring gull, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, <1% of birds at the Project during this period will originate from this population.
UK9004171	Forth Islands	554	542	Kittiwake, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						recorded during this season, <1% of birds at the Project during this period will originate from this population.
UK9004171	Forth Islands	554	542	Lesser black-backed gull, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, <1% of birds at the Project during this period will originate from this population.
UK9004171	Forth Islands	554	542	Puffin, b	IN	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Screened in for non-breeding season impacts as species was recorded during this season, and >1% of birds at the Project during this period will originate from this population.

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
UK9004171	Forth Islands	554	542	Razorbill, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, <1% of birds at the Project during this period will originate from this population.
UK9004171	Forth Islands	554	542	Roseate tern, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season. Therefore there is no evidence for connectivity between this feature and the Project at any time of year.
UK9004171	Forth Islands	554	542	Sandwich tern, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						breeding season impacts as whilst species was recorded during this season, <1% of birds at the Project during this period will originate from this population.
UK9004171	Forth Islands	554	542	Seabird assemblage, b	OUT	Project is beyond the published mean maximum foraging range of all qualifying features of this site, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as it is considered very unlikely that sufficient numbers of the assemblage would be present at the Project for LSE to occur.
UK9004171	Forth Islands	554	542	Shag, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season. Therefore there is no evidence for connectivity

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						between this feature and the Project at any time of year.
UK9004451	Imperial Dock Lock Leith	556	539	Common tern, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as species not recorded.
UK9003211	Glas Eileanan	595	590	Common tern, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as species not recorded.
UK9003041	Treshnish Isles	595	595	Storm petrel, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season. Therefore there is no evidence for connectivity between this feature and the Project at any time of year.

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
UK9001121	Mingulay and Berneray	641	636	Fulmar, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, <1% of birds at the Project during this period will originate from this population.
UK9001121	Mingulay and Berneray	641	636	Guillemot, b	IN	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Screened in for non-breeding season impacts as species was recorded during this season, and >1% of birds at the Project during this period will originate from this population.
UK9001121	Mingulay and Berneray	641	636	Kittiwake, b	IN	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Screened in for non-

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						breeding season impacts as species was recorded during this season, and >1% of birds at the Project during this period will originate from this population.
UK9001121	Mingulay and Berneray	641	636	Puffin, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, <1% of birds at the Project during this period will originate from this population.
UK9001121	Mingulay and Berneray	641	636	Razorbill, b	IN	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Screened in for non-breeding season impacts as species was recorded during this season, and >1% of birds at the Project during this period

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						will originate from this population.
UK9001121	Mingulay and Berneray	641	636	Seabird assemblage, b	OUT	Project is beyond the published mean maximum foraging range of all qualifying features of this site, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as it is considered very unlikely that sufficient numbers of the assemblage would be present at the Project for LSE to occur.
UK9001121	Mingulay and Berneray	641	636	Shag, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season. Therefore there is no evidence for connectivity between this feature and the Project at any time of year.
UK9001341	Rum	642	637	Guillemot, b	OUT	Project is beyond the published mean maximum

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, <1% of birds at the Project during this period will originate from this population.
UK9001341	Rum	642	637	Kittiwake, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, <1% of birds at the Project during this period will originate from this population.
UK9001341	Rum	642	637	Manx shearwater, b	IN	Project is within the published mean maximum foraging range, and feature was recorded during baseline surveys during the breeding season. Therefore, screened in for potential

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						impacts during the breeding season. Non-breeding season impacts will also be considered.
UK9001341	Rum	642	637	Red-throated diver, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season. Therefore there is no evidence for connectivity between this feature and the Project at any time of year.
UK9001341	Rum	642	637	Seabird assemblage, b	OUT	With the exception of Manx shearwater, the Project is beyond the published mean maximum foraging range of all qualifying features of this site, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as it is considered very unlikely that sufficient numbers of the assemblage would be

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						present at the Project for LSE to occur.
UK9020319	West Coast of the Outer Hebrides	653	648	Red-throated diver, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season. Therefore there is no evidence for connectivity between this feature and the Project at any time of year.
UK9001431	Canna and Sanday	658	652	Guillemot, b	IN	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Screened in for non-breeding season impacts as species was recorded during this season, and >1% of birds at the Project during this period will originate from this population.
UK9001431	Canna and Sanday	658	652	Herring gull, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, <1% of birds at the Project during this period will originate from this population.
UK9001431	Canna and Sanday	658	652	Kittiwake, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, <1% of birds at the Project during this period will originate from this population.
UK9001431	Canna and Sanday	658	652	Puffin, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, <1% of birds at

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						the Project during this period will originate from this population.
UK9001431	Canna and Sanday	658	652	Seabird assemblage, b	OUT	Project is beyond the published mean maximum foraging range of all qualifying features of this site, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as it is considered very unlikely that sufficient numbers of the assemblage would be present at the Project for LSE to occur.
UK9001431	Canna and Sanday	658	652	Shag, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season. Therefore there is no evidence for connectivity between this feature and the Project at any time of year.

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
UK9002271	Fowlsheugh	670	649	Kittiwake, b	IN	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Screened in for non-breeding season impacts as species was recorded during this season, and >1% of birds at the Project during this period will originate from this population.
UK9001082	South Uist Machair and Lochs	675	684	Little tern, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season. Therefore there is no evidence for connectivity between this feature and the Project at any time of year.
UK9002491	Buchan Ness to Collieston Coast	721	699	Fulmar, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						breeding season impacts as whilst species was recorded during this season, <1% of birds at the Project during this period will originate from this population.
UK9002492	Buchan Ness to Collieston Coast	721	699	Guillemot, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, <1% of birds at the Project during this period will originate from this population.
UK9002493	Buchan Ness to Collieston Coast	721	699	Herring gull, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, <1% of birds at the Project during this

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						period will originate from this population.
UK9002494	Buchan Ness to Collieston Coast	721	699	Kittiwake, b	IN	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Screened in for non-breeding season impacts as species was recorded during this season, and >1% of birds at the Project during this period will originate from this population.
UK9002496	Buchan Ness to Collieston Coast	721	699	Seabird assemblage, b	OUT	Project is beyond the published mean maximum foraging range of all qualifying features of this site, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as it is considered very unlikely that sufficient numbers of the assemblage would be present at the Project for LSE to occur.
UK9002495	Buchan Ness to Collieston Coast	721	699	Shag, b	OUT	Project is beyond the published mean maximum

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season. Therefore there is no evidence for connectivity between this feature and the Project at any time of year.
UK9001501	Mointeach Scadabhaigh	724	719	Black-throated diver, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season. Therefore there is no evidence for connectivity between this feature and the Project at any time of year.
UK9001501	Mointeach Scadabhaigh	724	719	Red-throated diver, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season.

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						Therefore there is no evidence for connectivity between this feature and the Project at any time of year.
UK9020332	Seas off St Kilda	744	740	Fulmar, b	OUT	Site boundary encompasses core areas used during the breeding season. Extensive distance between the site boundary and the Project. No evidence for connectivity between this feature and the Project at any time of year.
UK9020332	Seas off St Kilda	744	740	Gannet, b	OUT	Site boundary encompasses core areas used during the breeding season. Extensive distance between the site boundary and the Project. No evidence for connectivity between this feature and the Project.
UK9020332	Seas off St Kilda	744	740	Guillemot, b	OUT	Site boundary encompasses core areas used during the breeding season. Extensive distance between the site boundary and the Project. No evidence for connectivity between this feature and

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						the Project at any time of year.
UK9020332	Seas off St Kilda	744	740	Puffin, b	OUT	Site boundary encompasses core areas used during the breeding season. Extensive distance between the site boundary and the Project. No evidence for connectivity between this feature and the Project at any time of year.
UK9020332	Seas off St Kilda	744	740	Seabird assemblage, b	OUT	Site boundary encompasses core areas used during the breeding season. Extensive distance between the site boundary and the Project. No evidence for connectivity between this feature and the Project at any time of year.
UK9020332	Seas off St Kilda	744	740	Storm petrel, b	OUT	Site boundary encompasses core areas used during the breeding season. Extensive distance between the site boundary and the Project. No evidence for connectivity between this feature and the Project at any time of year.

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
UK9001041	Shiant Isles	749	744	Fulmar, b	IN	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Screened in for non-breeding season impacts as species was recorded during this season, and >1% of birds at the Project during this period will originate from this population.
UK9001041	Shiant Isles	749	744	Guillemot, b	IN	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Screened in for non-breeding season impacts as species was recorded during this season, and >1% of birds at the Project during this period will originate from this population.
UK9001041	Shiant Isles	749	744	Kittiwake, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						breeding season impacts as whilst species was recorded during this season, <1% of birds at the Project during this period will originate from this population.
UK9001041	Shiant Isles	749	744	Puffin, b	IN	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Screened in for non-breeding season impacts as species was recorded during this season, and >1% of birds at the Project during this period will originate from this population.
UK9001041	Shiant Isles	749	744	Razorbill, b	IN	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Screened in for non-breeding season impacts as species was recorded during this season, and >1% of birds at the Project during this period

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						will originate from this population.
UK9001041	Shiant Isles	749	744	Seabird assemblage, b	OUT	Site boundary encompasses core areas used during the breeding season. Extensive distance between the site boundary and the Project. No evidence for connectivity between this feature and the Project at any time of year.
UK9001041	Shiant Isles	749	744	Shag, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season. Therefore there is no evidence for connectivity between this feature and the Project at any time of year.
UK9002471	Troup, Pennan and Lion's Heads	750	732	Fulmar, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						as whilst species was recorded during this season, <1% of birds at the Project during this period will originate from this population.
UK9002471	Troup, Pennan and Lion's Heads	750	732	Guillemot, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, <1% of birds at the Project during this period will originate from this population.
UK9002471	Troup, Pennan and Lion's Heads	750	732	Herring gull, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, <1% of birds at the Project during this period will originate from this population.

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
UK9002471	Troup, Pennan and Lion's Heads	750	732	Kittiwake, b	IN	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Screened in for non-breeding season impacts as species was recorded during this season, and >1% of birds at the Project during this period will originate from this population.
UK9002471	Troup, Pennan and Lion's Heads	750	732	Razorbill, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, <1% of birds at the Project during this period will originate from this population.
UK9002471	Troup, Pennan and Lion's Heads	750	732	Seabird assemblage, b	OUT	Project is beyond the published mean maximum foraging range of all qualifying features of this site, therefore no connectivity during the

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						breeding season. Not screened in for non-breeding season impacts as it is considered very unlikely that sufficient numbers of the assemblage would be present at the Project for LSE to occur.
UK9001261	Priest Island (Summer Isles)	758	752	Storm petrel, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season. Therefore there is no evidence for connectivity between this feature and the Project at any time of year.
UK9001031	St Kilda	762	757	Fulmar, b	IN	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Screened in for non-breeding season impacts as species was recorded during this season, and >1% of birds at the

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						Project during this period will originate from this population.
UK9001031	St Kilda	762	757	Gannet, b	IN	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Screened in for non-breeding season impacts as species was recorded during this season, and >1% of birds at the Project during this period will originate from this population.
UK9001031	St Kilda	762	757	Great skua, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season. Therefore there is no evidence for connectivity between this feature and the Project at any time of year.
UK9001031	St Kilda	762	757	Guillemot, b	IN	Project is beyond the published mean maximum foraging range, therefore

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						no connectivity during the breeding season. Screened in for non-breeding season impacts as species was recorded during this season, and >1% of birds at the Project during this period will originate from this population.
UK9001031	St Kilda	762	757	Kittiwake, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, <1% of birds at the Project during this period will originate from this population.
UK9001031	St Kilda	762	757	Leach's petrel, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season. Therefore there is no

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						evidence for connectivity between this feature and the Project at any time of year.
UK9001031	St Kilda	762	757	Manx shearwater, b	IN	Project is within the published mean maximum foraging range, and feature was recorded during baseline surveys during the breeding season. Therefore, screened in for potential impacts during the breeding season. Non-breeding season impacts will also be considered.
UK9001031	St Kilda	762	757	Puffin, b	IN	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Screened in for non-breeding season impacts as species was recorded during this season, and >1% of birds at the Project during this period will originate from this population.
UK9001031	St Kilda	762	757	Razorbill, b	OUT	Project is beyond the published mean maximum foraging range, therefore

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, <1% of birds at the Project during this period will originate from this population.
UK9001031	St Kilda	762	757	Seabird assemblage, b	OUT	Project is beyond the published mean maximum foraging range of all qualifying features of this site, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as it is considered very unlikely that sufficient numbers of the assemblage would be present at the Project for LSE to occur.
UK9001031	St Kilda	762	757	Storm petrel, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						during any season. Therefore there is no evidence for connectivity between this feature and the Project at any time of year.
UK9001151	Caithness and Sutherland Peatlands	765	790	Black-throated diver, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season. Therefore there is no evidence for connectivity between this feature and the Project at any time of year.
UK9001151	Caithness and Sutherland Peatlands	765	790	Common scoter, Melanitta nigra, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season. Therefore there is no evidence for connectivity between this feature and the Project at any time of year.

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
UK9001151	Caithness and Sutherland Peatlands	765	790	Red-throated diver, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season. Therefore there is no evidence for connectivity between this feature and the Project at any time of year.
UK9001571	Lewis Peatlands	770	764	Black-throated diver, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season. Therefore there is no evidence for connectivity between this feature and the Project at any time of year.
UK9001572	Lewis Peatlands	770	764	Red-throated diver, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						baseline surveys to date during any season. Therefore there is no evidence for connectivity between this feature and the Project at any time of year.
UK9001182	East Caithness Cliffs	782	772	Cormorant, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season. Therefore there is no evidence for connectivity between this feature and the Project at any time of year.
UK9001182	East Caithness Cliffs	782	772	Fulmar, b	IN	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Screened in for non-breeding season impacts as species was recorded during this season, and >1% of birds at the Project during this period

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						will originate from this population.
UK9001182	East Caithness Cliffs	782	772	Great black-backed gull, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, <1% of birds at the Project during this period will originate from this population.
UK9001182	East Caithness Cliffs	782	772	Guillemot, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, <1% of birds at the Project during this period will originate from this population.
UK9001182	East Caithness Cliffs	782	772	Herring gull, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, <1% of birds at the Project during this period will originate from this population.
UK9001182	East Caithness Cliffs	782	772	Kittiwake, b	IN	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Screened in for non-breeding season impacts as species was recorded during this season, and >1% of birds at the Project during this period will originate from this population.
UK9001182	East Caithness Cliffs	782	772	Razorbill, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, <1% of birds at

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						the Project during this period will originate from this population.
UK9001182	East Caithness Cliffs	782	772	Seabird assemblage, b	OUT	Project is beyond the published mean maximum foraging range of all qualifying features of this site, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as it is considered very unlikely that sufficient numbers of the assemblage would be present at the Project for LSE to occur.
UK9001182	East Caithness Cliffs	782	772	Shag, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season. Therefore there is no evidence for connectivity between this feature and the Project at any time of year.

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
UK9001241	Handa	801	796	Fulmar, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, <1% of birds at the Project during this period will originate from this population.
UK9001241	Handa	801	796	Great skua, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season. Therefore there is no evidence for connectivity between this feature and the Project at any time of year.
UK9001241	Handa	801	796	Guillemot, b	IN	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Screened in for non-

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						breeding season impacts as species was recorded during this season, and >1% of birds at the Project during this period will originate from this population.
UK9001241	Handa	801	796	Kittiwake, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, <1% of birds at the Project during this period will originate from this population.
UK9001241	Handa	801	796	Razorbill, b	IN	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Screened in for non-breeding season impacts as species was recorded during this season, and >1% of birds at the Project during this period

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						will originate from this population.
UK9001241	Handa	801	796	Seabird assemblage, b	OUT	Project is beyond the published mean maximum foraging range of all qualifying features of this site, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as it is considered very unlikely that sufficient numbers of the assemblage would be present at the Project for LSE to occur.
UK9001021	Flannan Isles	803	798	Fulmar, b	IN	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Screened in for non-breeding season impacts as species was recorded during this season, and >1% of birds at the Project during this period will originate from this population.
UK9001021	Flannan Isles	803	798	Guillemot, b	IN	Project is beyond the published mean maximum

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						foraging range, therefore no connectivity during the breeding season. Screened in for non-breeding season impacts as species was recorded during this season, and >1% of birds at the Project during this period will originate from this population.
UK9001021	Flannan Isles	803	798	Kittiwake, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, <1% of birds at the Project during this period will originate from this population.
UK9001021	Flannan Isles	803	798	Leach's petrel, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season.

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						Therefore there is no evidence for connectivity between this feature and the Project at any time of year.
UK9001021	Flannan Isles	803	798	Puffin, b	IN	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Screened in for non-breeding season impacts as species was recorded during this season, and >1% of birds at the Project during this period will originate from this population.
UK9001021	Flannan Isles	803	798	Razorbill, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, <1% of birds at the Project during this period will originate from this population.

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
UK9001021	Flannan Isles	803	798	Seabird assemblage, b	OUT	Project is beyond the published mean maximum foraging range of all qualifying features of this site, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as it is considered very unlikely that sufficient numbers of the assemblage would be present at the Project for LSE to occur.
UK9001231	Cape Wrath	825	819	Fulmar, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, <1% of birds at the Project during this period will originate from this population.
UK9001231	Cape Wrath	825	819	Guillemot, b	IN	Project is beyond the published mean maximum foraging range, therefore no connectivity during the

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						breeding season. Screened in for non-breeding season impacts as species was recorded during this season, and >1% of birds at the Project during this period will originate from this population.
UK9001231	Cape Wrath	825	819	Kittiwake, b	IN	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Screened in for non-breeding season impacts as species was recorded during this season, and >1% of birds at the Project during this period will originate from this population.
UK9001231	Cape Wrath	825	819	Puffin, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, <1% of birds at

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						the Project during this period will originate from this population.
UK9001231	Cape Wrath	825	819	Razorbill, b	IN	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Screened in for non-breeding season impacts as species was recorded during this season, and >1% of birds at the Project during this period will originate from this population.
UK9001231	Cape Wrath	825	819	Seabird assemblage, b	OUT	Project is beyond the published mean maximum foraging range of all qualifying features of this site, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as it is considered very unlikely that sufficient numbers of the assemblage would be present at the Project for LSE to occur.

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
UK9001181	North Caithness Cliffs	829	821	Fulmar, b	IN	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Screened in for non-breeding season impacts as species was recorded during this season, and >1% of birds at the Project during this period will originate from this population.
UK9001181	North Caithness Cliffs	829	821	Guillemot, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, <1% of birds at the Project during this period will originate from this population.
UK9001181	North Caithness Cliffs	829	821	Kittiwake, b	IN	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Screened in for non-

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						breeding season impacts as species was recorded during this season, and >1% of birds at the Project during this period will originate from this population.
UK9001181	North Caithness Cliffs	829	821	Puffin, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, <1% of birds at the Project during this period will originate from this population.
UK9001181	North Caithness Cliffs	829	821	Razorbill, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, <1% of birds at the Project during this

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						period will originate from this population.
UK9001181	North Caithness Cliffs	829	821	Seabird assemblage, b	OUT	Project is beyond the published mean maximum foraging range of all qualifying features of this site, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as it is considered very unlikely that sufficient numbers of the assemblage would be present at the Project for LSE to occur.
UK9002141	Hoy	856	845	Arctic skua, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season. Therefore there is no evidence for connectivity between this feature and the Project at any time of year.
UK9002141	Hoy	856	845	Fulmar, b	IN	Project is beyond the published mean maximum

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						foraging range, therefore no connectivity during the breeding season. Screened in for non-breeding season impacts as species was recorded during this season, and >1% of birds at the Project during this period will originate from this population.
UK9002141	Hoy	856	845	Great black-backed gull, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, <1% of birds at the Project during this period will originate from this population.
UK9002141	Hoy	856	845	Great skua, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season.

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						Therefore there is no evidence for connectivity between this feature and the Project at any time of year.
UK9002141	Hoy	856	845	Guillemot, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, <1% of birds at the Project during this period will originate from this population.
UK9002141	Hoy	856	845	Kittiwake, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, <1% of birds at the Project during this period will originate from this population.

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
UK9002141	Hoy	856	845	Puffin, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, <1% of birds at the Project during this period will originate from this population.
UK9002141	Hoy	856	845	Red-throated diver, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season. Therefore there is no evidence for connectivity between this feature and the Project at any time of year.
UK9002141	Hoy	856	845	Seabird assemblage, b	OUT	Project is beyond the published mean maximum foraging range of all qualifying features of this site, therefore no connectivity during the

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						breeding season. Not screened in for non-breeding season impacts as it is considered very unlikely that sufficient numbers of the assemblage would be present at the Project for LSE to occur.
UK9002181	Sule Skerry and Sule Stack	875	870	Gannet, b	IN	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Screened in for non-breeding season impacts as species was recorded during this season, and >1% of birds at the Project during this period will originate from this population.
UK9002181	Sule Skerry and Sule Stack	875	870	Guillemot, b	IN	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Screened in for non-breeding season impacts as species was recorded during this season, and >1% of birds at the

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						Project during this period will originate from this population.
UK9002181	Sule Skerry and Sule Stack	875	870	Leach's petrel, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season. Therefore there is no evidence for connectivity between this feature and the Project at any time of year.
UK9002181	Sule Skerry and Sule Stack	875	870	Puffin, b	IN	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Screened in for non-breeding season impacts as species was recorded during this season, and >1% of birds at the Project during this period will originate from this population.
UK9002181	Sule Skerry and Sule Stack	875	870	Seabird assemblage, b	OUT	Project is beyond the published mean maximum foraging range of all

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						qualifying features of this site, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as it is considered very unlikely that sufficient numbers of the assemblage would be present at the Project for LSE to occur.
UK9002181	Sule Skerry and Sule Stack	875	870	Shag, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season. Therefore there is no evidence for connectivity between this feature and the Project at any time of year.
UK9002181	Sule Skerry and Sule Stack	875	870	Storm petrel, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						during any season. Therefore there is no evidence for connectivity between this feature and the Project at any time of year.
UK9002311	Orkney Mainland Moors	877	866	Red-throated diver, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season. Therefore there is no evidence for connectivity between this feature and the Project at any time of year.
UK9001011	North Rona and Sula Sgeir	883	877	Fulmar, b	IN	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Screened in for non-breeding season impacts as species was recorded during this season, and >1% of birds at the Project during this period will originate from this population.

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
UK9001011	North Rona and Sula Sgeir	883	877	Gannet, b	IN	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Screened in for non-breeding season impacts as species was recorded during this season, and >1% of birds at the Project during this period will originate from this population.
UK9001011	North Rona and Sula Sgeir	883	877	Great black-backed gull, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, <1% of birds at the Project during this period will originate from this population.
UK9001011	North Rona and Sula Sgeir	883	877	Guillemot, b	IN	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Screened in for non-

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						breeding season impacts as species was recorded during this season, and >1% of birds at the Project during this period will originate from this population.
UK9001011	North Rona and Sula Sgeir	883	877	Kittiwake, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, <1% of birds at the Project during this period will originate from this population.
UK9001011	North Rona and Sula Sgeir	883	877	Leach's petrel, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season. Therefore there is no evidence for connectivity between this feature and

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						the Project at any time of year.
UK9001011	North Rona and Sula Sgeir	883	877	Puffin, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, <1% of birds at the Project during this period will originate from this population.
UK9002121	Marwick Head	892	882	Guillemot, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, <1% of birds at the Project during this period will originate from this population.
UK9002121	Marwick Head	892	882	Kittiwake, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, <1% of birds at the Project during this period will originate from this population.
UK9002121	Marwick Head	892	882	Seabird assemblage, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, <1% of birds at the Project during this period will originate from this population.
UK9002101	West Westray	914	902	Arctic skua, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season. Therefore there is no evidence for connectivity

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						between this feature and the Project at any time of year.
UK9002101	West Westray	914	902	Arctic tern, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season. Therefore there is no evidence for connectivity between this feature and the Project at any time of year.
UK9002101	West Westray	914	902	Fulmar, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, <1% of birds at the Project during this period will originate from this population.
UK9002101	West Westray	914	902	Guillemot, b	OUT	Project is beyond the published mean maximum foraging range, therefore

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, <1% of birds at the Project during this period will originate from this population.
UK9002101	West Westray	914	902	Kittiwake, b	IN	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Screened in for non-breeding season impacts as species was recorded during this season, and >1% of birds at the Project during this period will originate from this population.
UK9002101	West Westray	914	902	Razorbill, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						season, <1% of birds at the Project during this period will originate from this population.
UK9002101	West Westray	914	902	Seabird assemblage, b	OUT	Project is beyond the published mean maximum foraging range of all qualifying features of this site, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as it is considered very unlikely that sufficient numbers of the assemblage would be present at the Project for LSE to occur.
UK9002091	Fair Isle	955	938	Arctic skua, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season. Therefore there is no evidence for connectivity between this feature and the Project at any time of year.

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
UK9002092	Fair Isle	955	938	Arctic tern, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season. Therefore there is no evidence for connectivity between this feature and the Project at any time of year.
UK9002093	Fair Isle	955	938	Fulmar, b	IN	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Screened in for non-breeding season impacts as species was recorded during this season, and >1% of birds at the Project during this period will originate from this population.
UK9002084	Fair Isle	955	938	Gannet, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						breeding season impacts as whilst species was recorded during this season, <1% of birds at the Project during this period will originate from this population.
UK9002085	Fair Isle	955	938	Great skua, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season. Therefore there is no evidence for connectivity between this feature and the Project at any time of year.
UK9002086	Fair Isle	955	938	Guillemot, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, <1% of birds at the Project during this

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						period will originate from this population.
UK9002087	Fair Isle	955	938	Kittiwake, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, <1% of birds at the Project during this period will originate from this population.
UK9002088	Fair Isle	955	938	Puffin, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, <1% of birds at the Project during this period will originate from this population.
UK9002089	Fair Isle	955	938	Razorbill, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, <1% of birds at the Project during this period will originate from this population.
UK9002091	Fair Isle	955	938	Seabird assemblage, b	OUT	Project is beyond the published mean maximum foraging range of all qualifying features of this site, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as it is considered very unlikely that sufficient numbers of the assemblage would be present at the Project for LSE to occur.
UK9002090	Fair Isle	955	938	Shag, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season.

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						Therefore there is no evidence for connectivity between this feature and the Project at any time of year.
UK9002061	Foula	1,014	1,000	Arctic skua, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season. Therefore there is no evidence for connectivity between this feature and the Project at any time of year.
UK9002061	Foula	1,014	1,000	Arctic tern, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season. Therefore there is no evidence for connectivity between this feature and the Project at any time of year.

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
UK9002061	Foula	1,014	1,000	Fulmar, b	IN	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Screened in for non-breeding season impacts as species was recorded during this season, and >1% of birds at the Project during this period will originate from this population.
UK9002061	Foula	1,014	1,000	Great skua, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season. Therefore there is no evidence for connectivity between this feature and the Project at any time of year.
UK9002061	Foula	1,014	1,000	Guillemot, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						breeding season impacts as whilst species was recorded during this season, <1% of birds at the Project during this period will originate from this population.
UK9002061	Foula	1,014	1,000	Kittiwake, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, <1% of birds at the Project during this period will originate from this population.
UK9002061	Foula	1,014	1,000	Leach's petrel, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season. Therefore there is no evidence for connectivity between this feature and

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						the Project at any time of year.
UK9002061	Foula	1,014	1,000	Puffin, b	IN	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Screened in for non-breeding season impacts as species was recorded during this season, and >1% of birds at the Project during this period will originate from this population.
UK9002061	Foula	1,014	1,000	Razorbill, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, <1% of birds at the Project during this period will originate from this population.
UK9002061	Foula	1,014	1,000	Red-throated diver, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						breeding season. Species not recorded during baseline surveys to date during any season. Therefore there is no evidence for connectivity between this feature and the Project at any time of year.
UK9002061	Foula	1,014	1,000	Seabird assemblage, b	OUT	Project is beyond the published mean maximum foraging range of all qualifying features of this site, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as it is considered very unlikely that sufficient numbers of the assemblage would be present at the Project for LSE to occur.
UK9002061	Foula	1,014	1,000	Shag, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season.

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						Therefore there is no evidence for connectivity between this feature and the Project at any time of year.
UK9002081	Noss	1,032	1,014	Fulmar, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, <1% of birds at the Project during this period will originate from this population.
UK9002081	Noss	1,032	1,014	Gannet, b	IN	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Screened in for non-breeding season impacts as species was recorded during this season, and >1% of birds at the Project during this period will originate from this population.

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
UK9002081	Noss	1,032	1,014	Great skua, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season. Therefore there is no evidence for connectivity between this feature and the Project at any time of year.
UK9002081	Noss	1,032	1,014	Guillemot, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, <1% of birds at the Project during this period will originate from this population.
UK9002081	Noss	1,032	1,014	Kittiwake, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						breeding season impacts as whilst species was recorded during this season, <1% of birds at the Project during this period will originate from this population.
UK9002081	Noss	1,032	1,014	Puffin, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, <1% of birds at the Project during this period will originate from this population.
UK9002081	Noss	1,032	1,014	Seabird assemblage, b	OUT	Project is beyond the published mean maximum foraging range of all qualifying features of this site, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as it is considered very unlikely that sufficient numbers of the

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						assemblage would be present at the Project for LSE to occur.
UK9002041	Ronas Hill - North Roe and Tingon SPA	1,072	1,056	Great skua, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season. Therefore there is no evidence for connectivity between this feature and the Project at any time of year.
UK9002041	Ronas Hill - North Roe and Tingon SPA	1,072	1,056	Red-throated diver, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season. Therefore there is no evidence for connectivity between this feature and the Project at any time of year.
UK9002011	Hermaness, Saxavord and Valla Field	1,099	1,081	Fulmar, b	OUT	Project is beyond the published mean maximum foraging range, therefore

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, <1% of birds at the Project during this period will originate from this population.
UK9002011	Hermaness, Saxavord and Valla Field	1,099	1,081	Gannet, b	IN	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Screened in for non-breeding season impacts as species was recorded during this season, and >1% of birds at the Project during this period will originate from this population.
UK9002011	Hermaness, Saxavord and Valla Field	1,099	1,081	Great skua, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season. Therefore there is no

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						evidence for connectivity between this feature and the Project at any time of year.
UK9002011	Hermaness, Saxavord and Valla Field	1,099	1,081	Guillemot, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, <1% of birds at the Project during this period will originate from this population.
UK9002011	Hermaness, Saxavord and Valla Field	1,099	1,081	Kittiwake, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, <1% of birds at the Project during this period will originate from this population.

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
UK9002011	Hermaness, Saxavord and Valla Field	1,099	1,081	Puffin, b	IN	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Screened in for non-breeding season impacts as species was recorded during this season, and >1% of birds at the Project during this period will originate from this population.
UK9002011	Hermaness, Saxavord and Valla Field	1,099	1,081	Red-throated diver, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season. Therefore there is no evidence for connectivity between this feature and the Project at any time of year.
UK9002011	Hermaness, Saxavord and Valla Field	1,099	1,081	Seabird assemblage, b	OUT	Project is beyond the published mean maximum foraging range of all qualifying features of this site, therefore no connectivity during the

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						breeding season. Not screened in for non-breeding season impacts as it is considered very unlikely that sufficient numbers of the assemblage would be present at the Project for LSE to occur.
UK9002011	Hermaness, Saxavord and Valla Field	1,099	1,081	Shag, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season. Therefore there is no evidence for connectivity between this feature and the Project at any time of year.
1 "b" indicates breeding season, "nb" indicates non-breeding season						

Appendix 3 Screening outcome for transboundary SPA and Ramsar Sites with offshore ornithology qualifying features

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
004009	Lady's Island Lake	134	130	Arctic tern, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season. Therefore there is no evidence for connectivity between this feature and the Project at any time of year.
004009	Lady's Island Lake	134	130	Common tern, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as species not recorded during this season.
004009	Lady's Island Lake	134	130	Roseate tern, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season. Therefore there is no evidence for connectivity between this feature and

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						the Project at any time of year.
004009	Lady's Island Lake	134	130	Sandwich tern, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, it is expected that <1% of birds at the Project during this period will originate from this population.
004002	Saltee Islands	137	135	Cormorant, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season. Therefore there is no evidence for connectivity between this feature and the Project at any time of year.
004002	Saltee Islands	137	135	Fulmar, b	IN	Project is within the published mean maximum foraging range, and feature was recorded during baseline surveys during the

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						breeding season. Therefore screened in for potential impacts during the breeding season. Non-breeding season impacts will also be considered.
004002	Saltee Islands	137	135	Gannet, b	IN	Project is within the published mean maximum foraging range, and feature was recorded during baseline surveys during the breeding season. Therefore screened in for potential impacts during the breeding season. Non-breeding season impacts will also be considered.
004002	Saltee Islands	137	135	Guillemot, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, it is expected that <1% of birds at the Project during this period will originate from this population.
004002	Saltee Islands	137	135	Herring gull, b	OUT	Project is beyond the published mean maximum

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, it is expected that <1% of birds at the Project during this period will originate from this population.
004002	Saltee Islands	137	135	Kittiwake, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, it is expected that <1% of birds at the Project during this period will originate from this population.
004002	Saltee Islands	137	135	Lesser black-backed gull, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						during this season, it is expected that <1% of birds at the Project during this period will originate from this population.
004002	Saltee Islands	137	135	Puffin, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, it is expected that <1% of birds at the Project during this period will originate from this population.
004002	Saltee Islands	137	135	Razorbill, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, it is expected that <1% of birds at the Project during this period will originate from this population.

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
004002	Saltee Islands	137	135	Shag, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season. Therefore there is no evidence for connectivity between this feature and the Project at any time of year.
004193	Mid-Waterford Coast	166	165	Cormorant, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season. Therefore there is no evidence for connectivity between this feature and the Project at any time of year.
004193	Mid-Waterford Coast	166	165	Herring gull, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						during this season, it is expected that <1% of birds at the Project during this period will originate from this population.
004192	Helvick Head to Ballyquin	180	180	Cormorant, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season. Therefore there is no evidence for connectivity between this feature and the Project at any time of year.
004192	Helvick Head to Ballyquin	180	180	Herring gull, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, it is expected that <1% of birds at the Project during this period will originate from this population.
004192	Helvick Head to Ballyquin	180	180	Kittiwake, b	OUT	Project is beyond the published mean maximum

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, it is expected that <1% of birds at the Project during this period will originate from this population.
004127	Wicklow Head	206	200	Kittiwake, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, it is expected that <1% of birds at the Project during this period will originate from this population.
004186	The Murrough	209	204	Black-headed gull, Chroicocephalus ridibundus, nb	OUT	Site boundary encompasses core areas used during the non-breeding season. Extensive distance between the site boundary and the Project. No evidence for connectivity between this

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						feature and the Project at any time of year.
004186	The Murrough	209	204	Herring gull, nb	OUT	Site boundary encompasses core areas used during the non-breeding season. Extensive distance between the site boundary and the Project. No evidence for connectivity between this feature and the Project.
004186	The Murrough	209	204	Little tern, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season. Therefore there is no evidence for connectivity between this feature and the Project at any time of year.
004186	The Murrough	209	204	Red-throated diver, nb	OUT	Site boundary encompasses core areas used during the non-breeding season. Extensive distance between the site boundary and the Project. No evidence for connectivity between this feature and the Project.
004124	Sovereign Islands	222	224	Cormorant, b	OUT	Project is beyond the published mean maximum

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season. Therefore there is no evidence for connectivity between this feature and the Project at any time of year.
004021	Old Head of Kinsale	227	229	Guillemot, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, it is expected that <1% of birds at the Project during this period will originate from this population.
004021	Old Head of Kinsale	227	229	Kittiwake, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, it is

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						expected that <1% of birds at the Project during this period will originate from this population.
004172	Dalkey Islands	241	235	Arctic tern, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season. Therefore there is no evidence for connectivity between this feature and the Project at any time of year.
004172	Dalkey Islands	241	235	Common tern, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as species not recorded during this season.
004172	Dalkey Islands	241	235	Roseate tern, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						season. Therefore there is no evidence for connectivity between this feature and the Project at any time of year.
004113	Howth Head Coast	250	245	Kittiwake, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, it is expected that <1% of birds at the Project during this period will originate from this population.
004117	Ireland's Eye	254	249	Cormorant, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season. Therefore there is no evidence for connectivity between this feature and the Project at any time of year.
004117	Ireland's Eye	254	249	Guillemot, b	OUT	Project is beyond the published mean maximum

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, it is expected that <1% of birds at the Project during this period will originate from this population.
004117	Ireland's Eye	254	249	Herring gull, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, it is expected that <1% of birds at the Project during this period will originate from this population.
004117	Ireland's Eye	254	249	Kittiwake, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						during this season, it is expected that <1% of birds at the Project during this period will originate from this population.
004117	Ireland's Eye	254	249	Razorbill, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, it is expected that <1% of birds at the Project during this period will originate from this population.
004069	Lambay Island	263	257	Cormorant, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season. Therefore there is no evidence for connectivity between this feature and the Project at any time of year.
004069	Lambay Island	263	257	Fulmar, b	IN	Project is within the published mean maximum

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						foraging range, and feature was recorded during baseline surveys during the breeding season. Therefore screened in for potential impacts during the breeding season. Non-breeding season impacts will also be considered.
004069	Lambay Island	263	257	Guillemot, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, it is expected that <1% of birds at the Project during this period will originate from this population.
004069	Lambay Island	263	257	Herring gull, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, it is expected that <1% of birds

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						at the Project during this period will originate from this population.
004069	Lambay Island	263	257	Kittiwake, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, it is expected that <1% of birds at the Project during this period will originate from this population.
004069	Lambay Island	263	257	Lesser black-backed gull, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, it is expected that <1% of birds at the Project during this period will originate from this population.
004069	Lambay Island	263	257	Puffin, b	OUT	Project is beyond the published mean maximum foraging range, therefore no

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, it is expected that <1% of birds at the Project during this period will originate from this population.
004069	Lambay Island	263	257	Razorbill, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as whilst species was recorded during this season, it is expected that <1% of birds at the Project during this period will originate from this population.
004069	Lambay Island	263	257	Shag, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season. Therefore there is no evidence for connectivity

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						between this feature and the Project at any time of year.
004014	Rockabill	272	266	Arctic tern, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season. Therefore there is no evidence for connectivity between this feature and the Project at any time of year.
004014	Rockabill	272	266	Common tern, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Not screened in for non-breeding season impacts as species not recorded during this season.
004014	Rockabill	272	266	Roseate tern, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season. Therefore there is

Site code	Site name	Distance from Project (km)	Distance from cable AoS (km)	Qualifying feature[1]	Screening decision	Rationale
						no evidence for connectivity between this feature and the Project at any time of year.
004122	Skerries Islands	273	268	Cormorant, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season. Therefore there is no evidence for connectivity between this feature and the Project at any time of year.
004122	Skerries Islands	273	268	Shag, b	OUT	Project is beyond the published mean maximum foraging range, therefore no connectivity during the breeding season. Species not recorded during baseline surveys to date during any season. Therefore there is no evidence for connectivity between this feature and the Project at any time of year.

1 “b” indicates breeding season, “nb” indicates non-breeding season

White Cross Offshore Windfarm Environmental Statement

Appendix 6.B: Mitigation Register

Document Code:	FLO-WHI-REP-0016-06	
Contractor Document Number:	PC2978-RHD-ZZ-XX-RP-Z-0385	
Version Number:	00	
Date:	*Issue Date* 14/08/2023	
Prepared by:	TM	*Electronic Signature*
Checked by:	CB	*Electronic Signature*
Owned by:	AH	*Electronic Signature*
Approved by Client:	OG	*Electronic Signature*

Version Number	**Reason for Issue / Major Changes**	**Date of Change**
00	For issue	14/08/2023

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Glossary of Acronyms

Acronym	Definition
ADD	Acoustic Deterrent Device
AEZ	Archaeological Exclusion Zone
AIS	Automatic Identification System
ALDFG	Abandoned, Lost or otherwise Discarded Fishing Gear
ALO	Agricultural Liaison Officer
BMP	Best Management Practice
BWM	Ballast Water and Sediments
CBRA	Cable Burial Risk Assessment
CDM	Construction Design Management
CEMP	Construction Environmental Management Plan
CIRIA	Construction Industry Research and Information Association
CNVMP	Construction Noise and Vibration Management Plan
CGOC	Coastguard Operations Centre
CoCP	Code of Construction Practice
COLREGS	International Convention for the Prevention of Collision at Sea
COSHH	Control of Substances Hazardous to Health
CTMP	Construction Traffic Management Plan
DAS	Design and Access
DCC	Devon County Council
DECC	Department for Energy and Climate Change
DPF	Diesel Particulate Filters
DSC	Digital Selective Calling
EA	Environment Agency
ECoW	Ecological Clerk of Works
EIA	Environmental Impact Assessment
EMF	Electromagnetic Frequency
EPSL	European Protected Species Licence
ERCOP	Emergency Response Co-Operation Plan
ES	Environmental Statement
EU	European Union

Acronym	Definition
FLO	Fisheries Liaison Officer
FLOWW	Fishing Liaison with Offshore Wind and Wet Renewables Group
GPP	Guidance for Pollution Prevention
GPS	Global Positioning System
HGV	Heavy Goods Vehicle
HLC	Historic Landscape Character
HVAC	High Voltage Alternate Cable
IEC	International Electrotechnical Commission
IEMA	Institute of Environmental Management and Assessment
INNS	Invasive Non-Native Species
LLFA	Lead Local Flood Authority
MAIB	Marine Accident Investigation Branch
MARPOL	The International Convention for the Prevention of Pollution from Ships
MCA	Maritime and Coastguard Agency
ML	Marine Licence
MHWS	Mean High Water Springs
MLWS	Mean Low Water Springs
MMMP	Marine Mammal Mitigation Plan
MMO	Marine Management Organisation
MMP	Materials Management Plan
MW	Megawatt
NRMM	Non-Road Mobile Machinery
NVSR	Noise and Vibration Sensitive Receptors
OLEMP	Outline Landscape and Ecology Management Plan
OREI	Offshore Renewable Energy Installation
ORPAD	Offshore Renewables Protocol for Archaeological Discoveries
WCOWL	White Cross Offshore Windfarm Limited
PAD	Protocol for Archaeological Discoveries
PEMP	Project Environmental Management Plan
PPE	Personal Protective Equipment
PPG	Pollution Prevention Guidelines

Acronym	Definition
PRA	Preliminary Risk Assessment
PTS	Physical and Auditory Injury
ROV	Remotely Operated Vehicle
RYA	Royal Yachting Association
SAC	Special Area of Conservation
SAR	Search and Rescue
SCV	Small Commercial Vehicle
SIP	Site Integrity Plan
SMP	Soil Management Plan
SSSI	Site of Special Scientific Interest
SuDS	Sustainable Drainage System
TCPA	Town and Country Planning Act 1990
TH	Trinity House
UK	United Kingdom
UKC	Under Keel Clearance
UKHO	United Kingdom Hydrographic Office
UWS	Unconfirmed Wildlife Site
UXO	Unexploded Ordnance
VHF	Very High Frequency
WSI	Written Scheme of Investigation
WTG	Wind Turbine Generator

Glossary of Terminology

Defined Term	Description
Applicant	White Cross Offshore Windfarm Limited
Cumulative effects	The effect of the Onshore Project taken together with similar effects from a number of different projects, on the same single receptor/resource. Cumulative Effects are those that result from changes caused by other past, present or reasonably foreseeable actions together with the Onshore Project.
Environmental Impact Assessment (EIA)	Assessment of the potential impact of the proposed Project on the physical, biological and human environment during construction, operation and decommissioning.
Export Cable Corridor	The area in which the export cables will be laid, either from the Offshore Substation or the inter-array cable junction box (if no offshore substation), to the NG Onshore Substation comprising both the Offshore Export Cable Corridor and Onshore Export Cable Corridor.
In-combination effects	In-combination effects are those effects that may arise from the development proposed in combination with other plans and projects proposed/consented but not yet built and operational.
Landfall	Where the offshore export cables come ashore.
Mean high water springs	The average tidal height throughout the year of two successive high waters during those periods of 24 hours when the range of the tide is at its greatest.
Mean low water springs	The average tidal height throughout a year of two successive low waters during those periods of 24 hours when the range of the tide is at its greatest.
Mean sea level	The average tidal height over a long period of time.
Mitigation	Mitigation measures have been proposed where the assessment identifies that an aspect of the development is likely to give rise to significant environmental impacts, and discussed with the relevant authorities and stakeholders in order to avoid, prevent or reduce impacts to acceptable levels. For the purposes of the EIA, two types of mitigation are defined: • Embedded mitigation: consisting of mitigation measures that are identified and adopted as part of the evolution of the project design, and form part of the project design that is assessed in the EIA. • Additional mitigation: consisting of mitigation measures that are identified during the EIA process specifically to reduce or eliminate

Defined Term	Description
	any predicted significant impacts. Additional mitigation is therefore subsequently adopted by WCOWL as the EIA process progresses.
National Grid Onshore Substation	Part of an electrical transmission and distribution system. Substations transform voltage from high to low, or the reverse by means of the electrical transformers.
National Grid Connection Point	The point at which the White Cross Offshore Windfarm connects into the distribution network at East Yelland substation and the distributed electricity network. From East Yelland substation electricity is transmitted to Alverdiscott where it enters the national transmission network.
Offshore Development Area	The Windfarm Site (including wind turbine generators, substructures, mooring lines, seabed anchors, inter-array cables and Offshore Substation Platform (as applicable)) and Offshore Export Cable Corridor to MHWS at the Landfall. This encompasses the part of the project that is the focus of this application and Environmental Statement and the parts of the project consented under Section 36 of the Electricity Act and the Marine and Coastal Access Act 2009.
Offshore Export Cables	The cables which bring electricity from the Offshore Substation Platform or the inter-array cables junction box to the Landfall.
Offshore Export Cable Corridor	The proposed offshore area in which the export cables will be laid, from Offshore Substation Platform or the inter-array cable junction box to the Landfall.
Offshore Infrastructure	All of the offshore infrastructure including wind turbine generators, substructures, mooring lines, seabed anchors, Offshore Substation Platform and all cable types (export and inter-array). This encompasses the infrastructure that is the focus of this application and Environmental Statement and the parts of the project consented under Section 36 of the Electricity Act and the Marine and Coastal Access Act 2009.
the Offshore Project	The Offshore Project for the offshore Section 36 and Marine Licence application includes all elements offshore of MHWS. This includes the infrastructure within the windfarm site (e.g. wind turbine generators, substructures, mooring lines, seabed anchors, inter-array cables and Offshore Substation Platform (as applicable)) and all infrastructure associated with the export cable route and landfall (up to MHWS) including the cables and associated cable protection (if required).
Onshore Development Area	The onshore area above MLWS including the underground onshore export cables connecting to the White Cross Onshore Substation and onward to the NG grid connection point at East Yelland. The onshore development area will form part of a separate Planning application to the Local Planning Authority (LPA) under the Town and Country Planning Act 1990.
Onshore Export Cables	The cables which bring electricity from MLWS at the Landfall to the White Cross Onshore Substation and onward to the NG grid connection point at East Yelland.

Defined Term	Description
Onshore Export Cable Corridor	The proposed onshore area in which the export cables will be laid, from MLWS at the Landfall to the White Cross Onshore Substation and onward to the NG grid connection point at East Yelland.
Onshore Infrastructure	The combined name for all infrastructure associated with the Project from MLWS at the Landfall to the NG grid connection point at East Yelland. The onshore infrastructure will form part of a separate Planning application to the Local Planning Authority (LPA) under the Town and Country Planning Act 1990.
the Onshore Project	The Onshore Project for the onshore TCPA application includes all elements onshore of MLWS. This includes the infrastructure associated with the offshore export cable (from MLWS), landfall, onshore export cable and associated infrastructure and new onshore substation (if required).
White Cross Offshore Windfarm Ltd	White Cross Offshore Wind Ltd (WCOWL) is a joint venture between Cobra Instalaciones Servicios, S.A., and Flotation Energy Ltd.
the Project	the Project is a proposed floating offshore windfarm called White Cross located in the Celtic Sea with a capacity of up to 100MW. It encompasses the project as a whole, i.e. all onshore and offshore infrastructure and activities associated with the Project.
Project Design Envelope	A description of the range of possible elements that make up the Project design options under consideration. The Project Design Envelope, or 'Rochdale Envelope' is used to define the Project for Environmental Impact Assessment (EIA) purposes when the exact parameters are not yet known but a bounded range of parameters are known for each key project aspect.
Safety zones	A marine zone outlined for the purposes of safety around a possibly hazardous installation or works / construction area
Service operation vessel	A vessel that provides accommodation, workshops and equipment for the transfer of personnel to turbine during OMS. Vessels in service today are typically up to 85m long with accommodation for about 60 people.
White Cross Offshore Windfarm	100MW capacity offshore windfarm including associated onshore and offshore infrastructure
White Cross Onshore Substation	A new substation built specifically for the White Cross project. It is required to ensure electrical power produced by the offshore windfarm is compliant with NG electrical requirements at the grid connection point at East Yelland.
Wind Turbine Generators (WTG)	The wind turbine generators convert wind energy into electrical power. Key components include the rotor blades, nacelle (housing for electrical generator and other electrical and control equipment) and tower. The final

Defined Term	Description
	selection of project wind turbine model will be made post-consent application.
Windfarm Site	The area within which the wind turbines, Offshore Substation Platform and inter-array cables will be present.
Works completion date	Date at which construction works are deemed to be complete and the windfarm is handed to the operations team. In reality, this may take place over a period of time.

Appendix 6.B: Mitigation Register

1. Introduction

1. White Cross Offshore Windfarm is a proposed floating offshore windfarm located in the Celtic Sea with a capacity of up to 100MW. The Onshore Project is a separate Town and Country Planning Act 1990 (TCPA) application to the Offshore Project components, which have been submitted as a separate Section 36 (under the Electricity Act 1989) and Marine Licence (ML) application to the Marine Management Organisation (MMO) following the MMO confirming that they would not consent the Onshore Infrastructure of the Windfarm Project.

2. This Mitigation Register presents the mitigation and commitments set out within both the Onshore Project (entailing all components of the project landward of Mean Low Water Springs (MLWS)) and the Offshore Project (entailing all components of the project seaward of Mean High Water Springs (MHWS)).

3. The Onshore Project includes the infrastructure associated with the Landfall at Saunton Sands (to MLWS) where the onshore elements connect to the Offshore Project infrastructure, Onshore Export Cable (including joint bays and link boxes), Taw Estuary Crossing, a new White Cross Onshore Substation, and an Interconnecting Cable to the Grid Connection Point at the existing East Yelland Substation. The Offshore Project includes the infrastructure within the Windfarm Site (e.g., wind turbine generators, substructures, mooring lines, seabed anchors, inter-array cables and Offshore Substation Platform (as applicable)) and all infrastructure associated with the offshore export cable, Landfall (up to MHWS) and the crossing underneath the Taw Estuary (from MHWS to MHWS).

4. The Windfarm Site is located over 52km off the North Cornwall and North Devon coast (west-north-west of Hartland Point). The Offshore Export Cable will connect the Offshore Substation Platform (if needed) to shore. The Export Cable will come ashore at a Landfall at Saunton Sands on the North Devon Coast, and then be routed underground to the East Yelland Substation where it connects into the distribution network. Prior to connecting to the East Yelland Substation the cable will connect to a new White Cross Onshore Substation. A full description of the Onshore Project is given in **Chapter 5: Project Description**.

1.1 Purpose of this Document

5. This document lists the mitigation identified as required in the Environment Impact Assessment (EIA) for both the Onshore Project Environmental Statement (ES) and Offshore Project ES.

6. Where an impact assessment identifies that an aspect of the development is likely to give rise to significant environmental effects, mitigation measures have been considered and discussed with the statutory consultees in order to avoid impacts or reduce them to acceptable levels and, if possible, to enhance the environment.

7. For the purposes of the EIA, two types of mitigation have been defined:

    - Embedded mitigation: consisting of mitigation measures that are identified and adopted as part of the evolution of the Onshore Project design, and are included and assessed in the EIA[1]. Embedded mitigation is considered when predicting the magnitude of impact and is therefore taken into account prior to the evaluation of significance
    - Additional mitigation: consisting of mitigation measures that are identified during the EIA process specifically to reduce or eliminate any predicted significant effects. Additional mitigation has therefore been subsequently adopted as a commitment of the Onshore Project[2].

8. This document identifies both embedded and additional mitigation.

9. In some circumstances it may be necessary to detail monitoring requirements as part of the mitigation measures identified. Monitoring may be appropriate to confirm the assumptions that the assessment is reliant upon (i.e., continue to monitor baseline conditions) and / or to confirm the efficacy of mitigation measures implemented. Monitoring undertaken would be proportionate and directly relevant to the findings of the impact assessment, i.e., it should not be monitoring for the sake of monitoring. This document includes monitoring requirements within the relevant mitigation measures set out in **Table 1** and **Table 2.**

10. The schedules presented in **Section 2** list all the measures proposed on a topic-by-topic basis and signposts where the commitments made in the ES are secured in the associated documents.

11. This document details all mitigation associated with the Project as a whole (i.e. the Onshore Project and the Offshore Project). To avoid repetition, the Onshore Project ES chapters, that are predominantly relevant with infrastructure and activities above MHWS, are included within **Table 1**. The Offshore Project ES chapters, that are

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[1] Considers primary and tertiary mitigation as defined by Institute of Environmental Management and Assessment (IEMA).

[2] Considers secondary mitigation as defined by IEMA.

predominantly relevant with infrastructure and activities below MHWS, are included within **Table 2.**

12. The Onshore Project ES chapters which **Section 2** and **Table 1** relates to are as follows:

- **Chapter 12: Ground Conditions and Contamination**
- **Chapter 13: Air Quality**
- **Chapter 14: Water Resources and Flood Risk**
- **Chapter 15: Land Use**
- **Chapter 16: Onshore Ecology and Ornithology**
- **Chapter 17: Onshore Archaeology and Cultural Heritage**
- **Chapter 18: Noise and Vibration**
- **Chapter 19: Traffic and Transport**
- **Chapter 20: Onshore Landscape and Visual Amenity**
- **Chapter 21: Socio-economics (including Tourism and Recreation)**
- **Chapter 22: Human Health**.

13. The Offshore Project ES chapters which **Section 2** and **Table 2** relates to are as follows:

- **Chapter 8: Marine Geology, Oceanography and Physical Processes**
- **Chapter 9: Marine Water and Sediment Quality**
- **Chapter 10: Benthic and Intertidal Ecology**
- **Chapter 11: Fish and Shellfish Ecology**
- **Chapter 12: Marine Mammal and Marine Turtle Ecology**
- **Chapter 13: Offshore Ornithology**
- **Chapter 14: Commercial Fisheries**
- **Chapter 15: Shipping and Navigation**
- **Chapter 16: Marine Archaeology and Cultural Heritage**
- **Chapter 17: Civil and Military Aviation**
- **Chapter 18: Infrastructure and Other Users**
- **Chapter 19: Offshore Seascape, Landscape and Visual Amenity**.

2. Onshore and Offshore Project Mitigation Measures

14. The mitigation measures for the Onshore Project are outlined in **Table 1**.

15. The mitigation measures for the Onshore Project are outlined in **Table 2**.

Table 1 Onshore Project Mitigation Measures

Reference	Cross Reference to ES	Type of Mitigation	Component / Activity	Impact	Mitigation Measure or Commitment	Effect of Mitigation	Means of Implementation
Chapter 12: Ground Conditions and Contamination							
12.1	12.3.4	Embedded	All construction activities	Potential sources of ground contamination	The Development and adherence to a Construction Environmental Management Plan (CEMP). The CEMP would be regularly reviewed and updated both prior to and during the construction works. The CEMP would be informed by the findings of any pre-construction ground investigations and include an assessment of the potential risks to human health and controlled waters receptors. Based on that risk assessment, appropriate working methods would be developed to avoid, minimise, or mitigate impacts relating to construction. The risk mitigation strategies incorporated into the CEMP would include: ▪ Use of Personal Protective Equipment (PPE) ▪ Provision of welfare facilities ▪ Monitoring of works including air quality and odour ▪ Implementation of relevant good working practices including stockpile management and dust suppression activities to reduce the risk relating to the creation and inhalation of wind-blown dusts. The CEMP would incorporate legislation requirements including the Construction Design Management (CDM) Regulations (2015), Health and Safety at Work Act (1974) and Control of Substances Hazardous to Health (COSHH) Regulations. In addition, a plan for dealing with unexpected contamination would be developed as part of the CEMP. This plan would also incorporate the Environment Agency best practice guidelines for pollution prevention which have been withdrawn from use but still provide a useful best practice guide and include: ▪ Environment Agency Pollution Prevention Guidance (PPG) 01 – Understanding your environmental responsibilities ▪ Environment Agency PPG 05 – Works and maintenance near water ▪ Environment Agency PPG 06 – Working at construction and demolition preventing pollution guidance ▪ Environment Agency PPG 08 – Safe storage and disposal of used oils ▪ Environment Agency PPG 21 – Pollution incident response planning ▪ Environment Agency PPG 22 – Dealing with spills. In areas that have been identified as potential areas of contamination within the Preliminary Risk Assessment (PRA) or encountered during construction works, perched waters within Made Ground or groundwater from dewatering activities would be collected within a tank or lagoon prior to any treatment or discharge. This wastewater shall either be: ▪ Discharged to foul sewer under a trade effluent consent agreed with the local water company or supplier ▪ Discharged to surface water under an environmental permit issued by the Environment Agency.	Minimises the potential for effects from all onshore components of the project	CEMP

Reference	Cross Reference to ES	Type of Mitigation	Component / Activity	Impact	Mitigation Measure or Commitment	Effect of Mitigation	Means of Implementation
					An on site treatment plant may be required to treat the wastewater prior to disposal in order to meet discharge limits set by either the Environment Agency or local water company. The CEMP discussed above would include specific measures that are protective of controlled waters in relation to the storage of fuels, oils, lubricants, wastewater, and other chemicals during the works. This would include: ▪ Storing all fuels, oils, lubricants, wastewater and other chemicals in suitable containers with impermeable bunds and at least 110% of the stored capacity. Any damaged containers would be removed from site. Refuelling would take place in a dedicated impermeable area, using a bunded bowser. Biodegradable oils are to be used where possible that spill kits are available on the site at all times as well as sand bags and stop logs for deployment in case of accidental spillages.		
12.2	12.3.4	Embedded	Export Cable installation	Potential sources of ground contamination	The route of the Onshore Export Cable Corridor has been determined as part of a detailed site selection process (see **Chapter 4: Site Selection and Assessment of Alternatives**). The route of the Onshore Export Cable Corridor has been designed to avoid potential sources of contamination where possible.	Minimise the potential for ground contamination	Embedded mitigation
12.3	12.3.4	Embedded	Export Cable installation	Contamination of groundwater	Ground investigations and hydrogeological risk assessments meeting the requirements of the Environment Agency's approach to groundwater protection (Environment Agency, 2018) would be undertaken at each trenchless crossing location.	Minimise the potential for contamination of groundwater	Embedded mitigation
12.4	12.3.4	Embedded	Construction of White Cross Onshore Substation	Pollution of groundwater from leaks and spills	Informed by the CEMP, oil water sumps will be utilised within the White Cross Onshore Substation to reduce the potential for leaks and spills impacting groundwater quality.	Minimise the potential for groundwater contamination from leaks and spills	CEMP
12.5	12.3.4	Additional	All construction activities	Potential contamination from chemicals and site waste	Adoption of a CL:AIRE Industry Code of Practice to manage the re-use and disposal of excavated soils within the Onshore Project area would also be incorporated as an additional mitigation measure in the CEMP, this would aid in maximising sustainability and provide an audit trail to demonstrate the appropriate use of materials. A Materials Management Plan (MMP) would be drafted in advance of any construction works, this would include chemical screening criteria in order to ensure that imported and/or reused materials are chemically suitable for use. If materials identified as containing asbestos are identified, then a specialist contractor would be employed to aid in its removal from Onshore Project area, in line with current legislation. The MMP would form part of the final CEMP to be submitted post consent. A Site Waste Management Plan will be developed post-consent to ensure the proper handling and protocols are in place to deal with any wastes generated.	Reduces the risk of ground and groundwater contamination from chemicals and site waste	CEMP MMP Site Waste Management Plan
Chapter 13: Air Quality							
13.1	13.3.6	Embedded	All construction	Various impacts	The Onshore Project has undergone an extensive site selection process which has	Reduces the effect	Embedded

Reference	Cross Reference to ES	Type of Mitigation	Component / Activity	Impact	Mitigation Measure or Commitment	Effect of Mitigation	Means of Implementation
			activities	on human and environmental receptors	involved incorporating environmental considerations in collaboration with the engineering design requirements. Considerations include (but are not limited to) adhering to the Horlock Rules (for explanation see **Chapter 4: Site Selection and Assessment of Alternatives**) for the White Cross Onshore Substation and associated infrastructure, a preference for the shortest route length (where practical) and developing construction methodologies to minimise potential impacts. Key principles that have informed the location of the Onshore Export Cable Corridor include: ▪ Preference for the shortest onshore cable corridors to minimise the overall footprint and the number of receptors that will be affected ▪ Avoiding key constraints, where possible ▪ Avoid avoiding populated areas, where possible. Consideration has been taken into account for the following constraints: ▪ Sites designated for nature conservation ▪ Residential properties ▪ Other infrastructure (e.g., buried cables, railways, roads).	on key constraints, populated areas, and designated sites	mitigation
13.2	13.3.6	Embedded	Dusty construction activities	Potential impacts relating to dust from construction activities	The Project will commit to the implementation of best practice dust mitigation measures. However, a project-specific dust assessment has been undertaken, taking into consideration the specific activities which will be carried out and the sensitivity of nearby receptors. This has resulted in the identification of site-specific mitigation measures. Mitigation measures include minimising the production and transmission of dust from construction activities, and the requirement to carry out regular visual on-site and off-site inspections of dust deposition levels, so that appropriate action can be taken in the event of any issues being identified. Mitigation will be outlined in the Construction Traffic Management Plan (CTMP).	Minimise potential impacts relating to dust.	Dust Management Plan as part of the CEMP CTMP
13.3	13.3.6	Embedded	Non-Road Mobile Machinery (NRMM)	Potential impacts relating to NRMM and air quality	The following mitigation measures specific to NRMM will be outlined within the Project's Construction Environmental Management Plan (CEMP) which will be available as part of the statutory consultation and will be secured within the final CEMP submitted post-consent. NRMM and plant should be well maintained. If any emissions of dark smoke occur, then the relevant machinery should stop immediately, and any problem rectified. In addition, the following controls should apply to NRMM: ▪ All NRMM should use fuel equivalent to ultralow sulphur diesel (fuel meeting the specification within EN590:2004) where practicable ▪ All NRMM should comply with the appropriate NRMM regulations ▪ All NRMM would be fitted with Diesel Particulate Filters (DPF) conforming to defined and demonstrated filtration efficiency (load/duty cycle permitting)	Minimise potential impacts relating to NRMM and air quality	CEMP

Reference	Cross Reference to ES	Type of Mitigation	Component / Activity	Impact	Mitigation Measure or Commitment	Effect of Mitigation	Means of Implementation
					- The ongoing conformity of plant retrofitted with DPF, to a defined performance standard, should be ensured through a programme of onsite checks - Fuel conservation measures should be implemented, including instructions to (i) throttle down or switch off idle construction equipment; (ii) switch off the engines of trucks while they are waiting to access the site and while they are being loaded or unloaded and (iii) ensure equipment is properly maintained to ensure efficient fuel consumption. Consideration should also be given to the siting of NRMM within the working area. Where practicable, locating generators and plant at the greatest distance from receptors will reduce the potential for air quality effects.		
Chapter 14: Water Resources and Flood Risk							
14.1	14.3.4	Embedded	Cable crossings beneath watercourses	Impact on watercourses	The River Taw estuary and Boundary Drain will be crossed using trenchless techniques, such as trenchless techniques or Direct Pipe, to avoid direct interaction with the channel and associated statutory designations (SSSI, SAC, Shellfish Waters).	Avoid impacts arising from trenching on watercourses	Embedded mitigation
14.2	14.3.4	Embedded	Ground disturbance	Impact on sediment supply to watercourses	Under the flood risk activities permitting regime (e.g. Land Drainage Act 1991), any activities within 8m of a Main River or flood defence will need to be permitted; this increases to 16m if the Main River is tidal. In addition, a permit is also required for any “quarrying or excavation” within 16m of any Main River or flood defence. These buffer distances will be implemented to avoid locating construction compounds, stockpiles and permanent infrastructure too close to a watercourse.	Minimise the impacts on sediment supply to watercourses	Embedded mitigation
14.3	14.3.4	Embedded	White Cross Onshore Substation and trenchless crossings	Impact of contaminants on surface and groundwaters	Operational drainage at the White Cross Onshore Substation would be developed according to the principles of the sustainable drainage system (SuDS) discharge hierarchy. The aim will be to discharge clean surface water runoff as high up the following hierarchy of drainage options as reasonably practicable: i) into the ground (infiltration); ii) to a surface water body; iii) to a surface water sewer, highway drain or another drainage system; or iv) to a combined sewer. This will include attenuation and hydrocarbon interceptors to prevent the supply of contaminants (including oils and fine sediment). Foul drainage (from construction welfare facilities) will be collected through mains connection to an existing mains sewer (if such a connection is available) or collected in a septic tank and transported off site for disposal at a licensed facility with appropriate treatment capacity within its existing permit. In addition, inert drilling fluid will be used for trenchless technique (bentonite) and cable ducting will be inert. Best practice guidance will also be followed: - Construction activities will adhere to industry good practice measures as detailed in the Environment Agency’s Pollution Prevention Guidance (PPG) notes (PPG1, PPG5, PPG8 and PPG21). Although Environment	Minimise the potential impacts on surface and groundwater via pollution prevention measures	Embedded mitigation

Reference	Cross Reference to ES	Type of Mitigation	Component / Activity	Impact	Mitigation Measure or Commitment	Effect of Mitigation	Means of Implementation
					Agency (EA) PPG notes have been revoked, they have been updated as Guidance for Pollution Prevention (GPP notes) for use in Scotland and Northern Ireland (Metegs, 2022) and can be used to establish best practice. ▪ Construction Industry Research and Information Association (CIRIA) best practice (Control of water pollution from construction sites: Guidance for consultants and contractors (C532) (2001)) will also be adhered to.		
14.4	14.3.4	Embedded	Surface water runoff	Impacts from changes in surface water runoff	Changes in surface water runoff resulting from the increase in impermeable area following construction of the Onshore Export Cable Corridor, and particularly the White Cross Onshore Substation, would be attenuated and discharged at a controlled rate. The methodology will be developed in consultation with the Lead Local Flood Authority (LLFA) and the Environment Agency, and potentially South West Water (if a connection to their drainage infrastructure is required during construction of the White Cross Onshore Substation).A Construction Surface Water and Drainage Plan will be developed as part of the CEMP in agreement with the relevant regulators. During construction, installation of the onshore export cables would be designed such that it will be bounded by parallel drainage channels (one on each side) to intercept drainage within the working width. Additional drainage channels would be installed to intercept water from the cable trench. This would be discharged at a controlled rate into local ditches or drains via temporary interceptor drains. Depending upon the precise location, water from the channels would be infiltrated or discharged into the existing drainage network. Construction drainage would be developed and implemented to minimise water within the cable trench and ensure ongoing drainage of surrounding land. If water enters the trenches during installation from surface runoff of groundwater seepage, this would be pumped via settling tanks, sediment basins or mobile treatment facilities to remove sediment, before being discharged into local ditches or drains via temporary interceptor drains.	Minimise the impacts from surface water runoff	Construction Surface Water and Drainage Plan developed as part of the CEMP
14.5	14.3.4	Embedded	Groundwater flows	Impacts on groundwater flows	Ground investigations and a hydrogeological risk assessment meeting the requirements of the Environment Agency's approach to groundwater protection (Environment Agency, 2018), will be undertaken at each trenchless technique crossing location. A written scheme dealing with contamination of any land and groundwater will be submitted and approved by the Local Planning Authority before construction activities commence. To protect groundwater bodies, excavation will be shallow (<2 m), except where below road or rail infrastructure and water bodies, where it may be deeper.	Minimise the impacts on groundwater flows	Embedded mitigation
Chapter 15: Land Use							
15.1	15.3.4	Embedded	Site selection	Impacts on residential properties,	The Onshore Project has undergone an extensive site selection process which has involved incorporating environmental considerations in collaboration with the engineering design requirements (for more information see **Chapter 4: Site**	Minimise the impact on existing infrastructure	Embedded mitigation

Reference	Cross Reference to ES	Type of Mitigation	Component / Activity	Impact	Mitigation Measure or Commitment	Effect of Mitigation	Means of Implementation
				historic and nature designations, and infrastructure	**Selection and Assessment of Alternatives**). Land take has been minimised where possible, reducing sterile land parcels and aligning with field boundaries.		
15.2	15.3.4	Embedded	Haul road	Impact on areas from physical disturbance	The Applicant has included a haul road to deliver equipment to the installation site from construction compounds. This will limit physical disturbance to a specific area.	Minimise the physical disturbance on areas	Embedded mitigation
15.3	15.3.4	Embedded	Construction corridor	Impact on soils and drainage	As well as a working easement, the construction corridor will have sufficient space allowed to ensure appropriate soil management and pre-construction drainage.	Minimise the impact on soil or drainage from construction	Embedded mitigation
15.4	15.3.4	Embedded	Topsoil stripping	Impact on soil	Topsoil stripping; appropriate storage and handling of soils according to their characteristics and in appropriate weather conditions; restrict movements of heavy plan vehicles; minimising excavation footprints; Soil Management Plan (SMP); construction method statements for soil handling; private agreements.	Minimise the impact on soil.	SMP
15.5	15.3.4	Embedded	Agricultural land	Impacts to agricultural land	Landowner consultation; maintain access for farm vehicles; plan timing of works; implement private agreements. Livestock management including the use of stockproof fencing and rotation of livestock around the works. provision of an Agricultural Liaison Officer (ALO)	Minimise the impacts to agricultural land	Private agreements ALO
15.6	15.3.4	Embedded	Agricultural drainage	Impacts on agricultural drainage	Implementation of the final CEMP and SMP.	Minimise the impacts on agricultural drainage	CEMP and SMP
15.7	15.3.4	Additional	Agricultural drainage	Impacts on agricultural drainage	Maintaining / reinstating land drainage systems; provision of an ALO and / or local specialised drainage contractor.	Minimise the impacts on agricultural drainage	ALO
15.8	15.3.4	Additional	Users of recreational routes	Impacts to users of recreational routes	Appropriately fenced (unmanned) crossing points; manned crossing points; and temporary alternative routes.	Minimise the impacts to users of recreational routes	Embedded mitigation
Chapter 16: Onshore Ecology and Ornithology							
16.1	16.3.4	Embedded	Designated nature conservation sites	Impacts on designated nature conservation sites	The Onshore Development Area has undergone an extensive site selection process which has involved incorporating environmental considerations in collaboration with the engineering design requirements. The Onshore Export Cable Corridor has been: a) routed to avoid designated nature conservation sites (SAC and SSSIs) wherever possible, and b) where this is not possible, trenchless installation methods (which will involve below ground installation) will be used for the export cables. This approach has	Avoid any overlap with designated nature conservation sites	Embedded mitigation

Reference	Cross Reference to ES	Type of Mitigation	Component / Activity	Impact	Mitigation Measure or Commitment	Effect of Mitigation	Means of Implementation
					been devised to avoid direct impacts to habitat features within the designated sites within the Onshore Development Area. In relation to trenchless techniques: ▪ Agreement will be obtained on the trenchless technique methodology and emergency response procedures. ▪ Further post-consent geotechnical investigations will be conducted to refine the trenchless technique approach and methods. This will include providing calculations of the pressure required for the relevant sub-surface material the trenchless technique will travel through to prevent frac-out (i.e., the release of inert drilling lubricant to ground surface). ▪ This risk of frac-out is considered to be low based on analysis of historical borehole and desk-based assessment of the geology present in the area, and in view of the measures outlined in Section 1.5.3 of the Taw Estuary Crossing Method Statement (**Appendix 5.A: Braunton Burrows and Taw Estuary Crossing Method Statement**) to prevent fluid drilling break-out, which will be implemented at all trenchless crossing technique stages. ▪ During works continual monitoring of the trenchless technique bore above ground will be undertaken. ▪ In the unlikely event of a frac-out, contingency measures to be adopted at the trenchless crossing and techniques will be agreed before drilling operations commence. Possible containment and clean-up steps are detailed in Section 1.5.4 of the Taw Estuary Crossing Method Statement (**Appendix 5.A: Braunton Burrows and Taw Estuary Crossing Method Statement**), which will be implemented at all trenchless crossing technique stages. Where open trenching is used (only in the areas outside designated conservation sites), a minimum 5m standoff would be maintained between the Onshore Development Area and adjacent SAC/SSSIs with the exception of one short pinch point where the route is restricted between an existing farm building and the boundary of the SAC/SSSI.		
16.2	16.3.6	Embedded	Unconfirmed Wildlife Sites (UWS)	Impacts UWS	The extent and duration of works within these habitats has been minimised. Topsoil and subsoil will be extracted and stored separately during construction and reinstated in the correct order following completion of works to maintain soil structure and allow the vegetation to re-establish on completion, informed by the SMP.	Minimise the impacts on UWS	SMP
16.3	16.3.6	Embedded	Cable and haul road crossings: hedgerows	Impacts on hedgerows from construction	Where the Onshore Export Cable Corridor crosses through hedgerows, with the exception of areas where visibility splays are required, the working corridor will be minimised where possible, commonly reduced from the maximum working width of 30m down to 10-20m. Hedgerows outside the 30m working corridor will be unaffected.	Minimise the impacts on hedgerows from construction	Embedded mitigation
16.4	16.3.6	Embedded	Cable and haul road crossings: watercourses	Impacts on watercourses from	All ditches falling within the Onshore Export Cable Corridor would either be crossed using trenchless techniques (such as trenchless techniques), to avoid direct interaction with these watercourses, or culverts/ temporary bridges or	Minimise the impacts on watercourses from	Embedded mitigation

Reference	Cross Reference to ES	Type of Mitigation	Component / Activity	Impact	Mitigation Measure or Commitment	Effect of Mitigation	Means of Implementation
				construction	temporary dams will be installed at open ditch crossings. Where dams are used, pipes will be used to maintain water flow across the crossing.	construction	
16.5	16.3.6	Embedded	All construction activities and sites	Various impacts from construction activities	CEMP will be implemented to avoid or minimise impacts from all construction activities. This will include ecological site supervision during the works to confirm adherence to constraints and implementation of control measures. The Project will include a pre-commencement site meeting and regular subsequent compliance monitoring visits; these will be undertaken and recorded by a suitably qualified ecologist.	Minimise any impacts from construction activities	CEMP
16.6	16.3.6	Embedded	Pollution prevention	Impacts from pollution on sensitive habitats and designated sites	All works will be undertaken in compliance with Statutory Pollution Prevention Guidelines. Spillage kits will be present at all plant and machinery locations. No storage facilities for hazardous liquids or chemicals will be located within or in close proximity to designated areas or sensitive habitats. Refuelling and maintenance of all equipment will take place away from waterbodies, intertidal zones and the estuary.	Reduce the risk of pollution through pollution prevention and control measures	Embedded mitigation
16.7	16.3.6	Embedded	Equipment	Impacts from equipment and vehicles	All equipment and vehicles will be fit for purpose and will be subject to daily checks for signs of wear and tear, including leaks of any substance.	Minimise the impacts from equipment and vehicles	Embedded mitigation
16.8	16.3.6	Embedded	Restricted working areas	Impacts on sensitive areas such as the inundated tidal areas of the Taw Estuary	No personnel, equipment or vehicles are to operate within the inundated tidal areas of the Taw Estuary.	Avoid impacts on sensitive areas	Embedded mitigation
16.9	16.3.6	Embedded	Bats	Impacts on bats	Direct impacts on known or potential bat roosts are avoided through the positioning of the Onshore Export Cable Corridor. Hedgerow removal on foraging/ commuting routes has been minimised.	Minimise the impacts on bats	Embedded mitigation
16.10	16.3.6	Embedded	Otters	Impacts on otters	Direct effects on identified holts are avoided through the positioning of the Onshore Export Cable Corridor.	Minimise the impacts on otters	Embedded mitigation
16.11	16.3.6	Embedded	Badgers	Impacts on badgers	Direct effects on identified setts are avoided through the positioning of the Onshore Export Cable Corridor.	Minimise the impacts on badgers	Embedded mitigation
16.12	16.3.6	Embedded	Great crested newt	Impacts on great crested newts	No great crested newt ponds are within the Onshore Export Cable Corridor. Wherever possible, the route has been designed to avoid suitable terrestrial habitat for great crested newts where ponds are located within 250m of a great crested newt breeding pond.	Minimise the impacts on great crested newts	Embedded mitigation
16.13	16.3.6	Additional	Lighting	Impacts from lighting on designated sites and protected species	Artificial lighting requirements associated with the onshore construction works will be minimised where it is required and designed with reference to industry guidance for artificial lighting to avoid an impact on bats and other wildlife. The illumination of habitat features will be avoided at times of year when they could be used by foraging or commuting bats. ECoW will be present on site to ensure that the specified protection and	Minimise the impacts from lighting on designated sites and protected species	CEMP

Reference	Cross Reference to ES	Type of Mitigation	Component / Activity	Impact	Mitigation Measure or Commitment	Effect of Mitigation	Means of Implementation
					mitigation measures are appropriately understood and implemented. This will be included within the CEMP.		
16.14	16.3.6	Additional	Water pollution	Impacts from water pollution and physical impacts on watercourses	The CEMP will be developed and agreed with stakeholders to identify the measures needed to avoid, minimise, or mitigate any construction effects on the environment. This will include measures to mitigate the effects associated with watercourse crossings. Appropriate measures which will be applied to all watercourse crossings to ensure best practice is followed and any potential impacts are minimised are detailed in **Chapter 14: Water Resources and Flood Risk**.	Minimise the impacts from water pollution and physical impacts on watercourses	CEMP
16.15	16.3.6	Additional	Neutral and marshy grassland habitats	Impacts on neutral and marshy grassland habitats	In grassland affected by trenching within Braunton Marsh, which support semi-improved grassland or marshy grassland (as opposed to improved grassland), management will be carried out to promote re-establishment (reseeding/mowing/weed management) and informed by the Outline Landscape and Ecology Mitigation Plan (OLEMP) and the CEMP. Vegetation establishment will be monitored to ensure that habitats are restored to the desired condition.	Minimise the impacts on neutral and marshy grassland habitats such as Braunton Marsh	Outline Landscape and Ecology Mitigation Plan CEMP
16.16	16.3.6	Additional	Hedgerows	Impacts on hedgerows	Prior to the commencement of any works to a hedgerow, an Ecological Clerk of Works (ECoW) will be present on site to ensure that the specified protection and mitigation measures are appropriately understood and implemented. Replacement hedgerow planting will be completed following completion of the construction works. This will be informed by the OLEMP and CEMP and use of range of locally appropriate native species. Where hedgerow removal is required purely to provide visibility splays, the hedgerow will be coppiced and allowed to re-establish following completion of construction works.	Minimise the impacts on hedgerows	OLEMP CEMP
16.17	16.3.6	Additional	Bats	Impacts on bats from hedgerow removal	Where hedgerow removal is required to provide visibility splays, temporary mitigation at these locations will include installation of 'fake hedges' to maintain bat flight lines. Coppicing will allow rapid recovery and growth of hedgerow on completing of the work. ECoW will be present on site to ensure that the specified protection and mitigation measures are appropriately understood and implemented.	Minimise the impacts on bats where hedgerow removal is required	ECoW
16.18	16.3.6	Additional	Otters	Impacts on otters	The proposed route design is considered sufficiently distant from the holts located to avoid the risk of significant disturbance. Precautionary survey will be carried out to ensure that activity status of all nearby holts is understood and kept up to date. An ECoW will be present on site to ensure that the specified protection and mitigation measures in relation to otters are implemented for any works affecting watercourses. The requirement for obtaining a Natural England licence for any work that could give rise to disturbance will be kept under review, for example, should the status of holts recorded change and breeding holts be located	Minimise the impacts on otters	ECoW
16.19	16.3.6	Additional	Badgers	Impacts on badgers	Precautionary pre-construction updated surveys for badger setts will be carried out in advance of development commencing.	Minimise the impacts on badgers	Suitably qualified and experienced

Reference	Cross Reference to ES	Type of Mitigation	Component / Activity	Impact	Mitigation Measure or Commitment	Effect of Mitigation	Means of Implementation
							ecologist
16.20	16.3.6	Additional	Breeding birds	Impacts on breeding birds	The removal of vegetation suitable for use by nesting birds will be carried out outside of the bird nesting season. For the majority of species this is between March and August. Should any small areas of vegetation require removal during the nesting season they will be preceded by a precautionary nesting bird check by a suitably qualified and experienced ecologist to determine whether nests are present. Should any nests be located, a 10m exclusion zone will be implemented around the nest and will be avoided until nesting is complete. NB the checking for nests is only practical for very small areas of habitat that can be thoroughly searched for nests; it is not suitable for dense areas of scrub or hedgerow, or any extensive areas of habitat. Where physical nesting bird checks are not practical, a suitably qualified and experienced ecologist should carry out an alternative approach, for example monitoring the identified location for a pre-agreed duration to confirm no birds are returning to a potentially active nesting site.	Minimise the impacts on breeding birds	Suitably qualified and experienced ecologist
16.21	16.3.6	Additional	Reptiles	Impacts on reptiles	Vegetation clearance during the reptile hibernation period will be carried out using a phased removal approach (walking through, removing in stages to encourage any reptiles present to leave the working area into adjacent habitat). This will be carried out under an ecological watching brief (by an ECoW) and where there is a risk of encountering reptiles.	Minimise the impacts on reptiles	ECoW
16.22	16.3.6	Additional	Great crested newt	Impacts on great crested newts	The amount of vegetation clearance work within 250m of breeding ponds is minimal, and the risk of an impact on this species is considered to be very low. It is proposed that vegetation clearance will be carried out under a precautionary method statement approach. Where necessary, this will involve precautionary phased removal of vegetation and destructive search (by an ECoW). The need for Natural England (EPSL) licence will be kept under review.	Minimise the impacts on great crested newts	ECoW
16.23	16.3.6	Additional	Invasive species	Impacts from Invasive Non-Native Species (INNS)	Three INNS are present within the Onshore Development Area, including Japanese knotweed, three-cornered garlic and Montbretia. An INNS Management Plan would be detailed in the Outline Construction Environmental Management Plan (**Appendix 5.B: Outline CEMP**) which will include the following measures: A plan of all INNS locations and extents. ▪ A protocol for avoiding INNS or removing where necessary, and for managing the waste generated ▪ Good site practice measures for managing the spread of invasive species during works at or near to watercourses ▪ A requirement for an ECoW and details of their responsibilities with respect to INNS.	Minimise the impacts from INNS	INNS Management Plan as detailed in the CEMP
16.24	Appendix 16.R: Arboricultural Impact Assessment	Embedded	Trees/hedgerows	Impacts to trees/hedgerows	Impacts to trees and hedgerows will be mitigated by implementing the following measures: ▪ Arboricultural monitoring and supervision: Will be implemented through the appointment of a suitably qualified and experienced arboriculturist to attend meetings and site visits, undertake monitoring and advise on ad-hoc arboricultural matters. A further ECoW will be nominated to be	Minimise the impacts to trees/hedgerows	Embedded mitigation

Reference	Cross Reference to ES	Type of Mitigation	Component / Activity	Impact	Mitigation Measure or Commitment	Effect of Mitigation	Means of Implementation
					responsible for arboricultural matters on site. - Use of Construction exclusion zones - Tree protection fencing - Root protection areas		
16.25	Appendix 16.A: Biodiversity Net Gain Assessment	Embedded	On site enhancement	Impacts on biodiversity from the construction of the Onshore Project	Options to overcome the biodiversity unit deficit on-site include future management of retained habitats within the Onshore Development Area to deliver further enhancement, which may be possible. For example: - Modifying the grassland management regimes - Creation of new hedgerows on field boundaries where none currently exist - Reinstating pre-existing gaps in hedgerows and carrying out supplementary planting of existing species-poor hedgerows to increase diversity.	Enhancement of the on-site development area, increasing biodiversity	Embedded mitigation
Chapter 17: Onshore Archaeology and Cultural Heritage							
17.1	17.3.5	Embedded	Site selection	Impacts on designated heritage assets, non-designated heritage assets and potential heritage assets	The site selection process has included consideration of all designated heritage assets and has avoided direct physical impacts upon designated heritage assets as part of the site selection process. The site selection process has also sought to avoid all direct physical impacts on non-designated and potential heritage assets, wherever possible, using the datasets available at the time of assessment.	Minimise the impacts on designated heritage assets, non-designated heritage assets and potential heritage assets	Embedded mitigation
17.2	17.3.5	Embedded	Survey strategy	Various impacts on from ground investigation	The Onshore Project will submit an Outline Written Scheme of Investigation (WSI) as part of the ES (**Appendix 17.F: White Cross Offshore Windfarm Onshore Outline Written Scheme of Investigation**) to accompany the application. This document will outline the strategy to undertake additional programmes of survey and evaluation post-consent and will include a range of likely mitigation options and responses to be utilised under various scenarios.	Minimise the impacts from ground investigation	WSI
17.3	Appendix 17.E: Outline WSI, 1.8	Embedded	Human Remains	Impacts to human remains	Human remains will be excavated and removed only after obtaining the required Ministry of Justice license under the Burials Act 1857, with the Archaeological Contractor responsible for the application. The District Coroner will be promptly notified, and the process will follow the Environmental Health regulations and potential site-specific requirements. Excavation follows the guidelines, including recording in situ, careful cleaning and packaging, and the retrieval of samples for small bones and biological remains. Additionally, if articulated human remains are found, an on-site visit by a specialist in human skeletal material will verify their identification. Further detail is provided in the WSI.	Minimise the impacts to human remains	WSI
17.4	Appendix 17.E: Outline WSI,	Embedded	Treasure	Impacts to treasure	Recovered artifacts deemed Treasure under the Treasure Act 1996 will be managed as per the Act, requiring reporting to H. M. Coroner, and immediate notification to	Minimise the impacts to treasure	WSI

Reference	Cross Reference to ES	Type of Mitigation	Component / Activity	Impact	Mitigation Measure or Commitment	Effect of Mitigation	Means of Implementation
	1.9				White Cross's project team and the Archaeological Coordinator. Artifacts will be securely stored, with appropriate security measures implemented if removal cannot occur on the discovery day to prevent theft. Further detail is provided in the WSI.		
17.5	Appendix 17.E: Outline WSI, 7.4	Embedded	Archaeological monitoring/watching brief	Impacts to archaeological remains/assets	Where appropriate (in locations identified in advance), machine excavation would proceed under archaeological observation, but would not be controlled directly by the nominated on-site archaeologist(s). A contingency period would be included in the works programme to allow investigation and recording of archaeological remains that might be identified, disturbed, or destroyed. Further detail is provided in the WSI	Minimise the impacts to archaeological remains/assets	WSI
17.6	Appendix 17.E: Outline WSI, 7.4	Embedded	Preservation In-Situ	Impacts to archaeological remains/assets	Where well-preserved and/or significant archaeological remains survive within or along a development site, the local planning authority may state a preference for preservation 'in-situ' of certain remains. This will be through their archaeological advisors, in this case Devon County Council (DCC) HET. Where opportunities remain for preserving sites in situ through the pre-construction and construction stages, these would be considered on a case by case, site by site and area by area basis. This would be determined in further discussion with North Devon Council and DCC HET/HE (as required). As part of the post-consent detailed design phase, further consideration would be given, where possible, to micrositing (within the confines of the project boundary). This will seek to minimise impact upon those areas of highest sub-surface archaeological potential, within the confines of engineering and other environmental constraints.	Minimise the impacts to archaeological remains/assets	WSI
17.7	Appendix 17.E: Outline WSI, 7.6	Embedded	Sensitive and precautionary approaches to construction works	Impacts on sensitive archaeological remains/assets	The onshore cable corridor may be more constrained at certain locations and construction works will need to be conducted in a sensitive and controlled manner. Signage and temporary barriers would be required to ensure that no accidental damage or physical interactions occur, in certain instances. Specific constrained areas would be identified in the post-consent detailed design stage. The above measures of precautionary working will likely need to be adopted and would be further detailed in a Construction Stage Plan(s), Contractor Environmental Action Plan(s), or similar.	Minimise the impacts on sensitive archaeological remains/assets	WSI
17.8	Appendix 17.E: Outline WSI, 7.7	Embedded	Protocol for archaeological discoveries	Impacts on archaeological and cultural heritage assets	For all intrusive groundworks carried out onshore above MHWS where an archaeologist is not present, The Applicant's project team and the relevant appointed Principal Contractor(s) will implement a Protocol for Reporting Archaeological Discoveries (PAD). The PAD	Minimise the impacts on archaeological and cultural heritage	WSI

Reference	Cross Reference to ES	Type of Mitigation	Component / Activity	Impact	Mitigation Measure or Commitment	Effect of Mitigation	Means of Implementation
					would be based on the principles set out in the Offshore Renewables Protocol for Archaeological Discoveries (ORPAD) (The Crown Estate, 2014). ORPAD came into effect in December 2010 (updated in July 2014) and applies to pre-construction, construction, and installation activities in developing offshore renewable energy schemes where an archaeologist is not present on site. The main objective of the protocol is to reduce direct impacts from occurring on currently unrecorded heritage assets. This is done by allowing for the effective reporting of discoveries of archaeological material in a manner that is conducive to construction works. This will ensure that advice, concerning measures to address discoveries, is received, and implemented in a timely and efficient manner. Further detail is provided in the WSI	assets	
17.9	Appendix 17.E: Outline WSI, 7.8	Embedded	Reinstatement of field boundaries and hedgerows	Impacts to the Historic Landscape Character (HLC)	Impact to the HLC of the Onshore Development Area has been minimised through careful route selection. This would be further offset by returning field boundaries/hedgerows to their pre-construction condition and character post-construction, wherever possible, as part of a sensitive programme of backfilling and reinstatement/landscaping. Certain hedgerows and field boundaries (e.g., county and parish boundaries) may require archaeological recording prior to and/or during the construction process and further enhanced provisions made and implemented during backfilling and reinstatement.	Minimise the impacts to the HLC	WSI
Chapter 18: Noise and Vibration							
18.1	18.3.4	Embedded	Site selection	Impacts on residential properties and other noise and vibration sensitive receptors (NVSRs)	The Onshore Project has been defined following an extensive site selection process, which has accounted for environmental, engineering, planning and land requirements to identify an optimal project location. The site selection process is described in detail **in Chapter 4: Site Selection and Assessment of Alternatives**. The site selection process has included consideration of the nearby residential properties and other NVSRs, and distances to these have been maximised, particularly in relation to the location of the White Cross Onshore Substation.	Minimise the impacts on residential properties and other NVSRs	Embedded mitigation
18.2	18.3.4	Embedded	Construction phase noise and vibration	Impacts on various noise and vibration receptors	Commitment to Best Practicable Means (BPM) implemented during the construction phase, detailed in the Construction Noise and Vibration Management Plan (CNVMP) which will be included as part of the CEMP secured through a planning condition. An CEMP has been submitted with the planning application. If required consent for specific construction works will be sought under Section 61 of the Control of Pollution Act in order to demonstrate that mitigation measures are in place	Minimise the impacts on various noise and vibration receptors	Construction Noise and Vibration Management Plan (CNVMP) as part of the CEMP
18.3	18.3.4	Embedded	Construction phase road traffic noise	Noise and vibration impact from road and	A CTMP will implement traffic and transport mitigation measures. The plan outlines methods to manage peak construction traffic flows and minimise significant traffic and transport impacts. The CTMP will also serve to reduce the	Minimise the impacts of noise and vibration from	CTMP

Reference	Cross Reference to ES	Type of Mitigation	Component / Activity	Impact	Mitigation Measure or Commitment	Effect of Mitigation	Means of Implementation
				construction traffic	associated construction traffic noise and the relative noise change. Traffic management measures are provided in **Chapter 19: Traffic and Transport.**	road and construction traffic	
18.4	18.3.4	Embedded	Operational substation noise	Noise impacts from the White Cross Onshore Substation	Noise attenuation would be introduced at six High Voltage Alternate Cable (HVAC) ventilation units located at the northern part of the onshore electrical substation. This would reduce noise levels of five units from 80 dB L_{WA} to 75 dB $L_{\mathrm{WA},}$ and for one unit from 80 dB L_{WA} to 73 dB L_{WA} .	Minimise the noise impacts from the White Cross Onshore Substation	Embedded mitigation
18.5	18.3.4	Embedded	Operational substation vibration	Vibration impacts from the White Cross Onshore Substation	The substation plant will be designed and installed as to minimise vibration transmission from any plant items which might generate vibration. This control of vibration at source is necessary to maximise life of the plant and minimise maintenance. Typically, placing vibration isolation mounts into concrete pads would ensure that ground-borne vibration is not perceptible beyond the immediate area of the substation.	Minimise the vibration impacts from the White Cross Onshore Substation	Embedded mitigation
18.6	18.3.4	Additional	Noise of construction works at the landfall	Noise impacts at the landfall on nearby NVSRs	Temporary screening between the landfall compound and the nearby NVSRs.	Minimise the noise impacts on nearby NVSRs at the landfall	CEMP
18.7	18.3.4	Additional	Noise of cable corridor construction	Noise impacts from the cable corridor construction	Temporary screening between the haul road and NVSRs R14 and R16.	Minimise the noise impacts on nearby NVSRs from cable corridor construction	CEMP
Chapter 19: Traffic and Transport							
19.1	19.3.4	Embedded	CTMP	Various impacts from traffic and transport	An CTMP will be developed. The CTMP contains details of measures to secure embedded mitigation through control, monitor and enforcement of Heavy Goods Vehicle (HGV) movements and provides details of the mechanisms for managing the design of accesses.	Minimise the various impacts from traffic and transport	CTMP
19.2	19.3.4	Embedded	Travel plan	Various impacts from traffic and transport	The CTMP also includes 'Travel Plan' measures to manage the number of single occupancy car trips.	Minimise the various impacts from traffic and transport	CTMP
19.3	19.3.4	Embedded	Timing of deliveries to the landfall area	Impacts from increased traffic movements associated with deliveries at the landfall	Access to the Landfall would be provided from the existing Saunton Sands car park. To minimise the potential conflict with tourist traffic, the Applicant has agreed to all equipment (for drilling) being scheduled to arrive during the winter season and be held within a compound at the car park for the entirety of summer, before being removed in winter. The CTMP contains details of measures to secure this embedded mitigation.	Minimise the impacts from deliveries at the landfall	CTMP
19.4	19.3.4	Embedded	Timing of road works	Impact of increased traffic movements where road works are planned to take place	DCC have highlighted that undertaking road works in the summer could result in potentially significant delays. A CTMP will be developed and will include a commitment to undertaking agreeing the timing of any road works with DCC prior to applying for road space. The only road works required for the Onshore Project would be during the installation/removal of the temporary accesses and crossings.	Minimise the impact of planned road works on construction traffic	CTMP

Reference	Cross Reference to ES	Type of Mitigation	Component / Activity	Impact	Mitigation Measure or Commitment	Effect of Mitigation	Means of Implementation
19.5	19.3.4	Embedded	Strategy for access	Impacts from construction traffic on the local road network	To avoid HGVs accessing narrow local roads including Blind Acres Lane, Moor Lane, Sandy Lane and Vellator Way, access to the section of Onshore Export Cable Corridor south of the B3231 to the River Taw would be provided from a new temporary access from the B3231 (shown within **Appendix 19.A: Transport Assessment**). Vehicles would then travel south along a new temporary haul road towards Sandy Lane. To allow vehicles to continue south of Sandy Lane to the River Taw, HGVs would cross over Sandy Lane at a new access (shown within **Appendix 19.A: Transport Assessment**).	Minimise the impact from construction traffic on the local road network	CTMP
19.6	19.3.4	Additional	CTMP	Various impacts from construction traffic	The CTMP performs a dual function. In additional to securing embedded mitigation, the CTMP contains details of measures to secure additional mitigation through control, monitoring, and enforcement of construction traffic movements. It also provides traffic liaison for complaints and a requirement for HGV to display identification.	Minimise the various impacts from construction traffic	CTMP
Chapter 20: Onshore Landscape and Visual Amenity							
20.1	20.4.10	Embedded	Onshore export cable corridor – general	Various potential landscape and visual impacts	Project decision to underground the Onshore Export Cable Corridor will notably reduce potential landscape and visual effects. Use of trenchless technique and careful routeing of the Onshore Export Cable Corridor will minimise loss of trees, hedgerows, and other landscape elements. Micro-siting of the Onshore Export Cable Corridor to avoid loss of trees and hedgerows where practical.	Minimise the various potential landscape and visual impacts	Embedded mitigation
20.2	20.4.10	Embedded	White Cross Onshore Substation - general	Potential landscape and visual impacts	Siting and location of Onshore Infrastructure and design of mitigation planting assists in reducing potential landscape and visual effects.	Minimise the potential landscape and visual impacts	Embedded mitigation
20.3	20.4.10	Embedded	Onshore export cable corridor - construction	Impacts on trees and hedgerows	Onshore Export Cable Corridor to avoid loss of trees and hedgerows where practical.	Minimise the impacts on trees and hedgerows	Embedded mitigation
20.4	20.4.10	Embedded	Construction compounds - construction	Impacts on trees and hedgerows	Detailed location and layout of sites to avoid loss of trees and hedgerows where practical.	Minimise the impacts on trees and hedgerows	Embedded mitigation
20.5	20.4.10	Embedded	Onshore export cable corridor - construction	Potential landscape and visual impacts	Replacement planting of all removed hedgerows in-situ. Planting to be implemented at the end of the construction period.	Minimise the potential landscape and visual impacts	Embedded mitigation
20.6	20.4.10	Embedded	White Cross Onshore Substation - construction	Potential landscape and visual impacts	Implementation of mitigation planting around the White Cross Onshore Substation including woodland planting, for screening, hedgerows and scrub for landscape and ecological connectivity. Planting to be implemented at the end of the construction period.	Minimise the potential landscape and visual impacts	Embedded mitigation
20.7	Design and Access (DAS) Appendix B:	Embedded	White Cross Onshore Substation – architectural form and silhouette	Landscape and visual impacts	Exterior design of buildings should be simple rather than complex in form and elevation, to ensure the development does not become a significant or defining characteristic of	Minimise the landscape and visual impacts	DAS design code

Reference	Cross Reference to ES	Type of Mitigation	Component / Activity	Impact	Mitigation Measure or Commitment	Effect of Mitigation	Means of Implementation
	Design Code				the wider fabric, character, and quality of the landscape. All buildings should be of high-quality design and within the defined maximum parameters, complementing the local vernacular, enhancing visual amenity and minimising any adverse impacts on the built environment and neighbouring amenity. Buildings should offer a clean and unbroken silhouette from all external viewpoints. The substation building should not exceed 10 metres at its tallest point. The substation control building should not exceed 5 metres at its tallest point.		
20.8	DAS Appendix B: Design Code	Embedded	White Cross Onshore Substation – Scale and layout	Landscape and visual impacts	Design should be appropriate and sympathetic to setting in terms of scale, density, massing, height, layout and relationship to buildings and landscape features in the local area. The proposed development should comprise a maximum of two substation buildings to reduce the built form. All electrical equipment should be enclosed within the substation buildings. The maximum parameter for the operational footprint of the onshore substation compound is 5300sqm. Where possible, buildings should be orientated and articulated to minimise the perceived bulk/massing of the buildings and to take advantage of existing and proposed landscape screening.	Minimise the landscape and visual impacts	DAS design code
20.9	DAS Appendix B: Design Code	Embedded	White Cross Onshore Substation – landscaping	Landscape and visual impacts	Landscaping activities should be in accordance with the submitted Outline Landscape and Ecological Management Plan, and any detailed iterations which are submitted post-consent. The proposed landscaping should increase the screening of the substation in sensitive views and provide a connection between different vegetation. All cable routing should be sub-terranean and will therefore not be visible during the operational phase of the development. Any area which has been impacted by the construction of the cable underground should be reinstated with appropriate hedgerow plants and scrub/groundcover planting.	Minimise the landscape and visual impacts	DAS design code
20.10	DAS Appendix B: Design Code	Embedded	White Cross Onshore Substation – lighting	Landscape and visual impacts	There will be a maximum of 14 spotlight projectors located on the site. 12 of the spotlight projectors are permitted on the perimeter of the substation site.	Minimise the landscape and visual impacts	DAS design code

Reference	Cross Reference to ES	Type of Mitigation	Component / Activity	Impact	Mitigation Measure or Commitment	Effect of Mitigation	Means of Implementation
					All spotlights should be shorter than the substation building. Proposed lighting should satisfy the fundamental demands for safety and security. However, luminaires should be switched off when not required for safety and security. High performance lighting solutions should be selected that avoid over-lighting thus minimising light pollution, as well as energy efficient solutions that optimise energy use. Light should be directed to avoid reflectance from buildings and structures and to avoid illuminating building facades, as well as away from adjacent sensitive sites wherever possible.		
20.11	DAS Appendix B: Design Code	Embedded	White Cross Onshore Substation – appearance and materials	Landscape and visual impacts	. Buildings should be constructed in durable materials which are resilient to climate change. Buildings should be constructed in materials complimentary to that of the surrounding industrial and commercial development, which incorporates the use of brickwork and cladding. Exterior design and colours (including hue and tone) for the buildings should be identified based on the surrounding landscape and built form context. Design and colours should be appropriate to these surroundings and seek to simplify the visual appearance of the buildings, as opposed to creating contrast or design feature.	Minimise the landscape and visual impacts	DAS design code
20.12	DAS Appendix B: Design Code	Embedded	White Cross Onshore Substation – Security and access	Landscape and visual impacts	Security of the site should be ensured through the provision of palisade fencing around the site perimeter. The palisade fencing should be a green (RAL 6005) colour and sympathetic to the existing surrounds.	Minimise the landscape and visual impacts	DAS design code
20.13	20.4.10	Embedded	Onshore export cable corridor - operation	Potential landscape and visual impacts	Ongoing management of plant establishment to ensure mitigation potential realised.	Minimise the potential landscape and visual impacts	Embedded mitigation
20.14	20.4.10	Embedded	White Cross Onshore Substation – operation	Potential landscape and visual impacts	Ongoing management of plant establishment to ensure mitigation potential realised. Complimentary building materials, form, colour, and finish for the substation that are consistent with large scale buildings in close proximity.	Minimise the potential landscape and visual impacts	Embedded mitigation
20.15	20.4.10	Embedded	White Cross Onshore Substation – decommissioning	Potential landscape and visual impacts	Protection of landscape elements during decommissioning of the White Cross Onshore Substation to avoid loss to trees, hedgerows, and other landscape elements.	Minimise the potential landscape and visual impacts	Embedded mitigation
Chapter 21: Socio-economics (including Tourism and Recreation)							
21.1	21.3.4	Embedded	Traffic	Impacts from construction traffic on the	The CTMP contains details of measures to secure embedded mitigation through control, monitor and enforcement of HGV movements and provides details of the mechanisms for managing the design of accesses. The CTMP also includes 'Travel	Minimise the impact from construction traffic	CTMP

Reference	Cross Reference to ES	Type of Mitigation	Component / Activity	Impact	Mitigation Measure or Commitment	Effect of Mitigation	Means of Implementation
				local road network and car parks	Plan' measures to manage the number of single occupancy car trips. In addition, requirements for the use of Saunton Sands car park have been scaled down to avoid impacts on visitors.	on the local road network and car parks.	
21.2	21.3.4	Embedded	Spending share	Impacts on the local economy	The applicant is committed, where possible, to maximise the share of its spending benefiting local and national businesses. More details on this are described in **Appendix 21.A: Standalone Economic Impact Assessment.**	Benefit the local economy.	Embedded mitigation
20.3	21.3.4	Embedded	Timing of the works	Impacts on the local road network and the local economy	The timing and phasing of the works and Saunton Sands car park have been selected to reduce the extent of works during peak season, avoiding impacts on visitors and the local road network.	Minimise the impacts on the local road network and the local economy	Embedded mitigation
20.4	21.3.4	Embedded	Siting of the works	Impacts on the local economy	The siting of the works at Saunton Sands car park have been selected to reduce, wherever possible the space required for the works, ensuring as many car park spaces remain usable as possible.	Minimise the impacts on the local economy	Embedded mitigation
20.5	21.3.4	Embedded	Compensation	Impacts on the local economy	Direct compensation to Saunton Sands car park operator will be paid to cover the loss of income for the period in which the works are present within the car park.	Minimise the impacts on the local economy	Embedded mitigation
Chapter 22: Human Health							
22.1	22.3.6	Embedded	Site Selection	Disturbance	The Onshore Project has been defined following an extensive site selection process, which has accounted for environmental, engineering, planning and land requirements to identify an optimal project location. The site selection process is described in detail in **Chapter 4 Site Selection and Assessment of Alternatives.**	Minimise disturbance impacts	Embedded mitigation
22.2	22.3.6	Embedded	Electromagnetic Frequency (EMF)	Impacts of EMF from the export cables	Embedded design for EMF comprises the shielding part of the cable which is designed to the ICNIRP guidelines (2010). Embedded mitigation through the burial of cables, as EMF decreases rapidly with distance and by burying the cables, eliminates the magnetic field and creates distance between any receptor at the surface (even directly above the cables).	Minimise the potential impacts of EMF from the export cable	Embedded mitigation
22.3	22.3.6	Embedded	Communication and engagement	Impacts on visitors and recreational routes	Communication and engagement activities to ensure that visitors to Saunton Sands, and to the recreational routes, are aware of the timing and extent of construction and/or operation and maintenance activities in the nearshore/intertidal zone.	Minimise the impacts on visitors and recreational routes	Engagement activities and communication
22.4	22.3.6	Embedded	Access	Impacts to access	A CTMP will be developed and includes a commitment to undertaking any road works outside of the summer as well as specifying routes of travel for the construction traffic. Maintaining access to Saunton Sands, and to the recreational routes, during construction and/or operation and maintenance – no closures.	Minimise the impacts to access	CTMP
22.5	22.3.6	Embedded	Health and safety	Health and safety impacts from construction	Apply health and safety requirements proportionately: for example, balance the need to protect the public from accessing construction and/or operation and maintenance works with the need to maintain access to Saunton Sands and to the recreational routes.	Minimise the potential health and safety impacts from construction	Embedded mitigation

Reference	Cross Reference to ES	Type of Mitigation	Component / Activity	Impact	Mitigation Measure or Commitment	Effect of Mitigation	Means of Implementation
				activities on the public		works on the public	
22.6	22.3.6	Embedded	Construction and/or operational and maintenance activities	Various impacts from construction, operation, and maintenance activities	Measures set out in the CEMP that limit and manage the timing of construction and/or operation and maintenance activities.	Minimise the impacts from construction, operation, and maintenance activities	CEMP
22.7	22.3.6	Additional	Protective and preventative measures for the protection of public health	Impacts on human health	Take protective and preventative measures for the protection of public health: increase capacity for human intervention if people are attempting or considering self-harm and provide signs and resources. For example, support local initiatives for non-health staff and members of the public to train and/or raise awareness about self-harm; provide signs with information about sources of help.	Minimise the impacts on human health	Embedded mitigation

No further mitigation measures are required than those proposed in other ES chapters used to inform the health assessment, namely:

- **Chapter 12: Ground Conditions and Contamination**
- **Chapter 13: Air Quality**
- **Chapter 14: Water Resources and Flood Risk**
- **Chapter 15: Land Use**
- **Chapter 18: Noise and Vibration**
- **Chapter 19: Traffic and Transport**
- **Chapter 21: Socio-economics (including Tourism and Recreation)**.

Table 2 Offshore Project Mitigation Measures

Reference	Cross Reference to ES	Type of Mitigation	Component / Activity	Impact	Mitigation Measure or Commitment	Effect of Mitigation	Means of Implementation
Chapter 8: Marine Geology, Oceanography and Physical Processes							
8.1	8.3.5	Embedded	Cables	Impact on sediment transport and seabed processes	The Applicant will make reasonable endeavours to bury cables, minimising the requirement for cable protection measures and thus effects on sediment transport. Use of external cable protection would be minimised in all cases and no cable protection would be located in the nearshore including at the trenchless technique exit point. Route selection and micro-siting of the cables will be used to avoid areas of seabed that pose a significant challenge to their installation, including for example, areas of sand waves and megaripples. This will minimise the requirement for seabed preparation (levelling) and the associated seabed disturbance.	Minimise the impact on sediment transport and seabed processes	Embedded mitigation
8.2	8.3.5	Embedded	Landfall	Impact on coastal processes at the landfall	Either open-cut trenching or trenchless technique will be used to install the cables at the landfall (up to MHWS). Cables will be buried at sufficient depth to have no effect on coastal processes. Sediment transport would continue as a natural phenomenon driven by waves, which would not be affected by the Offshore Project.	Minimise the impact on coastal processes at the landfall	Embedded mitigation
Chapter 9: Marine Water and Sediment Quality							
9.1	9.3.4	Embedded	Cables	Impact on seabed processes	Route selection and micro-siting of the cables will be used to avoid areas of seabed that pose a significant challenge to their installation, including for example, areas of sand waves and megaripples. This will minimise the requirement for seabed preparation (levelling) and the associated seabed disturbance and resuspension of sediment.	Minimise and avoid where possible impacts on seabed processes	Embedded mitigation
9.2	9.3.4	Embedded	All construction activities	Various impacts associated with vessels involved in construction and operation activities	All vessels involved with construction and operation of The Offshore Project will be required to comply with the International Convention for the Prevention of pollution from Ships (MARPOL)73/78. A CEMP will also be put in place for the Offshore Project to ensure all works are undertaken in line with best practice for working in the marine environment.	Minimise the impacts from vessels associated with construction and operation activities	CEMP
Chapter 10: Benthic and Intertidal Ecology							
10.1	10.3.4	Embedded	Landfall	Impacts on species and habitats at the landfall	Trenchless technology will be used to avoid intertidal areas completely or open trenching designed to avoid impacts. One of the main uncertainties in the Landfall construction methodology is the depth to which the cables should be buried across the beach. At the Landfall (up to MHWS), the beach sand overlies bedrock, but the depth to the bedrock is not known. It is important to define the depth of burial, so that over the design lifetime of the cables (minimum 25 year), the risk of exposure is reduced if beach levels lower (potentially because of sea-level rise) into the future. A Cable Burial Risk Assessment will be completed to accurately define the preferred burial depth to mitigate future exposure.	Avoid or minimise the impacts on species and habitats at the landfall	Cable Burial Risk Assessment
10.2	10.3.4	Embedded	Cable corridor crossing of the Taw-Torridge Estuary SSSI	Impacts on the Taw-Torridge SSSI	Trenchless techniques will be used. As the entry and exit areas for the trenchless technique used to cross the estuary are above Mean High-Water Springs (MHWS), the assessment will be carried out in the White Cross Onshore Project.	Avoid impacts on the Taw-Torridge SSSI	Embedded mitigation

Reference	Cross Reference to ES	Type of Mitigation	Component / Activity	Impact	Mitigation Measure or Commitment	Effect of Mitigation	Means of Implementation
10.3	10.3.4	Embedded	Guidance and measures	Various impacts on benthic and intertidal ecology	The Project Environmental Management Plan (PEMP) will be agreed prior to the start of construction which will include biosecurity measures following relevant regulations and guidance such as: - International Convention for the Prevention of Pollution from Ships (MARPOL). The MARPOL sets out appropriate vessel maintenance - The Environmental Damage (Prevention and Remediation (England) Regulations 2015, which set out a polluter pays principle where the operators who cause a risk of significant damage or cause significant damage to land, water or biodiversity will have the responsibility to prevent damage occurring, or if the damage does occur will have the duty to reinstate the environment to the original condition - The International Convention for the Control and Management of Ships' Ballast Water and Sediments (BWM Convention), which provide global regulations to control the transfer of potentially invasive species	Minimise the various impacts on benthic and intertidal ecology	PEMP
Chapter 11: Fish and Shellfish Ecology							
11.1	11.3.4	Embedded	Entanglement hazards	Impacts of Abandoned Lost or otherwise Discarded Fishing Gear (ALDFG) and other potential entanglement hazards	Annual monitoring of anchor/moorings will be undertaken during the lifetime of the Offshore Project. Remotely operated vehicles (ROVs) will be used to identify any entanglement hazards such as ALDFG snagged on Project substructures.	Minimise the impacts of ALDFG and other entanglement hazards	Embedded mitigation
11.2	11.3.4	Embedded	Cables and cable burial	Impact of EMF from the export cable	The target burial depth is 1.5m where possible (recognised industry good practice and reducing effects of EMF), with a burial depth range of 0.5m – 3m. A detailed Cable Burial Risk Assessment (CBRA) will also be required, to confirm the extent to which cable burial can be achieved. Where it is not possible to achieve cable burial, additional cable protection (rock placement, concrete mattressing or grout bags) may be required, and this will also increase the minimum distance between the cable and a migratory fish. Cables will be specified to reduce EMF emissions, as per industry standards and best practice, such as the relevant IEC (International Electrotechnical Commission) specifications.	Minimise the impact of EMF from the export cable	Cable Burial Risk Assessment
11.3	11.3.4	Embedded	Construction noise	Impacts from construction noise on fish and shellfish	A draft Marine Mammal Mitigation Protocol (MMMP) (**Appendix 12.C: Draft MMMP**) has been developed and will be implemented, which will include proposals for soft start and ramp-up of piling. A soft start and ramp up protocol for pile driving would allow mobile species to move away from the area of highest noise impact. The MMMP details the required mitigation measures to minimise the potential risk of physical and auditory injury (PTS) to marine mammals as a result of underwater noise during Unexploded Ordinance (UXO) clearance and piling.	Minimise the impacts from construction noise on fish and shellfish	MMMP

Reference	Cross Reference to ES	Type of Mitigation	Component / Activity	Impact	Mitigation Measure or Commitment	Effect of Mitigation	Means of Implementation
					Any mitigation beneficial to marine mammals would also potentially reduce impacts on fish.		
Chapter 12: Marine Mammal and Marine Turtle Ecology							
12.1	12.4.4	Embedded	Monitoring of entanglement for asset integrity	Impact of debris on causing entanglement	Monitoring of all dynamic cables, mooring lines and Wind Turbine Generators (WTGs) will be undertaken throughout the operation and maintenance phase of the Offshore Project to ensure there is no risk to the infrastructure of caught debris in the mooring lines and cables. This will likely be done by use of a Remotely Operated Vehicle (ROV). In the case of any fishing gear / debris caught in the Offshore Projects infrastructure, it will be removed	Minimise the impact of debris causing entanglement	Embedded mitigation
12.2	12.4.4	Embedded	UXO clearance	Potential impact of UXO clearance on marine mammals and marine turtles	The hierarchy of UXO clearance techniques, in order of preference, are: ▪ Avoid (through micro-siting) ▪ Move UXO without clearing it (if safe to do so) ▪ Remove the UXO without clearing it (if safe to do so) ▪ Low-order deflagration if above options not suitable / unsafe ▪ High-order clearance, if low-order deflagration not possible, or in the unlikely event that low-order deflagration was unsuccessful.	Minimise the potential impact of UXO clearance on marine mammals and marine turtles	Embedded mitigation
12.3	12.4.4	Embedded	EMF	Impact of EMF	Cables will be buried to a target depth of 0.5-3.0m. This is a similar range to the Department for Energy and Climate Change (DECC) Guidelines (2011) which advise a 0.6m-1.5m depth to reduce the potential for effects relating to EMF. Cables will be specified to reduce EMF emissions as per industry standards and best practice such as the relevant International Electrotechnical Commission (IEC) specifications.	Minimise the impact of EMF	Embedded mitigation
12.4	12.4.4	Additional	Soft start and ramp up	Impact of underwater construction noise	Each piling event would commence with a soft-start at a lower hammer energy followed, by a gradual ramp-up for at least 20 minutes to the maximum hammer energy required (the maximum hammer energy is only likely to be required at a few of the piling installation locations). The soft-start and ramp-up allows mobile species to move away from the area before the maximum hammer energy with the greatest noise impact area is reached. The soft-start and ramp-up procedure, along with other mitigation measures for piling, will be detailed in the Marine Mammals Mitigation Protocol (MMMP) for Piling.	Minimise the impact of underwater construction noise	MMMP
12.5	12.4.4	Additional	UXO	Impact of UXO clearance on marine mammals and marine turtles	A draft MMMP (**Appendix 12.C: Draft MMMP**) will be drawn up for UXO clearance, which will ensure there are adequate mitigation measures to minimise the risk of any physical or permanent auditory injury to marine mammals and marine turtles as a result of UXO clearance. Low noise alternatives to high order detonations will be prioritised when developing protocols to clear UXOs.	Minimise the impacts of UXO clearance on marine mammals and marine turtles	MMMP
12.6	12.4.4	Additional	Water quality	Impact of pollution	As outlined in **Chapter 9: Marine Sediment and Water Quality**, the Applicant is committed to the use of best practice techniques and due diligence regarding the potential for pollution throughout all construction, operation and maintenance, and decommissioning activities.	Minimise the impact pollution	Best practice techniques

Reference	Cross Reference to ES	Type of Mitigation	Component / Activity	Impact	Mitigation Measure or Commitment	Effect of Mitigation	Means of Implementation
12.6	12.4.4	Additional	Piling activities	Impacts associated with piling	The MMMP for piling will be developed in the pre-construction period and based upon best available information, methodologies, industry best practice, latest scientific understanding, current guidance and detailed project design. The MMMP for piling will be developed in consultation with the relevant SNCBs and the MMO, detailing the proposed mitigation measures to reduce the risk of any physical or PTS to marine mammals and marine turtles during all piling operations. This will include details of the embedded mitigation, for the soft-start and ramp-up, as well as details of the mitigation zone and any additional mitigation measures required in order to minimise potential effects of any physical or PTS, for example, the activation of Acoustic Deterrent Device (ADD) (e.g., for 10 minutes) prior to the soft-start. Bubble curtains (and other noise at source reducing technologies) will be considered, however, it is unlikely they will be feasible for the Offshore Project given the specific environmental parameters of the site (notably the water depth).	Minimise the impacts of piling	MMMP
12.7	12.4.4	Additional	UXO	Impacts associated with UXO clearance	A detailed MMMP will be prepared for UXO clearance during the pre-construction phase. The MMMP for UXO clearance will ensure there are adequate mitigation measures to minimise the risk of any physical or permanent auditory injury to marine mammals and marine turtles as a result of UXO clearance. The MMMP for UXO clearance will be developed in the pre-construction period, when there is more detailed information on the UXO clearance which could be required and the most suitable mitigation measures, based upon best available information and methodologies at that time. The MMMP for UXO clearance will be prepared in consultation with the MMO and relevant SNCBs. The MMMP for UXO clearance will include details of all the required mitigation measures to minimise the potential risk of PTS as a result of underwater noise during UXO clearance, for example, this would consider the options, suitability and effectiveness of mitigation measures such as, but not limited to: ▪ Low-order clearance techniques, such as deflagration ▪ All UXO clearance to take place in daylight and, when possible, in favourable conditions with good visibility (sea state 3 or less) ▪ Establishment of a monitoring area with minimum of 1km radius. The observation of the monitoring area will be by dedicated and trained marine mammal observers (MMObs) during daylight hours and suitable visibility ▪ The activation of ADD ▪ The controlled explosions of the UXO will be undertaken by specialist contractors, using the minimum amount of explosive required in order to achieve safe disposal of the UXO ▪ Other UXO clearance techniques, such as avoidance of UXO; or relocation of UXO.	Minimise the impacts associated with UXO clearance	MMMP

Reference	Cross Reference to ES	Type of Mitigation	Component / Activity	Impact	Mitigation Measure or Commitment	Effect of Mitigation	Means of Implementation
					If more than one high-order detonation is required, other measures such as the use of scare charges; or multiple detonations, if UXO are located in close proximity, will also be considered in consultation with the MMO and SNCBs. UXO clearance is not included in the ES application, as currently not enough detailed information is available. Therefore, UXO clearance will be assessed through a separate Marine Licence (ML) application post consent.		
12.8	12.4.4	Additional	Vessel collision	Impact of vessel movements on marine mammals and marine turtles	Vessel movements, where possible, will follow set vessel routes and hence areas where marine mammals and marine turtles are accustomed to vessels, in order to reduce any increased collision risk. All vessel movements will be kept to the minimum number that is required to reduce any potential collision risk. Additionally, vessel operators will follow best practice guidance to reduce any risk of collisions with marine mammals and marine turtles, such as following the Cornwall Marine and Coastal Code for Vessels. All vessels will transit to and from the Windfarm Site at less than 10 knots to further reduce the potential for collision risk. No vessel will transit within 1km of any known seal haul out site at any time.	Minimise the risk of impacts from vessel movements	Best practice guidance
12.9	12.4.4	Additional	Bristol Channel Approaches SAC	Various impact on the Bristol Channel Approaches SAC	In addition to the MMMPs for piling and UXO clearance, a Site Integrity Plan (SIP) for the Bristol Channel Approaches SAC (solely designated for harbour porpoise) will be developed. The SIP will set out the approach to deliver any Project mitigation or management measures to reduce the potential for any significant disturbance of harbour porpoise in relation to the Bristol Channel Approaches SAC conservation objectives. The SIP is an adaptive management tool, which can be used to ensure that the most adequate, effective, and appropriate measures, if required, are put in place to reduce the significant disturbance of harbour porpoise in the Bristol Channel Approaches SAC. The SIP will be developed in the pre-construction period and will be based upon best available information and methodologies at that time, in consultation with the relevant SNCBs and the MMO.	Minimise the impacts on the Bristol Channel Approaches SAC	MMMP and SIP
Chapter 13: Offshore Ornithology							
13.1	13.3.5	Embedded	Entanglement	Impact of birds becoming entangled	Annual monitoring of anchor/moorings will be undertaken during the lifetime of the Offshore Project. Remotely operated vehicles (ROVs) will be used to identify any entanglement hazards such as ALDFG snagged on Project substructures.	Minimise the risk of birds becoming entangled	Embedded mitigation
Chapter 14: Commercial Fisheries							
14.1	14.3.4	Embedded	General	Various impacts on commercial fisheries	A CEMP, including an Emergency Spill Response Plan, Waste Management Plan, Marine Mammal Protection Plan, Fisheries Liaison and Co-existence Plan and Fisheries Management and Mitigation Strategy will be developed prior to commencement of works. An CEMP is provided in **Appendix 5.A: Outline CEMP**	Minimise the various impacts on commercial fisheries	CEMP including Emergency Spill Response Plan, Waste Management Plan, Marine Mammal Protection Plan,

Reference	Cross Reference to ES	Type of Mitigation	Component / Activity	Impact	Mitigation Measure or Commitment	Effect of Mitigation	Means of Implementation
							Fisheries Liaison and Co-existence Plan and Fisheries Management and Mitigation Strategy
14.2	14.3.4	Embedded	Liaison	Displacement and disruption	A Fisheries Liaison Officer (FLO) will be appointed for the Construction Phase and as required during the Operation Phase (including maintenance and repair) Phase. The Requirements for Decommissioning Phase will be determined following economic and environmental appraisals. Adherence to good practice guidance on the approach to fisheries liaison and mitigation (e.g., FLOWW, 2014; 2015). The Fisheries Liaison and Coexistence Plan will detail the scheduling, approach and stakeholders with whom liaison will be conducted and the content and formats of information to be provided and the process of recording and acting upon feedback from stakeholders.	Minimises risk, displacement, and disruption	Fisheries Liaison and Coexistence Plan
14.3	14.3.4	Embedded	Notification to relevant stakeholders	Displacement and disruption	Notice(s) to Mariners' (including Kingfisher) will be issued a week prior to works, Radio Navigational Warnings, NAVTEX and/or broadcast warnings will also be issued a week prior to the commencement of installation works along with direct liaison with relevant stakeholders.	Minimises displacement and disruption	Embedded mitigation
14.4	14.3.4	Embedded	Claims for loss/damage of fishing gear	Risk to gear	Development of a standard procedure for the claim of loss of/or damage to fishing gear.	Minimises risk to gear	Embedded mitigation
14.5	14.3.4	Embedded	Fishing gear	Damage to fishing gear	Development of a procedure for the claim of loss of/or damage to fishing gear.	Minimises risk to gear	Embedded mitigation
14.6.	14.3.4	Embedded	Offshore export cable burial	Displacement and snagging of fishing gear	Minimum cable burial depth of 0.5m, with a maximum cable burial depth of 3m. The use of cable burial will also prevent snagging with fishing gear.	Minimises risk to gear	Embedded mitigation
14.7	14.3.4	Embedded	Cable protection	Displacement and snagging of fishing gear	The use of cable protection will be limited to areas where cables cannot be buried to a sufficient depth and at crossings with 3rd party infrastructure.	Minimises risk to fishing gear	Embedded mitigation
14.8	14.3.4	Embedded	Cable protection charting and dissemination of information	Displacement and snagging of fishing gear	Information on the areas where cable protection is installed will be distributed to relevant representative organisations and stakeholders in appropriate formats for inclusion in charts and information bulletins.	Minimises risk to fishing gear	Embedded mitigation
14.9	14.3.4	Embedded	Rock placement	Displacement and snagging of fishing gear	Where rock placement is used for cable protection this will be designed to minimise potential snagging risks such as use of graded rock and 1:3 berm profiles. A vessel able to undertake a targeted placement method will be used.	Minimises risk to fishing gear	Embedded mitigation
14.10	14.3.4	Embedded	Cable exposure	Damage to fishing gear	In the event that cable exposures are identified during the operational phase, the location of these will be published via the standard notices with additional liaison to be undertaken with fisheries stakeholders. Where appropriate, additional temporary measures would also be put in place (e.g., surface marker buoys, use of guard vessels, etc).	Minimises risk to fishing gear	Embedded mitigation

Reference	Cross Reference to ES	Type of Mitigation	Component / Activity	Impact	Mitigation Measure or Commitment	Effect of Mitigation	Means of Implementation
14.11	14.3.4	Embedded	24hr cable installation	Disruption	Installation will normally be a 24-hour operation where viable, minimising overall installation time and, maximising use of fair-weather windows, and to take advantage of vessel and equipment availability.	Minimises disruption	Embedded mitigation
14.12	14.3.4	Embedded	Post-lay and cable burial inspection	Disruption, displacement, and damage to fishing gear	Undertaking of post-lay and cable burial inspection to confirm the burial status of the cables, identify potential seabed hazards associated with installation, and, where appropriate and practicable, undertaking of rectification works.	Minimises disruption and risk to fishing gear	Embedded mitigation
14.13	14.3.4	Additional	Export cable pre-installation and installation works	Displacement, disruption, and damage to fishing gear	In line with FLOWW Guidance, appropriate evidence-based cooperation agreements will be sought with those vessels' owners for the removal of their static gears from the Offshore Export Cable Corridor. Such agreements would include provisions aimed at to preventing displacement impacts on other vessels.	Minimises disruption and damage to fishing gear	Evidence-based cooperation agreements with vessel owners
14.14	14.3.4	Additional	Project vessels transits	Disruption and damage to fishing gear	In order to minimise conflicts between project vessels and deployed static fishing gears, project vessel transit routes would, as far as practicable, be designed to avoid important areas of static gear deployment. Project vessel crews would also be briefed on the types and locations of static gears within the vicinity of the Offshore Project.	Minimises disruption and damage to fishing gear	
14.15	14.3.4	Additional	Boulder relocation	Disruption and displacement	Consultation would be undertaken with fisheries stakeholders prior to the commencement of boulder relocation/removal works. The locations of relocated boulders as specified by the MMO would be provided to stakeholders in the appropriate formats including electronically for installation in vessel Global Positioning System (GPS) plotters.	Minimises disruption and displacement	Consultation with fisheries stakeholders
14.16	14.3.4	Additional	UXO clearance	Disruption and displacement	If UXO clearance is required, the locations of any removal or destruction works will be provided to stakeholders in the appropriate formats.	Minimises disruption and displacement	
14.17	14.3.4	Additional	Promulgation of information to fishermen	Disruption	Engagement of a locally experienced FIR to assist the Company Fisheries Liaison Officer.	Minimises disruption	Fisheries Liaison Officer
14.18	14.3.4	Additional	Obstructions on the seabed	Disruption, displacement, and damage to fishing gear	The Offshore Project will have agreed policies with construction contractors aimed at preventing objects being dropped overboard from their vessels as well as ensuring procedures are in place for the recording, notification, and recovery of any accidentally lost objects.	Minimises disruption, displacement, and damage to fishing gear	Agreed policies with construction contractors
Chapter 15: Shipping and Navigation							
15.1	15.3.4	Embedded	Notice to Mariners	Disruption	To ensure that the appropriate authorities are informed of works being carried out in waters adjacent to the Offshore Project. To include: ▪ UK Hydrographic Office (UKHO) ▪ Maritime and Coastguard Agency (MCA) ▪ Kingfisher ▪ Trinity House (TH) ▪ Royal Yachting Association (RYA) ▪ Local Ports and Harbours ▪ Oil and Gas Operators ▪ Marine Management Organisation (MMO).	Minimise disruption	Embedded mitigation

Reference	Cross Reference to ES	Type of Mitigation	Component / Activity	Impact	Mitigation Measure or Commitment	Effect of Mitigation	Means of Implementation
15.2	15.3.4	Embedded	Site marking and charting	Disruption	Site is marked on nautical charts including an appropriate chart note.	Minimise disruption	
15.3	15.3.4	Embedded	Safety zone	Disruption and damage to sub-sea equipment and fishing gear	Application and use of safety zones of up to 500m from platform edge (at sea level) during construction/major maintenance and decommissioning phases. Safety zones shall be of appropriate configuration, extent, and application to specified vessels of identified primary risk of sub-sea equipment to fishing and snagging hazard.	Minimise the risk of disruption and damage to sub-sea equipment and fishing gear	Embedded mitigation
15.4	15.3.4	Embedded	Project information	Damage to fishing equipment, snagging hazard on the cables	Appointment of a Fisheries Liaison and Co-existence Plan providing detailed project information to fishermen, such as site and export cable route location for upload into fish plotters	Minimise the risk of damage to fishing gear and snagging hazard on the cables	Fishing Liaison and Co-existence Plan
15.5	15.3.4	Embedded	Response to incidents	Various emergency impacts	Emergency Response Co-Operation Plan (ERCOP) with agreement of MCA.	Reduction of consequences of incidents	ERCOP
15.6	15.3.4	Embedded	Response to pollution incidents	Impacts from pollution	Measures will be informed by a Marine Pollution Contingency Plan and will ensure that the potential for release of pollutants from construction and operation and maintenance activities is minimised, which will include planning for accidental spills and responding to all potential contaminant releases.	Minimise the potential for the release of pollutants	Marine Pollution Contingency Plan
15.7	15.3.4	Embedded	Periodic Exercises	Increased consequences of incidents	Periodic emergency management and response exercises will be run by the Applicant, in conjunction with Coastguard Operations Centre (CGOC) and Search and Rescue (SAR).	Reduction in the consequences of incidents	Embedded mitigation
15.8	15.3.4	Embedded	Incident investigation and reporting	Increased likelihood of incidence reoccurrence	There are statutory incident reporting requirements and expectations: ▪ Marine Accident Investigation Branch (MAIB) (Merchant Shipping Act) ▪ HSE (RIDDOR) ▪ Harbour Authority under Port Marine Safety Code. Risk assessments to be reviewed following incidents, and additional risk controls identified if appropriate.	Reduction in the likelihood of incidence reoccurrence	Embedded mitigation
15.9	15.3.4	Embedded	Aids to navigation	Risk of allision with structures	Suitable Aids to Navigation (AtoN) lighting and marking the OWF site shall be undertaken complying with IALA Recommendations G1162 (IALA, 2021), to be finalised and approved in consultation with MCA and TH through an Aids to Navigation Management Plan. Fog horns to alert vessels to the position of structures when visibility is poor. Note planned update to O-139 to include painting reference from waterline (not HAT). Wind turbine generator (WTG) informal naming/associated markings shall not interfere with formal AtoN's. Automatic Identification System (AIS) transponders to be placed on periphery corner WTGs	Reduction in the risk of allision with structures	Aids to Navigation Management Plan
15.10	15.3.4	Embedded	Buoyed construction area	Risk of allision with structures or collision	Buoys deployed around construction work in windfarm site in line with TH requirements and may include a combination of cardinal and/or safe water	Reduction in the risk of allision with structures and	Aids to Navigation Management Plan

Reference	Cross Reference to ES	Type of Mitigation	Component / Activity	Impact	Mitigation Measure or Commitment	Effect of Mitigation	Means of Implementation
				with construction vessels	marks. To be finalised and approved in consultation with MCA and THLS through an Aids to Navigation Management Plan.	collision with construction vessels	
15.11	15.3.4	Embedded	Hydrographic surveys	Risk of grounding or snagging of cables	MGN 654 requires that hydrographic surveys should fulfil the requirements of the International Hydrographic Organisation (IHO) Order 1a standard, with the final data supplied as a digital full density data set, and survey report to the MCA Hydrography Manager and the UKHO. Further information can be found in MGN 654 Annex 4 supporting document titled 'Hydrographic Guidelines for Offshore Developers'.	Reduction in the risk of grounding or snagging of the cables	Embedded mitigation
15.12	15.3.4	Embedded	Subsea cables	Risk of grounding or snagging of cables	Cable Burial Risk Assessment to be undertaken pre-construction, including consideration of Under Keel Clearance (UKC). All subsea cables will be either fully buried (where ground conditions permit and burial tool performance allows), partially buried (buried but not to target depth) with rock protection, or surface laid with rock protection. Selected methods will be based on the CBRA and the protection will be periodically monitored and maintained as practicable. No more than 5% reduction in water depth (referenced to Chart Datum) will occur at any point on the cable route without prior written approval from the Licensing Authority.	Reduction in the risk of grounding or snagging of the cables	Cable Burial Risk Assessment
15.13	15.3.4	Embedded	Air draught clearance	Risk of allision with structures	Wind turbine blades will have at least 22 m clearance above MHWS. Noting these are floating, not fixed structures.	Minimise the risk of allision with structures	Embedded mitigation
15.14	15.3.4	Embedded	Layout plan and lines of orientation	Risk of allision with structures and ensuring access for SAR	WTG layout plan to be agreed with MCA and TH prior to construction and either maintain two lines of orientation or propose a suitable layout that is acceptable to the MCA/TH.	Minimise the risk of allision with structures	Embedded mitigation
15.15	15.3.4	Embedded	Electromagnetic interference	Impacts on navigation and communications equipment	A Cable Specification and Installation Plan will be prepared as part of the Code of Construction Practice. This will include the technical specification of offshore electrical circuits, and a desk-based assessment of attenuation of electro-magnetic field strengths, shielding and cable burial depth in accordance with industry good practice.	Reduction in the risk of impacts on navigation and communication equipment	Code of Construction Practice (CoCP) Cable Specification and Installation Plan
15.16	15.3.4	Embedded	Construction method statement and programme decommissioning plan	Risk of allision with structures or collision with construction vessels	Construction programme and plan to be submitted to MCA and TH for consultation. Where possible, construction to follow linear progression avoiding disparate construction sites across development area. Agreement of a decommissioning plan prior to decommissioning.	Reduction in the risk of allision with structures or collision with construction vessels	Embedded mitigation
15.17	15.3.4	Embedded	Moorings design	Risk of breakout	Adherence with HSE/MCA guidance "Regulatory expectations on moorings for floating wind and marine devices".	Minimise the risk of breakout	Embedded mitigation
15.18	15.3.4	Embedded	Marine operating guidelines	Risk of allision with structures or collision with vessels	Project vessels during construction and co-ordination during operation and maintenance to ensure project vessels do not present unacceptable risks to each other or third parties. Project marine traffic coordination plans to be made available to all maritime users. Information and warnings will be distributed via	Reduction in the risk of allision with	Embedded mitigation

Reference	Cross Reference to ES	Type of Mitigation	Component / Activity	Impact	Mitigation Measure or Commitment	Effect of Mitigation	Means of Implementation
					Notices to Mariners and other appropriate media (e.g. Admiralty Charts and fishermen's awareness charts) to enable vessels and operators to effectively and safely navigate around the windfarm site and activities during the Offshore Export Cable Corridor construction.	structures or collision with vessels	
15.19	15.3.4	Embedded	Vessel Standards	Risk of allision with structures or collision with vessels	All work vessels operating on behalf of projects will be required to adhere with the following: ▪ MCA Vessel Coding (e.g. Small Commercial vessel (SCV)) ▪ Appropriate Insurance ▪ Crewed by suitably trained/qualified personnel ▪ Automatic Identification System (AIS) (Class A/B) ▪ Very high frequency (VHF) (Ch16) ▪ Mooring Arrangements.	Reduction in the risk of allision with structures or collision with vessels	Embedded mitigation
15.20	15.3.4	Embedded	Health and safety	Risk of loss of life	All personnel will wear the correct PPE suitable for the location and role at all times, as defined by the relevant Quality, Health, Safety and Environment (QHSE) documentation. This will include the use of Personal Locator Beacons (PLBs).	Minimise the risk of loss of life	Relevant QHSE documentation
15.21	15.3.4	Embedded	Guard vessels	Risk of allision with structures or collision with vessels	Provision of guard vessel in vicinity of the windfarm site during construction or major maintenance to monitor 3rd party vessel traffic and intervene with warnings as necessary.	Reduction in the risk of allision with structures or collision with vessels	Embedded mitigation
15.22	15.3.4	Embedded	Inspection and maintenance programme	Risk of project asset failure	Regular maintenance regime by the Applicant to check the Offshore Project infrastructure, its fittings and any signs of wear and tear. This should identify any faults which might result in a failure.	Minimise the risk of project asset failure	Embedded mitigation
15.23	15.3.4	Embedded	Training	Risk of loss of life	Developers are responsible for ensuring that all staff engaged on operations are competent to carry out the allocated work.	Minimising the risk of loss of life	Embedded mitigation
15.24	15.3.4	Embedded	Compliance with International, UK and Flag State regulations including IMO conventions	Risk of allision with structures or collision with vessels	Compliance from all vessels associated with the proposed project with international maritime regulations as adopted by the relevant flag state (e.g. International Convention for the Prevention of Collision at Sea (COLREGS) (IMO, 1972) and International Convention for the Safety of Life at Sea (SOLAS (IMO, 1974)	Minimising the risk of allision with structures or collision with vessels	Embedded mitigation
15.25	15.3.4	Embedded	Vessel health and safety requirements	Risk of loss of life	As industry standard mitigation, the Applicant will ensure that all Project related vessels meet both IMO conventions for safe operation as well as HSE requirements, where applicable. This shall include the following good practice: ▪ Windfarm associated vessels will comply with international maritime regulations ▪ All vessels, regardless of size, will be required to carry AIS equipment on board ▪ All vessels engaged in activities will comply with relevant regulations for their size and class of operation and will be assessed on whether they are appropriate for activities they are required to carry out	Minimising the risk of loss of life	Embedded mitigation

Reference	Cross Reference to ES	Type of Mitigation	Component / Activity	Impact	Mitigation Measure or Commitment	Effect of Mitigation	Means of Implementation
					▪ All marine operations will be governed by operational limits, tidal conditions, weather conditions, and vessel traffic information ▪ Walk to work solutions will be utilised where relevant.		
15.26	15.3.4	Embedded	Continuous watch	Slow response to incidents	Continuous watch by multi-channel VHF, including Digital Selective Calling (DSC).	Responding to incidents quickly	Embedded mitigation
Chapter 16: Maine Archaeology and Cultural Heritage							
16.1	16.3.7	Embedded	Known heritage assets	Impacts on known heritage assets	For archaeologically significant anomalies that are clearly identifiable in the survey data and where the extents are largely known, Archaeological Exclusion Zones (AEZs) will be employed. AEZs will remain for the life of the Offshore Project or until ground truthing or higher resolution data determines a reduction in potential significance, or extents.	Minimise the impacts on known heritage assets	Implementation of AEZs
16.2	16.3.7	Embedded	Known heritage assets	Impacts on known heritage assets	Where an anomaly is not visible in the survey data but likely to exist on the seabed at a known position or where the extents of an anomaly are not fully identifiable, Temporary Archaeological Exclusion Zones (TAEZs) will be employed. TAEZs have been identified as highly likely to be altered following higher resolution or full coverage data assessment, however, they will remain in place until alterations have been formally agreed.	Minimise the impacts on known heritage assets	Implementation of TAEZs
16.3	16.3.7	Embedded	Potential heritage assets	Impacts on potential heritage assets	Avoidance where possible of identified anomalies. Avoidance by micro-siting where possible of previously recorded sites that have not been seen in the geophysical data and at which the presence of surviving material is considered unlikely. Further investigation of any identified anomalies and previously recorded sites that cannot be avoided by micro-siting of design and the application of either embedded mitigation (avoidance) or additional mitigation.	Minimise the impacts on potential heritage assets	Embedded mitigation
16.4	16.3.7	Embedded	Potential heritage assets	Impacts on potential heritage assets	In order to account for unexpected discoveries of archaeological material during construction, operation and decommissioning, a formal protocol will be required. It is recommended that if any objects of possible archaeological interest are encountered, they should be reported using a formal protocol.	Minimise the impacts on potential heritage assets	Embedded mitigation
Chapter 17: Civil and Military Aviation							
17.1	17.5	Embedded	Notification of information	Risk to navigation, safety	Appropriate notification to aviation stakeholders, to minimise effects to aviation flight operations (including SAR) would apply to the development of the Offshore Project. These will comply with current guidelines and be agreed with the appropriate stakeholders. Pilots are obliged to plan their flying activities in advance and to be familiar with any en-route obstacles they may encounter.	Minimise the risk to navigation	Embedded mitigation
17.2	17.5	Embedded	Layout and regularity	Risk to navigation, safety	Regularity of layout to minimise effects to aviation flight operations (including SAR) would apply to the development of the Offshore Project. These will comply with current guidelines and be agreed with the appropriate stakeholders. Pilots are obliged to plan their flying activities in advance and to be familiar with any en-route obstacles they may encounter.	Minimise the risk to navigation	Embedded mitigation

Reference	Cross Reference to ES	Type of Mitigation	Component / Activity	Impact	Mitigation Measure or Commitment	Effect of Mitigation	Means of Implementation
17.3	17.5	Embedded	Lighting and marking	Risk to navigation, safety	Appropriate lighting and marking (taking account of MGN 654 (M+F) OREI (MCA, 2021)) to minimise effects to aviation flight operations (including SAR) would apply to the development of the Offshore Project. These will comply with current guidelines and be agreed with the appropriate stakeholders. Pilots are obliged to plan their flying activities in advance and to be familiar with any en-route obstacles they may encounter.	Minimise the risk to navigation	Embedded mitigation
Chapter 18: Infrastructure and Other Users							
18.1	18.3.4	Embedded	Consultation	Disruption and damage to project infrastructure	Owners and operators of infrastructure (other renewable project developers, dredging companies and cable operators) have been and will continue to be consulted by the Applicant, and commercial and technical agreements will be put in place where required ahead of construction.	Minimise disruption and likelihood of damage to project infrastructure	Embedded mitigation
18.2	18.3.4	Embedded	Crossing and proximity to infrastructure and other users	Disruption	Crossing and proximity agreements will be agreed post-consent with the relevant asset owners.	Minimise disruption	Crossing and proximity agreements
18.3	18.3.4	Embedded	Promulgation of information	Risk of collision with structures or collision with vessels	Advance warning and accurate location details of construction, maintenance and decommissioning operations, associated safety zones and advisory passing distances will be given via Notices to Mariners and other appropriate media. This will be secured through the Marine Licence conditions. Relevant shipping and navigation mitigations are described in **Chapter 15: Shipping and Navigation.**	Minimise the risk of collision with structures or collision with vessels	Embedded mitigation
18.4	18.3.4	Embedded	Cables	Risk of snagging and damage to assets	All cables will be installed and maintained in line with standard industry guidance and good practice (e.g., Subsea Cables UK Guidelines, International Cable Protection Committee Recommendations) that provide guidance on proximity of cables to existing assets and coordination with other operators.	Minimise the risk of snagging and damage to assets	Embedded mitigation
18.5	18.3.4	Embedded	Pre-construction surveys	Risk of snagging and damage to fishing gear and assets	Pre-construction surveys will be implemented by the Offshore Project in order to identify any potential hazards within the Windfarm Site. These will include geophysical surveys to identify seabed hazards, such as discarded fishing gear, wrecks or unidentified objects and magnetometer surveys to identify existing subsea cable locations and for the presence of Unexploded Ordnance (UXO) devices. Any identified UXO devices would be avoided through micro-siting or require a subsequent UXO clearance campaign.	Minimise the risk of snagging and damage to fishing gear and assets	Embedded mitigation
Chapter 19: Offshore Seascape Landscape and Visual Amenity							
19.1	19.3.4	Embedded	Wind Turbine Generators (WTGs)	Impact to sensitive land-based receptors	The maximum blade tip height has been reduced to 284 m above Mean Sea Level (MSL), from ~345 m above MSL proposed at the Scoping stage. The maximum rotor diameter will be 262 m. This commitment defines the maximum height of WTGs that could be installed. The colour of the WTG tower and blades will be agreed with relevant stakeholders and will likely be RAL 7035 (light grey) from 15 m above water line which provides standard mitigation as a recessive colour in the seascape/sky backdrop. The structure (Floater and Tower) will likely be painted RAL 1023 (traffic yellow) from the Floater Water Line to approximately +15 m above Floater Water Line.	Minimise the impact to sensitive land-based receptors	Embedded mitigation

Reference	Cross Reference to ES	Type of Mitigation	Component / Activity	Impact	Mitigation Measure or Commitment	Effect of Mitigation	Means of Implementation
19.2	19.3.4	Embedded	Lighting	Impact to sensitive land-based receptors	A lighting scheme will be agreed for the aviation lighting of structures (Wind Turbine Generators (WTG) and Offshore Substation Platform (OSP)) with relevant authorities. Given the sensitivity of the night skies within the study area to lighting the Applicant has committed to introduce mitigation for the aviation lighting effects. A detection system will be mounted on the offshore WTGs, and these will detect when visibility is greater than 5km. When this is the case the aviation lights will be dimmed to 10% of the 2000 candela maximum so that the intensity of the light emitted would be 200 candela. This accords with CAA guidance. The reduced intensity above and below the horizontal, as set out in International Civil Aviation Organisation (ICAO), (2018) and described in Section 19.2.1 would also be applicable when the 200 candela lights are operational. Whilst it is not included in the assessment there is also potential for further mitigation to reduce the number of WTGs fitted with aviation lights as Article 223 of the Air Navigation Order 2016 allows the following: "(3) If four or more wind turbine generators are located together in the same group, with the permission of the CAA only those on the periphery of the group need be fitted with a light in accordance with paragraph (2)." This commitment provides for minimising lighting impacts as far practicable, whilst ensuring compliance with legal requirements for lighting and marking the WTGs and OSP. When sensors mounted on WTGs detect the visibility in all directions from every wind turbine is more than 5km aviation warning lights will enable a reduction in lighting intensity from 2000 candela to 200 candela.	Minimise the impact to sensitive land-based receptors	Embedded mitigation