Rampion 2 Wind Farm

Category 6: Environmental Statement

Volume 2, Chapter 12: Offshore and intertidal ornithology

Date: August 2023

Revision A

Document Reference: 6.2.12
Pursuant to: APFP Regulation 5 (2) (a)
Ecodoc number: 004866034-01

Document revisions

Revision	Date	Status/reason for issue	Author	Checked by	Approved by
A	04/08/2023	Final for DCO Application	GoBe	RED	RED

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Executive Summary

This chapter of the Rampion 2 Environmental Statement (ES) examines the likely significant effects that may be experienced as a result of Rampion 2 on offshore and intertidal ornithology.

The assessment identifies likely significant effects on bird species resulting from the proposed construction, operation and decommissioning of the offshore infrastructure. The assessment has considered impacts from disturbance and displacement of birds, and indirect impacts on bird species due to impacts on prey species habitat loss. During the operational phase impacts that have been assessed include collision risk with rotating Wind Turbine Generator (WTG) blades and barrier effects (i.e. blocking of flight paths from the array area). The study area for the offshore and intertidal ornithology assessment includes the area in which the WTGs will be located plus a 4km buffer, the export cable corridor and the cable landfall area.

The assessment for the intertidal environment has used both a desk-based approach to data collection, and survey data from 12 winter surveys. The data provides evidence that waterbird occurrence is generally very low on a regional and national scale within the intertidal environment at the proposed landfall area, with only sanderling and Mediterranean gull being found in sufficient numbers to warrant further consideration. For the offshore environment, a programme of 24 months of aerial digital surveys has been completed in order to determine the type and numbers of birds present in and around the wind farm.

Based on the proposed location of the offshore infrastructure and its subsequent operation, plus the incorporation of appropriate environmental measures, no significant effects have been identified at this stage in relation to any potential impact of Rampion 2 on offshore and intertidal ornithology.

There is potential for cumulative risk to birds as a result of operational activities associated with Rampion 2 and other developments. The main risk to birds is through potential collision with WTGs and other associated offshore wind farm infrastructure, resulting in injury or fatality. The Preliminary Environmental Impact Report (PEIR) assessment identified that there was a potentially significant adverse effect on great black-backed gull as a consequence of cumulative collision risk from Rampion 2 and other UK offshore wind farms in the UK south-west and the English Channel. However, the contribution from Rampion 2 is considered to be minimal and additional PVA modelling carried out has ruled out a significant effect. No other significant cumulative effects to any other bird species have been identified.

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12. Offshore and intertidal ornithology

12.1 Introduction

12.1.1 This chapter of the Environmental Statement (ES) presents the results of the assessment of the likely significant effects of Rampion 2 with respect to offshore and intertidal ornithology, during construction, operation and maintenance, and decommissioning. It should be read in conjunction with the project description provided in **Chapter 4: The Proposed Development, Volume 2** of the ES (Document Reference: 6.2.4) and the relevant parts of the following chapters and appendices:

- **Chapter 8: Fish and shellfish ecology, Volume 2** of the ES (Document Reference: 6.2.8) (due to the potential for indirect impacts from changes in abundance or distribution of prey species);
- **Chapter 9: Benthic, subtidal and intertidal ecology, Volume 2** of the ES (Document Reference: 6.2.9) (due to the intersections of habitats at mean high water springs (MHWS)); and
- **Chapter 22: Terrestrial ecology and nature conservation, Volume 2** of the ES (Document Reference: 6.2.22) (due to the presence of bird species that use both offshore and terrestrial habitats, as well as birds that migrate across the offshore environment).

12.1.2 This technical chapter describes:

- the legislation, planning policy and other documentation that has informed the assessment (**Section 12.2: Relevant legislation, planning policy and other documentation**);
- the outcome of consultation and engagement that has been undertaken to date, including how matters relating to offshore and intertidal ornithology within the Statutory Consultation, have been addressed (**Section 12.3: Consultation and engagement**);
- the scope of the assessment for offshore and intertidal ornithology (**Section 12.4: Scope of the assessment**);
- the methods used for the baseline data gathering (**Section 12.5** and **12.6: Methodology for baseline data gathering**);
- the overall baseline (**Section 12.7** and **12.8: Baseline conditions**);
- embedded environmental measures relevant to offshore and intertidal ornithology and the relevant maximum design scenario (**Section 12.9: Basis for ES assessment**);
- the assessment methods used for the ES (**Section 12.10: Methodology for ES assessment**);

- the assessment of offshore and intertidal ornithology effects (**Sections 12.11 – 12.14: Assessment of effects** and **Section 12.15: Assessment of cumulative effects**);
- consideration of transboundary effects (**Section 12.16: Transboundary effects**);
- inter-related effects (**Section 12.17: Inter-related effects**);
- a summary of residual effects for offshore and intertidal ornithology (**Section 12.18: Summary of residual effects**);
- a glossary of terms and abbreviations is provided in **Section 12.19: Glossary of terms and abbreviations**; and
- a references list is provided in **Section 12.20: References**.

12.1.3 The chapter is also supported by the following appendices:

- **Appendix 12.1: Offshore and intertidal ornithology baseline technical report, Volume 4** of the ES (Document Reference: 6.4.12.1);
- **Appendix 12.2: Offshore ornithology displacement, Volume 4** of the ES (Document Reference: 6.4.12.2)**;**
- **Appendix 12.3: Offshore ornithology collision risk, Volume 4** of the ES (Document Reference: 6.4.12.3);
- **Appendix 12.4: Offshore ornithology migratory collision risk modelling, Volume 4,** of the ES (Document Reference: 6.4.12.4); and
- **Appendix 12.5: Offshore ornithology population viability analysis, Volume 4** of the ES (Document Reference: 6.4.12.5).

12.2 Relevant legislation, planning policy and other documentation

Introduction

12.2.1 This section identifies the legislation, policy and other documentation that has informed the assessment of likely significant effects with respect to offshore and intertidal ornithology. Further information on policies relevant to the Environmental Impact Assessment (EIA) and their status is provided in **Chapter 2: Policy and legislative context, Volume 2** of the ES (Document Reference: 6.2.2).

Legislation and national planning policy

12.2.2 There are a number of international and national (UK) laws that need to be considered, specifically those regarding the protection of wildlife and the marine environment. In particular when undertaking ornithology assessment, the following international legislation has been taken into account, including:

- 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; and

- Ramsar Convention on Wetlands of International Importance 1971.

12.2.3 Within the UK, the Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019 (known as the '2019 Habitats Regulations') came into force at the end of the EU-UK transition period on 31 December 2020, providing amendments to the 2017 Habitats Regulations. The 2019 Habitats Regulations transfer functions from the European Commission to the appropriate authorities in England and Wales, with all the processes or terms unchanged. The 2019 Habitats Regulations transpose aspects of the Birds Directive and the Habitats Directive into national law, covering all environments out to 12 nm.

12.2.4 The Conservation of Offshore Marine Habitats and Species Regulations 2017 (as amended) (known as the 'Offshore Marine Regulations') provide similar provisions to the 2017 Habitats Regulations in the offshore environment beyond 12 nm throughout the UK.

12.2.5 The Wildlife and Countryside Act 1981 operates in conjunction with the Habitats Regulations and is the principal mechanism for the legislative protection of wildlife in the UK. The Wildlife and Countryside Act 1981 has also been amended following EU withdrawal so that species of wild birds found in or regularly visiting either the UK or the European territory of a Member State will continue to be protected on land and down to MLWS.

12.2.6 **Table 12-1** lists the legislation relevant to the assessment of the effects on offshore and intertidal ornithology receptors.

Table 12-1 Legislation relevant to offshore and intertidal ornithology

Legislation description	Relevance to assessment
The Convention on Wetlands of International Habitat (the 'Ramsar Convention').	Importance especially as Waterfowl
The Ramsar Convention allows contracting parties to the convention to designate suitable wetlands within their own territory for inclusion in the 'List of Wetlands of International Importance' (the 'List'). Contracting parties are required to incorporate into their planning the conservation of the areas included in the List. In addition, the Ramsar Convention states that "*where a Contracting Party in its urgent national interest, deletes or restricts the boundaries of a wetland included in the List, it should as far as possible compensate for any loss of wetland resources, and in particular it should create additional nature reserves for waterfowl*	The Proposed Development has the potential to affect the biodiversity features of Ramsar sites, specifically birds which breed or overwinter in a Ramsar site but may forage in or migrate through the Rampion 2 area. Rampion 2 is committed to minimising potential impacts on Ramsar sites, and embedded environmental measures are described in **paragraph 12.9.3**. The potential for effects on Ramsar sites is considered in detail in the Habitats Regulations Screening Report (RED, 2020b) and the **Report to Inform Appropriate Assessment (RIAA)** (Document Reference: 5.9)).

Legislation description	Relevance to assessment
and for the protection, either in the same area or elsewhere, of an adequate portion of the original habitat."	
The Convention on the Conservation of Migratory Species of Wild Animals (the 'Bonn Convention')	
The Bonn Convention provides for contracting parties to work together to conserve migratory species and their habitats by providing strict protection for endangered migratory species (listed in Appendix I of the Convention), by concluding multilateral agreements for the conservation and management of migratory species which require or would benefit from international cooperation (listed in Appendix II of the Convention), and by undertaking cooperative research activities.	The Proposed Development has the potential to impact on The Bonn Convention through acting as a barrier to migratory species and through the potential for collision with WTGs to adversely affect migratory species. Rampion 2 is committed to minimising potential impacts on migratory birds, and embedded environmental measures are described in **paragraph 12.9.3**. Within this chapter, migratory birds are given particular consideration in **paragraph 12.13.145**.
The Convention on the Conservation of European Wildlife and Natural Habitats (the 'Bern Convention').	
The Bern Convention aims to ensure conservation and protection of wild plant and animal species and their natural habitats (listed in Appendices I and II of the Convention). It also aims to increase cooperation between contracting parties and regulate the exploitation of those species (including migratory species) listed in Appendix III.	The Proposed Development has the potential to affect bird species which are protected under the Bern Convention. Rampion 2 is committed to minimising potential impacts on birds, and embedded environmental measures are described in **paragraph 12.9.3**. The potential for effects on birds protected under the Bern Convention is considered throughout the assessments in **Sections 12.11** to **12.17**.
European Council Directive 2009/147/EC on the Conservation of Wild Birds (the 'Birds Directive')	
The Birds Directive provides a framework for the conservation and management of wild birds in EU member states. The most relevant provisions of the Directive are the identification and classification of Special Protection Areas (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	The Proposed Development has the potential to impact on the objectives of the Birds Directive, specifically by affecting populations of birds which are designated features of SPAs and thereby having an Adverse Effect on Integrity of those SPAs. Rampion 2 is committed to minimising potential impacts on birds, and embedded environmental measures are described in **paragraph 12.9.3**. The potential for effects on birds protected under the Birds

Legislation description	Relevance to assessment
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. The Birds Directive also establishes a general scheme of protection for all wild birds (required by Article 5). Both the EU Birds Directive and the Wildlife and Countryside Act 1981 (as amended) provide protection against killing of birds (with a few exceptions) and provide protection for sites that support either specific bird species or concentrations of birds.	Directive is considered throughout the assessments in **Sections 12.11** to **12.17**. The potential for effects on Annex I species, migratory species and SPAs is considered in detail in the Habitats Regulations Screening Report (RED, 202b) and the **RIAA** (Document Reference: 5.9).
European Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (the 'Habitats Directive')	
The Habitats Directive provides a framework for the conservation and management of natural habitats, wild fauna (except birds) and flora in EU member states. The provisions of the Directive relevant to offshore ornithology are the procedures for the protection of Special Areas of Conservation (SACs) and SPAs (Article 6). The procedures require an appropriate assessment of any plan or project likely to affect a SAC or SPA and not to approve any plan or project that would have an adverse effect on a SAC or SPA except under very tightly constrained conditions. The procedures for the protection of SACs and SPAs are implemented in the United Kingdom (UK) through the Conservation of Habitats and Species Regulations 2017 and the Offshore Marine Conservation (Natural Habitats &c.) Regulations 2007 for waters beyond 12 nm.	The principal relevance of the Habitats Directive to Rampion 2 is the procedures for the protection of SPAs, which sets out the steps which must be taken in order to assess the impact of any proposed development. The procedures will be addressed through this EIA and the accompanying **RIAA** (Document Reference: 5.9). Rampion 2 is committed to minimising potential impacts on designated features of SPAs, and embedded environmental measures are described in **paragraph 12.9.3**. The potential for effects on designated features of SPAs protected under the Habitats Directive is considered throughout the assessments in **Sections 12.11** to **12.17**. The potential for effects on designated features of SPAs is considered in detail in the Habitats Regulations Screening Report (RED, 2020b) and the **RIAA** (Document Reference: 5.9).
The Conservation of Habitats and Species Regulations 2017 (the 'Habitats Regulations)	
The Habitats Regulations transpose the Birds Directive and the Habitats Directive into national law in the terrestrial, coastal and inshore (out to 12 nm) environment,	As the Habitats Regulations transpose the Birds Directive and the Habitats Directive into national law, they are relevant by virtue of the possibility for Rampion 2 to

Legislation description	Relevance to assessment
operating in conjunction with the Wildlife and Countryside Act 1981. The Habitats Regulations place an obligation on 'competent authorities' to carry out an appropriate assessment of any proposal likely to affect a SAC or SPA, to seek advice from Natural England and/or Joint Nature Conservation Committee (JNCC), and not to approve an application that would have an adverse effect on a SAC or SPA (except under very tightly constrained conditions that involve decisions by the Secretary of State, (SoS).	impact the objectives of those Directives. The Habitats Regulations further outline the assessment requirements for a proposed development, to which this document and the accompanying **RIAA** (Document Reference: 5.9) are intended to inform. Rampion 2 is committed to minimising potential impacts on designated features of SPAs, and embedded environmental measures are described in **paragraph 12.9.3**. The potential for effects on designated features of SPAs protected under the Habitats Directive is considered throughout the assessments in **Sections 12.11** to **12.17**. The potential for effects on designated features of SPAs is considered in detail in the Habitats Regulations Screening Report (RED, 2020b) and the **RIAA** (Document Reference: 5.9). Rampion 2 is committed to working with and seeking advice from Natural England and other relevant stakeholders through the Evidence Plan Process.
Conservation of Offshore Marine Habitats and Species Regulations 2017 (the 'Offshore Regulations')	
The Offshore Regulations transpose the Birds Directive and the Habitats Directive into national law in the offshore (beyond 12 nm) environment. The Offshore Regulations place an obligation on 'competent authorities' to carry out an appropriate assessment of any proposal likely to affect a SAC or SPA, to seek advice from Natural England and/ or JNCC, and not to approve an application that would have an adverse effect on a SAC or SPA (except under very tightly constrained conditions that involve decisions by the Secretary of State).	As the Marine Regulations transpose the Birds Directive and the Habitats Directive into national law, they are relevant by virtue of the possibility for Rampion 2 to impact the objectives of those Directives. The Habitats Regulations further outline the assessment requirements for a proposed development, to which this document and the accompanying **RIAA** (Document Reference: 5.9) are intended to inform. Rampion 2 is committed to minimising potential impacts on designated features of SPAs, and embedded environmental measures are described in **paragraph 12.9.3**. The potential for effects on

Legislation description	Relevance to assessment
	designated features of SPAs protected under the Habitats Directive is considered throughout the assessments in **Sections 12.11** to **12.17**. The potential for effects on designated features of SPAs is considered in detail in the Habitats Regulations Screening Report (RED, 2020b) and the **RIAA** (Document Reference: 5.9). Rampion 2 is committed to working with and seeking advice from Natural England and other relevant stakeholders through the Evidence Plan Process.
The Wildlife and Countryside Act 1981 (as amended)	
The Wildlife and Countryside Act 1981 is the principal mechanism for the legislative protection of wildlife in Great Britain. It provides protection for all wild birds with the few exceptions being provided by a licensing system. The act establishes the system of site protection for species and habitats through the notification of a suite of Sites of Special Scientific Interest (SSSI). The SSSI designation underpins the protection provided for SPAs and SACs on land and down to MLWS.	The Wildlife and Countryside Act 1981 is relevant as the project has a potential to impact on SSSIs, along with SPAs and SACs, both directly through the project's intertidal zone and indirectly by impacting on mobile species which may utilise the project area for foraging, on migration, or in other ways. The Wildlife and Countryside Act 1981 also provides protection to all birds. Rampion 2 is committed to minimising potential impacts on birds, and embedded environmental measures are described in **paragraph 12.9.3**. The potential for effects on birds protected under the Wildlife and Countryside Act 1981 is considered throughout the assessments in **Sections 12.11** to **12.17**.
The Natural Environment and Rural Communities Act 2006	
The Natural Environment and Rural Communities Act 2006 imposes a duty on public bodies to conserve biodiversity, including a requirement to compile a list of habitats and species of principal importance for the purpose of conserving biodiversity.	The Natural Environment and Rural Communities Act 2006 is relevant to the project as there is the potential for the project to have an adverse effect on the conservation of biodiversity. Rampion 2 is committed to minimising potential impacts on birds, and embedded

Legislation description	Relevance to assessment
	environmental measures are described in **paragraph 12.9.3**. Rampion 2 is committed to working with public bodies to ensure the conservation of biodiversity, including through the Evidence Plan Process.

12.2.7 Planning policy on offshore renewable energy Nationally Significant Infrastructure Projects (NSIPs), specifically in relation to offshore and intertidal ornithology, is contained in the Overarching National Policy Statement (NPS) for Energy (EN-1; DECC 2011a), and the NPS for Renewable Energy Infrastructure (EN-3, DECC 2011b). NPS EN-1 and NPS EN-3 include guidance on what matters are to be considered in the assessment (i.e. scope provisions). NPS EN-3 also highlights several factors relating to the determination of an application and in relation to mitigation.

12.2.8 **Table 12-2** provides further details on the national planning policy relevant to the assessment of the effects on offshore and intertidal ornithology receptors.

12.2.9 In addition to the current NPSs, further draft NPSs are also being consulted upon. The draft NPSs have been reviewed to determine the emerging expectations and changes from previous iterations of the NPSs. These are summarised in **Table 12-2** below.

Table 12-2 National planning policy relevant to offshore and intertidal ornithology

Policy description	Relevance to assessment
EN-1 National Policy Statement (NPS) for Energy (DECC, 2011a)	
EN-1 Paragraph 5.3.3 - states that "*the applicant should ensure that the ES clearly sets out any effects on internationally, nationally and locally designated sites of ecological or geological conservation importance, on protected species and on habitats and other species identified as being of principal importance for the conservation of biodiversity.*"	Protected sites are presented in **Appendix 12.1: Baseline technical report, Volume 4** of the ES (Document Reference: 6.4.12.1). Assessment of the potential effects of Rampion 2 on the features of these protected sites is provided in **Sections 12.12 –12.14**. Further consideration and assessment for designated sites with potential connectivity to Rampion 2 is presented in the **RIAA** (Document Reference: 5.9).
EN-1 Paragraph 5.3.7 - states that *"development should aim to avoid significant harm to biodiversity and geological conservation interests, including*	Rampion 2 has been designed to avoid significant harm to bird biodiversity interests, including through the site selection process and consideration of

Policy description	Relevance to assessment
through mitigation and consideration of reasonable alternatives… where significant harm cannot be avoided, then appropriate compensation measures should be sought."	reasonable alternatives. No significant harm to biodiversity is predicted in this assessment to ornithology receptors, as detailed in **Section 12.18**, therefore no compensation is deemed to be required.
EN-1 Paragraph 5.3.8 – intimates that *"the IPC should ensure that appropriate weight is attached to designated sites of international, national and local importance; protected species; habitats and other species of principal importance for the conservation of biodiversity; and to biodiversity and geological interests within the wider environment."*	Protected sites are presented in **Section 12.6.** Assessment of the potential effects of Rampion 2 on the features of these protected sites is provided in **Sections 12.11** to **12.17.** The potential for effects on designated sites is considered in detail in the **RIAA** (Document Reference: 5.9).
EN-1 Paragraph 5.3.9 – states that *"the most important sites for biodiversity are those identified through international conventions and European Directives. The Habitats Regulations provide statutory protection for these sites but do not provide statutory protection for potential Special Protection Areas (pSPAs) before they have been classified as a Special Protection Area. For the purposes of considering development proposals affecting them, as a matter of policy the Government wishes pSPAs to be considered in the same way as if they had already been classified. Listed Ramsar sites should, also as a matter of policy, receive the same protection."*	Protected sites are presented in **Section 12.7.** Assessment of the potential effects of Rampion 2 on the features of these protected sites is provided in **Sections 12.11** to **12.17.** The potential for effects on designated sites classified as a pSPA, SPA and / or Ramsar sites is considered in detail in the **RIAA** (Document Reference: 5.9). These designated sites are also accounted for in the summary of valued ornithological receptors and potential impacts in **Table 12-54**.
EN-1 Paragraph 5.3.17 - explains that *"other species and habitats have been identified as being of principal importance for the conservation of biodiversity in England and Wales and thereby requiring conservation action. The IPC should ensure that these species and habitats are protected from the adverse effects of development by using requirements or planning obligations. The IPC should refuse consent where harm to the habitats or species and their habitats would result, unless the benefits (including need) of the development outweigh that harm. In this*	RED has taken into account other bird species and habitats that have been identified as being of principal importance for the conservation of biodiversity in England and Wales and thereby requiring conservation action. RED has ensured that these species and habitats are protected from the potentially adverse effects of Rampion 2 by accepting the need for requirements or DML conditions as part of the consenting process, as outlined in **Table 12-20**. RED is committed to minimising potential impacts on birds, and embedded

Policy description	Relevance to assessment
context the IPC should give substantial weight to any such harm to the detriment of biodiversity features of national or regional importance which it considers may result from a proposed development."	environmental measures are described in **paragraph 12.9.3**. The potential for effects on birds identified as being of principal importance for conservation is considered throughout the assessments in **Sections 12.11** to **12.17**. Climate change is a significant threat to bird biodiversity interests (Pearce-Higgins & Crick 2019). Rampion 2 will contribute a significant amount of renewable energy (**Chapter 4: The Proposed Development, Volume 2** of the ES (Document Reference: 6.2.4)), to the UK Government's target of producing 40GW of renewable energy from offshore wind by 2030 and achieving net zero by 2050 (BEIS 2020).
EN-1 Paragraph 5.3.18 – states that EIAs should include effects on and opportunities to enhance and mitigation for biodiversity.	Potential effects, opportunities and mitigation on birds considered through the assessment are incorporated into the assessment process where applicable. Mitigation measures are implemented through embedded environmental measures and commitments (see **Section 12.9**).
EN-3 NPS for Renewable Energy Infrastructure (DECC, 2011b)	
EN-3 Paragraph 2.6.64 - states that the "*assessment of offshore ecology and biodiversity should be undertaken by the applicant for all stages of the lifespan of the proposed offshore wind farm*."	The potentially significant aspects of offshore ecology and biodiversity have been described and considered within the EIA documentation for all stages of the lifespan of Rampion 2. Potential impacts assessed include all stages of the lifespan of the Proposed Development; during construction (**Section 12.12**), operation and maintenance (**Section 12.13**) and decommissioning (**Section 12.14**).
EN-3 Paragraph 2.6.65 – states that "*Consultation on the assessment methodologies should be undertaken at early stages with the statutory consultees as appropriate."*	RED has agreement on the assessment approach and survey methods through discussions with Natural England and other interested parties through the Evidence Plan Process (**Section 12.3**)

Policy description	Relevance to assessment
EN-3 Paragraph 2.6.101 – explains that *"offshore wind farms have the potential to impact on birds through: collisions with rotating blades; direct habitat loss; disturbance from construction activities such as the movement of construction/decommissioning vessels and piling; displacement during the operational phase, resulting in loss of foraging/roosting area; and impacts on bird flight lines (i.e. barrier effect) and associated increased energy use by birds for commuting flights between roosting and foraging areas."*	These potential impacts on offshore ornithology receptors are assessed in **Sections 12.12** to **12.17.**
EN-3 Paragraph 2.6.102 - states that *"the scope, effort and methods required for ornithological surveys should have been discussed with the relevant statutory advisor."*	The survey methods have been discussed and agreed with Natural England and the Royal Society for the Protection of Birds (RSPB) through the Evidence Plan Process (see **Section 12.3**)
EN-3 Paragraph 2.6.103 – states that *"relevant data from operational offshore wind farms should be referred to in the applicant's assessment."*	Relevant data from operational offshore wind farms has been referred to in the Rampion 2 ES and **RIAA** (Document Reference: 5.9). The use of relevant data presented within published literature is considered throughout this ES Chapter to inform the impact assessment process. Of particular relevance to offshore ornithology is data available from the abutting Rampion 1 OWF, which is presented in detail in **Appendix 12.1: Baseline technical report, Volume 4** of the ES (Document Reference: 6.4.12.1). The use of relevant data presented within published literature is also considered throughout this ES chapter to inform the impact assessment process.
EN-3 Paragraph 2.6.104– states that *"it may be appropriate for the assessment to include collision risk modelling for certain bird species."*	Collision Risk Modelling (CRM) has been undertaken using parameters that have been agreed with SNCBs through the Evidence Plan process and is presented in **Appendix 12.3: Collision risk modelling, Volume 4** of the ES (Document Reference: 6.4.12.3). Potential effects from collision risk are presented and assessed in **Section 12.13.**

Policy description	Relevance to assessment
NPS EN-3 Paragraph 2.6.107 – requires that *"aviation and navigation lighting be minimised to avoid attracting birds, taking into account impacts on safety."*	In order to minimise attraction of birds, the final design of Rampion 2 will seek to install only the minimum lighting required for safe working/operation and compliance with regulatory and statutory requirements.
NPS EN-3 Paragraph 2.6.108 – notes that, *"subject to other constraints, wind turbines should be laid out within a site, in a way that minimises collision risk, where the collision risk assessment shows there is a significant risk of collision."*	The developable area for the Rampion 2 array area has been considered carefully so that the WTGs are within an area that minimises collision risk. The process of assessing the developable area and the changes accommodated between Scoping, PEIR and this ES are described in **Section 12.1** and further detailed in **Chapter 3: Alternatives, Volume 2** of the ES (Document Reference: 6.2.3)**.**
NPS EN-3 Paragraph 2.6.109 – requires that *"construction vessels associated with offshore wind farms should, where practicable and compatible with operational requirements and navigational safety, avoid rafting seabirds during sensitive periods."*	Construction vessels associated with Rampion 2 will, where practicable and compatible with operational requirements and navigational safety, avoid rafting seabirds during sensitive periods.

12.2.10 **Table 12-3** lists the emerging national planning policy considerations relevant to the assessment of the effects on offshore and intertidal ornithology receptors. Note that only emerging policy is only included where it differs significantly from existing policy.

Table 12-3 Emerging national planning policy relevant to offshore and intertidal ornithology

Policy description	Relevance to assessment
Draft National Policy Statement for Renewable Energy Infrastructure (EN-3)	
Draft NPS EN-3 Paragraph 3.8.1 – states "*As set out in the British Energy Security Strategy, the Government expects that offshore wind (including floating wind) will play a significant role in meeting demand and decarbonising the energy system. The ambition is to deploy up to 50GW of offshore wind capacity (including up to 5GW floating wind) by 2030, with an expectation that there will be a need for substantially more installed offshore*	Rampion 2 will contribute up to 1.2 GW of offshore wind. This is low-carbon energy that will contribute towards achieving net zero by 2050.

Policy description	Relevance to assessment
capacity beyond this to achieve net zero carbon emissions by 2050."	
Draft NPS EN-3 Paragraph 3.8.322 – states "*The designation of an area as a protected site (including HRA sites, MCZs and SSSIs) does not necessarily restrict the construction or operation of offshore wind farms in, near, or through that area (see also Sections 4.2 and 5.4 of EN-1). However, it may make consent for such construction more difficult to secure.*"	Rampion 2 has been designed to avoid and/ or mitigate potential adverse effects on protected sites, including the national site network, as described in the **RIAA** (Document Reference: 5.9). Mitigation measures are implemented through embedded environmental measures and commitments (see **Section 12.9**).

Other relevant information and guidance

12.2.11 This ES chapter has been compiled with attention to other relevant guidance for conducting EIA, particularly "*The Guidelines for Ecological Impact Assessment in the UK and Ireland*" (CIEEM, 2018) with regards to the structure and general approach for this EIA.

12.2.12 Consideration has also been given to the latest best practice guidance on assessment of Offshore Wind Marine Environmental assessments produced by Natural England (Parker et al*.,* 2022) and seabird specific assessments notes relating to displacement analysis (SNCBs, 2022) and CRM (Natural England, 2023), which are detailed in **Appendix 12.2: Displacement analysis, Volume 4** of the ES (Document Reference: 6.4.12.2) and **Appendix 12.3: Collision risk modelling, Volume 4** of the ES (Document Reference: 6.4.12.3), respectively.

12.3 Consultation and engagement

12.3.1 All details relating to the outcome of, and response to Scoping Opinion, S.42 Responses and ETG meetings is detailed in: **Appendix 5.2 Responses to the Scoping Opinion, Volume 4** of the ES (Document Reference: 6.4.4.5); **Appendix 5.3 Responses to Statutory Consultation, Volume 4** of the ES (Document Reference: 6.4.4.5); the **Evidence Plan Process Report** (Document Reference 7.21); and, the **Consultation Report** (Document Reference: 5.1) with signposting to relevant sections of the ES where addressed.

Scoping Opinion

12.3.2 Rampion Extension Development Limited (RED) submitted a Scoping Report (RED, 2020a) and request for a Scoping Opinion to the Secretary of State (administered by The Planning Inspectorate) on 2 July 2020. A Scoping Opinion was received on 11 August 2020. The Scoping Report sets out the proposed offshore and intertidal ornithology assessment methodologies, outline of the baseline data collected to date and proposed, and the scope of the assessment. **Table 12-4** sets out the comments received in Section 4 of the Planning Inspectorate's Scoping Opinion 'Aspect based scoping tables – Offshore' and how

these have been addressed in this ES. A full list of the Planning Inspectorate's Scoping Opinion comments and responses is provided in **Appendix 5.2: Responses to the Scoping Opinion, Volume 4** of the ES (Document Reference: 6.4.5.2). Regard has also been given to other stakeholder comments that were received in relation to the Scoping Report.

Table 12-4 Planning Inspectorate's Scoping Opinion responses – offshore and intertidal ornithology

Planning Inspectorate's ID number	Scoping Opinion comment	How this is addressed in this ES
4.7.1	The Inspectorate is content that there is unlikely to be significant effects from maintenance of the offshore export cable during operation and therefore agrees that this matter can be scoped out of the assessment.	This comment is acknowledged.
4.7.2	The Inspectorate is content that there is unlikely to be significant effects from maintenance of the intertidal export cable during operation and therefore agrees that this matter can be scoped out of the assessment.	This comment is acknowledged.
4.7.3	The Scoping Report provides limited information and no evidence of agreement with relevant consultation bodies to scope this matter out of the ES. The Inspectorate does not agree to scope these matters from the assessment. Accordingly, the ES should include an assessment of these matters where significant effects are likely to occur.	Barrier effect: Array –The presence of the array area could create a barrier to movements of breeding seabirds during foraging trips or to migratory movements during operation. An assessment of the potential impact from barrier effects during operation is included in **paragraph 12.13.145**.
4.7.4	The study area for offshore ornithology is described as being the Proposed Development array survey area with a 4km buffer, the export cable corridor and the cable landfall area. The Inspectorate considers that the study area should be extended to take into consideration potential impacts on	The study area is defined in **paragraph 12.4.3**. This assessment includes all bird species which may use the study area at any point, including using the study area for foraging, moulting, loafing (periods of sitting or resting between feeding and flight),

Planning Inspectorate's ID number	Scoping Opinion comment	How this is addressed in this ES
	bird species which may use the area for foraging and not just on migration as suggested in para 5.8.7. It is recommended that effort should be made to agree the scope of the study area with relevant consultation bodies.	or whilst migrating. The study area has been agreed with stakeholders through the evidence plan process.
4.7.5	The Inspectorate notes that aerial digital surveys are being undertaken to provide information regarding ornithological species in the Study Area. Details should be provided of the methodology used to undertake the surveys. This information should be clearly presented in the ES. The Applicant should make effort to agree the scope and adequacy of these surveys with relevant consultation bodies. Paragraph 5.8.5 and figures 5.8.3 – 5.8.6 show that a small part of the eastern area of the offshore Study Area has not been covered by digital survey. The ES should justify the extent of survey areas in supporting a robust assessment of significant effects on displacement of bird populations.	As a result of changes to the Proposed Development between Scoping and PEIR, and then between PEIR and this ES, the Offshore Array Area plus a 4km buffer are fully within the area covered by the digital aerial surveys. Justification that the Study Area is suitable to support a robust assessment of significant effects of displacement is presented in **Sections 12.12** and **12.13**.
4.7.6	The exact method for CRM has not yet been defined. The ES and/or accompanying technical appendices should provide detailed information regarding the methodology undertaken for the CRM and analysis of the data used to inform the impact assessment, together with figures where appropriate.	Detailed information regarding the CRM methodology and additional supporting information is provided in **Appendix 12.3: Collision risk modelling, Volume 4** of the ES (Document Reference: 6.4.12.3). RED has agreed with the relevant stakeholders through discussion at the ETGs and following responses to the PEIR that the approach to CRM is suitable.

Planning Inspectorate's ID number	Scoping Opinion comment	How this is addressed in this ES
4.7.7	The ES should contain details of other developments assessed in the cumulative effects assessment. Given the far ranging nature of breeding and migratory birds, justification should be provided as to the spatial and temporal extent of the other developments considered.	Cumulative effects are assessed in **Section 12.15**. Full justification is given for the spatial and temporal extent of the other developments considered.

Overview

12.3.3 This section describes the stakeholder engagement undertaken for Rampion 2. This consists of early engagement, the outcome of, and response to, the Scoping Opinion in relation to the offshore and intertidal ornithology assessment, the Evidence Plan Process (EPP), non-statutory consultation and Rampion 2's statutory consultation. An overview of engagement undertaken for Rampion 2 as a whole can be found in **Section 1.5** of **Chapter 1: Introduction, Volume 2** of the ES (Document Reference: 6.2.1).

12.3.4 Given the social distancing restrictions which have been in place due to the COVID-19 pandemic, all technical consultation relating to offshore and intertidal ornithology has taken place online, primarily in the form of conference calls using Microsoft Teams.

Evidence Plan Process (EPP)

12.3.5 The Evidence Plan Process (EPP) has been set up to provide a formal, non-legally binding, independently chaired forum to agree the scope of the EIA and Habitats Regulations Assessment (HRA), and the evidence required to support the DCO Application. The EPP commenced in January 2020 and has continued throughout the EIA helping to inform the ES.

12.3.6 For offshore and intertidal ornithology, further engagement has been undertaken via the EPP Expert Topic Group (ETG) for Offshore Ornithology. Following Scoping, the first ornithology ETG took place on 18 September 2020, for which the key discussions surrounded the approach to baseline data collection, the availability of baseline data for PEIR and the approach to assessment. The approach to assessment focused particularly on the consideration of an appropriate buffer zone surrounding Rampion 2 to account for Rampion 1 with regards to displacement analysis. RED's preferred approach to CRM was also presented. Concerns were raised regarding regional kittiwake colonies. Relevant details are summarised below.

12.3.7 A subsequent ETG meeting took place on 26 March 2021. The revisions to the boundary of the proposed development between scoping and this PEIR were presented. It was discussed that survey data from February 2019 may have been

influenced by unusual weather (Storm Ciara) causing bird movements. An update on site-specific aerial digital surveys and intertidal surveys was presented.

12.3.8 A third ETG meeting took place on 2 November 2021, the first ETG meeting following the publication of the PEIR. In this meeting, consultee's S42 responses were discussed, in order to ensure that the Applicant's approach in this ES will appropriately address any concerns.

12.3.9 A fourth ETG meeting took place on 12 April 2022. Prior to this meeting, consultees had been issued with an initial draft of Volume 4 Appendices 12.1, 12.2, 12.3, 12.4 and 12.5 to review. These appendices presented final baseline data from 24 months of site-specific surveys, revised displacement and CRM following the completed baseline survey results, modelling of migratory routes and subsequent collision risk for migratory bird species, and population viability analysis of gannet and great black-backed gull. The appendices had all been updated, following the PEIR submissions, accounting for Section 42 responses received from consultees. All appendices were well received and Natural England agreed that they were satisfied with the updated documents following advice provided on the PEIR submission through their Section 42 responses. Clarification was sought by the Applicant from Natural England as to an agreed approach on the application of macro avoidance for gannet within the CRM. Natural England confirmed that their suggested approach will be to apply a 70% macro avoidance to the monthly seabird density values for gannet prior to inserting into the CRM. This approach was applied by the Applicant within the assessment of collision risk for both Rampion 2 alone and cumulatively with other plans and projects to ensure displacement impacts were not double counted within the assessment of collision risk.

Method Statement

12.3.10 Prior to the first ETG, the Rampion 2 Method Statement was circulated to stakeholders. The method statement outlined the programme of baseline surveys, the amount of data from those surveys that was available to inform the PEIR, and RED's proposed approach to displacement analysis and CRM. There were no significant disagreements regarding any of the proposals, although the RSPB stressed that the conclusions presented in the PEIR should be treated cautiously pending completion of the programme of baseline surveys.

Buffer zone surrounding Rampion 2

12.3.11 For most offshore wind farm EIAs, consideration of displacement accounts for birds within the array area and out to a specific buffer, that may be species-specific. This would typically be a buffer surrounding the entire array area. In this instance, the Rampion 2 Study Area is immediately adjacent to the existing Rampion 1 project, which has already been assessed for displacement and consented following the judgement of no significant effects from displacement. As the purpose of this ES is to understand the potential effect from Rampion 2 on seabird species, with respect to displacement any birds residing in the Rampion 1 site should not be included in the abundances assessed for Rampion 2. Therefore, the approach to the assessment of potential displacement impacts excludes data from within the Rampion 1 site from the buffer zone for displacement analysis

purposes. The attendees of the ETG meeting did not express any objections to this proposed approach. Note that the impacts of Rampion 1 are still considered along with other relevant developments in **Section 12.15: Assessment of cumulative effects**.

Kittiwakes

12.3.12 The Sussex Ornithological Society (SOS), raised potential issues about several species, most notably kittiwake. SOS provided count data from the colony at Splash Point, Seaford, which demonstrated a decline in apparently occupied nests (AONs) from 1,120 AON in 2016 to 461 AON in 2020. SOS suggested that the construction and operation of Rampion 1 may have contributed to this decline through potential collisions and a potential barrier effect, although a causal relationship could not be demonstrated from the data provided. In response to this information it was noted that the count of 1,120 AONs was an unusual peak and the average annual count for this colony between 2002 and 2020 was 706 AONs, or 542 AONs without the unusual peak. Particular attention to the impact of Rampion 2 on local kittiwake colonies has been given in **Section 12.13**.

Storm Ciara

12.3.13 Storm Ciara made landfall in the UK on 8 February 2020. Survey number 11 was flown on 7 February 2020. It was suggested that the results from this survey could have been influenced by Storm Ciara, specifically as a result of migratory seabirds travelling ahead of the storm and seeking shelter in the English Channel and coastal areas. There is some evidence from seawatching data that an unusually large pulse of auks passed through the English Channel ahead of the storm, whereas in other years the same number of birds may have been spread over a larger number of days. It is therefore possible that the densities of auk species (particularly guillemot and razorbill) recorded in Survey 11 are atypically high.

12.3.14 There was disagreement from the ETG as to the likely extent of this impact. It was therefore agreed that the survey data from Survey 11 will not be subject to any special treatment. All results presented in this ES follow from using the full 24 months of survey days (including February 2020) and following a standard approach to data analysis.

12.3.15 Further information is provided in the **Evidence Plan** (Document Reference: 7.21).

Non-statutory consultation

Overview

12.3.16 Non-statutory consultation captures all consultation and engagement outside of statutory consultation and has been ongoing with a number of prescribed and non-prescribed consultation bodies and local authorities in relation to offshore and intertidal ornithology. A summary of the non-statutory consultation undertaken since completion of the Scoping Report is outlined in this section.

Non-statutory Consultation Exercise – January / February 2021

12.3.17 RED carried out a non-statutory Consultation Exercise for a period of four weeks from 14 January 2021 to 11 February 2021. This Consultation Exercise aimed to engage with a range of stakeholders including the prescribed and non-prescribed consultation bodies, local authorities, Parish Councils and general public with a view to introducing the Proposed Development and seeking early feedback on the emerging designs.

12.3.18 Further detail about the results of the Consultation Exercise can be found in the **Consultation Report** (Document Reference: 5.1).

Statutory Consultation

12.3.19 Rampion 2's first statutory consultation exercise ran from 14 July to 16 September 2021, a period of nine weeks. The PEIR (RED, 2021) was published as part of Rampion 2's first statutory consultation exercise which provided preliminary information on shipping and navigation within Chapter 12: Offshore and intertidal ornithology (RED, 2021).

12.3.20 Following feedback to the Statutory Consultation exercise in 2021 it was identified that some coastal residents did not receive consultation leaflets as intended. Therefore, the first Statutory Consultation exercise was reopened between 7 February 2022 to 11 April 2022 for a further nine weeks. The original PEIR published as part of the first Statutory Consultation exercise in 2021 was unchanged and re-provided alongside the reopened Statutory Consultation exercise in early 2022.

12.3.21 The following statutory consultation exercises focussed on changes made to the onshore (landward of MHWS) cable route, onshore substation, and National Grid interface point and did not consider offshore aspects of the Proposed Development.

12.3.22 The second Statutory Consultation exercise was undertaken from 18 October 2022 to 29 November 2022. This was a targeted consultation which focused on updates to the onshore cable route proposals which were being considered following feedback from consultation and further engineering and environmental works. As part of this second Statutory Consultation exercise, RED sought feedback on the potential changes to the onshore cable route proposals to inform the onshore design taken forward to DCO application.

12.3.23 The third Statutory Consultation exercise was undertaken from 24 February 2023 to 27 March 2023. This was a targeted consultation which focused on a further single onshore cable route alternative being considered following feedback from consultation and further engineering and environmental works. As part of this third Statutory Consultation exercise, RED sought feedback on the potential changes to the onshore cable route proposals to inform the onshore design taken forward to DCO Application.

12.3.24 The fourth Statutory Consultation exercise was undertaken from 28 April 2023 to 30 May 2023. This was a targeted consultation which focused on the proposed extension works to the existing National Grid Bolney substation to facilitate the connection of the Rampion 2 onshore cable route into the national grid electricity

infrastructure. As part of this fourth Statutory Consultation exercise, RED sought feedback on the proposed substation extension works to inform the onshore design taken forward to the DCO Application.

12.3.25 **Table 12-5** provides a summary of the key themes of the feedback received in relation to offshore and intertidal ornithology and outlines how the feedback has been considered in this ES chapter. A list of comments received during the statutory consultation period and the response to comments is provided in the **Consultation Report** (Document Reference: 5.1).

Table 12-5 Statutory consultation feedback

Stakeholder	Theme	How this is addressed in this ES
Natural England	Natural England's final conclusions on ornithology matters cannot be reached until the full 24 months of baseline survey data are analysed and the results presented in the final Environmental Statement (ES).	The accompanying **Appendix 12.1: Baseline technical report, Volume 4** of the ES (Document Reference: 6.4.12.1) provides the full 24 months of baseline survey data and has been used to inform this ES.
Natural England	Natural England do not agree that the initial findings of the cumulative assessments are either 'de minimis'. Whilst Natural England recognise that the predicted impacts from R2 are not unduly significant in scale, they have the potential to contribute to existing significant cumulative impacts on seabirds at an EIA scale.	The cumulative assessments have been revised following completion of site-specific baseline surveys and also revisions to the assessment methodology (see **Section 12.15**). While the Applicant recognises that some impacts are sufficient to materially contribute to cumulative impacts at an EIA scale, there remain some impacts where the Applicant considers Rampion 2's impact is not a material contribution to the cumulative total impact. Through discussions with EPP, Natural England have acknowledged the impacts from Rampion 2 are small.
Natural England	In response to the increasing level of cumulative impacts, Natural England therefore recommends that for all relevant future projects located in the	This is not considered in the ES Chapter as the Applicant has ruled out a draught height above 22m above

Stakeholder	Theme	How this is addressed in this ES
	North Sea and English Channel, including R2, raising turbine draught height should be considered as standard mitigation practice, and that relevant proposals should include this measure in order to reduce their contributions to the cumulative/in-combination collision totals by as much as is possible.	Mean High Water Spring (MHWS) for this project.
Natural England	Natural England has recently issued a template to assist with the consistency of presentation of the modelled outputs, including both the stipulated parameters to apply in the modelling and the need to present findings for a range of options, e.g. ranges of displacement and species flight speeds for use in CRM. Natural England kindly request that this template is used for the ES submission.	The Applicant has used Natural England's template as the basis for presenting a range of results for both CRM (**= Appendix 12.3: Collision risk modelling, Volume 4** of the ES (Document Reference: 6.4.12.3)) and displacement analysis (**Appendix 12.2: Displacement analysis, Volume 4** of the ES (Document Reference: 6.4.12.2)), although modifications have been made to ensure a consistency of approach with other application documents.
Natural England	Natural England welcome the intention to undertake further PVA analysis for gannet for which the results will be presented in the ES.	PVA analysis for gannet is presented in **Appendix 12.5: Population viability analysis, Volume 4** of the ES (Document Reference: 6.4.12.5).
Natural England	Natural England request that the list of OWF sites included in the final ES is updated to include those for which additional information may be available, most notably Sheringham and Dudgeon Extensions, which have consulted on a PEIR. For all sites under consideration the total impact should include both that assessed for displacement in addition to that	The cumulative assessment in **Section 12.15** of this ES has been updated with the latest available data, including the impacts presented at ES for Sheringham and Dudgeon Extensions.

Stakeholder	Theme	How this is addressed in this ES
	assessed for collision, i.e. in combination.	
Natural England	Natural England request that CEF totals for Rampion 2 include the presentation of combined impacts for gannet, i.e. so that the predicted impact of both collision and displacement are totalled.	**Paragraph 12.15.83** of this ES Chapter presents combined impacts from collision risk and displacement for gannet.
Natural England	The need to present predicted mortality for guillemot and razorbill against the relevant BDMPS or biogeographic scale for a range of displacement (30-70%) and mortality (1-10%). This can be addressed by using the Natural England template.	Predicted mortality for guillemot and razorbill has been assessed against both BDMPS and biogeographic scales for a range of displacement from 30% to 70% and a range of mortality from 1% to 10%, with results presented in **Section 12.13** (**Table 12-31** and **Table 12-32**).
Natural England	Natural England request further consideration of alternative suitable techniques for assessing the collision risk posed to migrant seabirds and the suggest the use of the Wildfowl & Wetlands Trust (WWT) Consultancy and MacArthur Green, 2014 modelling approach, in particular for Sandwich tern.	Full consideration of the collision risk posed to migrant seabirds and non-seabirds is presented in **Appendix 12.4: Migratory CRM, Volume 4** of the ES (Document Reference: 6.4.12.4), including assessment of Sandwich tern.
Natural England	Natural England advise that in the final analysis and assessment the cumulative totals for great black-backed gull are presented. This assessment should include the latest cumulative totals, including those available for Dudgeon and Sheringham Extensions, with the potential requirement to also undertake PVA analysis.	The cumulative assessment in **Section 12.15** of this ES has been updated to include great black-backed gull, including the impacts presented at PEIR for Sheringham and Dudgeon Extensions (**Table 12-50**).
Natural England	The need to include an assessment for herring gull in the CIA, consistent with the other species modelled.	The cumulative assessment in **Section 12.15** of this ES has been updated to include herring gull, including the

Stakeholder	Theme	How this is addressed in this ES
		impacts presented at for Sheringham and Dudgeon Extensions (**Table 12-52**).
Natural England	Natural England advise that the revised avoidance rates are applied in the CRM and analysis being undertaken for the R2 final ES.	The approach to CRM has been revised in line with the latest guidance on avoidance rates (Natural England, 2022). Full details are provided in **Appendix 12.3: Collision risk modelling, Volume 4** of the ES (Document Reference: 6.4.12.3)**.**
RSPB	Due to a lack of the full 24 months of aerial digital survey data underpinning the assessments for potential impacts on Offshore Ornithology, the RSPB cannot provide an appropriate analysis of the assessments.	The accompanying **Appendix 12.1: Baseline technical report, Volume 4** of the ES (Document Reference: 6.4.12.1) provides the full 24 months of baseline survey data and has been used to inform this ES.
RSPB	The RSPB has concern regarding the robustness of conclusions relating to the potential impacts during the operational phase on gannets. Subsequent 'downgrading' of the impacts from moderate to minor (insignificant) through assessments of other OWFs is inappropriate.	The impact assessments have been thoroughly reviewed for this ES and evidence-led justifications for all conclusions are provided.
RSPB	Migratory seabirds and non-seabirds: The RSPB does not consider the use of Rampion 1 OWF assessments of migratory seabirds and non-seabirds as appropriate for Rampion 2 OWF, due to both the use of data at least 9 years ago, alongside the lack of assessment around the combination of effects from Rampion 1 and 2 in unison.	Impacts on migratory birds have been assessed using a modelling approach. Full details are presented in **Appendix 12.4: Migratory CRM, Volume 4** of the ES (Document Reference: 6.4.12.4).
RSPB	Flight heights: The RSPB agrees that a review of site-specific flight heights should be completed once the full	The full dataset of aerial digitals surveys have been completed and analysed, and

Stakeholder	Theme	How this is addressed in this ES
	dataset of aerial digitals surveys are analysed. This could support a number of species collision risk modelling under Band Option 1	it has been determined that there is insufficient data of an appropriate quality to proceed with site-specific flight height data for Band Option 1 CRM.
RSPB	Nocturnal flight activity: It is not clear to the RSPB which percentages for nocturnal flight activity have been used in RED's collision risk modelling.	Nocturnal activity factors used for assessment have been provided in **Appendix 12.3: Collision risk modelling, Volume 4** of the ES (Document Reference: 6.4.12.3).
WWT	We note that throughout the PEIR, ecological surveys remain incomplete or not fully analysed. Full comment cannot be made at this stage, and we are concerned that this may have caused some species or habitat to be undervalued or scoped out prematurely.	The accompanying **Appendix 12.1: Baseline technical report, Volume 4** of the ES (Document Reference: 6.4.12.1) provides the full 24 months of baseline survey data, and has been used to inform this ES.
Sussex Ornithological Society	The Collision Risk and Displacement Assessments are based on data for a single year. This is considered to be inadequate. Consequently, SOS is not currently in a position to make any final comments on the assessments.	The accompanying **Appendix 12.1: Baseline technical report, Volume 4** of the ES (Document Reference: 6.4.12.1) provides the full 24 months of baseline survey data and has been used to inform this ES and all associated assessments.
Sussex Ornithological Society	The British Trust for Ornithology (BTO) recommendation is that surveys should consist of a combination of boat-based and aerial surveys with radar studies where mass migratory movements through the wind farm area are suspected. This is not mentioned in PEIR and hence no justification is given for the decision to ignore the BTO recommendations and undertake solely aerial surveys.	Conducting aerial surveys alone is recognised across the industry as the standard preferred approach to baseline data collection for offshore wind developments.

Stakeholder	Theme	How this is addressed in this ES
Sussex Ornithological Society	For all the reasons set out in 3, 4, 5, 6 in this section (offshore ornithology), we believe that an impact assessment on the numerous passage birds migrating through the Channel needs to form part of the Rampion justification, and that steps need to be taken to obtain data to support such an assessment.	Impacts on migratory birds have been assessed using a modelling approach. Full details are presented in **Appendix 12.4: Migratory CRM, Volume 4** of the ES (Document Reference: 6.4.12.4).
Sussex Ornithological Society	The Collision Risk Assessments have all been made on the basis of an array of 116 turbines with a rotor diameter of 210m. It has been suggested elsewhere in PEIR that the array may actually consist of 75 turbines with a rotor diameter of 295m. This is not mentioned in the Offshore Ornithology chapters of PEIR. If it considered that an array of 116 turbines is the worst-case scenario - as it presents a greater collision risk that an array of 75 turbines - then this should be stated in PEIR and the Collision Risk Assessments for the alternative array should be shown in order to demonstrate that they are lower than those for an array of 116 turbines.	CRM has been carried out on the basis of the worst case scenario design parameters, as detailed in **Section 12.13** (**Table 12-19**). Full details are provided in **Appendix 12.3: Collision risk modelling, Volume 4** of the ES (Document Reference: 6.4.12.3).
Sussex Ornithological Society	No passerine migrants are mentioned in PEIR. No figures are available for the number of passerines which cross the English Channel each spring but large 'falls' at suitable sites including Climping suggest that many thousands of birds are involved.	Passerine species have been screened out of detailed modelling, as it is expected that most passerine species migrate at flight heights above potential collision height.
Sussex Ornithological Society	Kittiwakes were recorded during eight aerial surveys. The peak estimated abundance of 623 occurred in February 2020 and coincided with the arrival of Storm Ciara. In PEIR it is suggested that this was an unusually high count due to the storm. SOS does not accept that the count was unusual.	The accompanying **Appendix 12.11: Baseline technical report, Volume 4** of the ES (Document Reference: 6.4.12.1) provides the full 24 months of baseline survey data, and has been used to inform this ES and all associated assessments.

Stakeholder	Theme	How this is addressed in this ES
Sussex Ornithological Society	As part of the embedded environmental measures (**Table 12-18**) SOS would urge RED (Rampion Extension Development Ltd) that, if the OWF is constructed, one blade of each turbine should be painted a darker colour in order to reduce motion smear and hence reduce the collision risk.	The Applicant has considered a range of possible mitigation methods, and the mitigation methods being proposed are presented in **Table 12-20**. The decision on which mitigation measures to proceed with depends on a number of factors, including evidence of effectiveness of a given method and the potential for negative effects (such as greater visual impacts).
Sussex Ornithological Society	Rose diagrams suggests that kittiwakes were passing through the proposed array area as they travelled from their feeding area back to the Seaford colony. The proposed array will present a barrier requiring the Kittiwakes to undertake longer journeys and expend more energy in undertaking their feeding trips.	**Section 12.13** of this ES considers the potential barrier effect to kittiwake.

12.4 Scope of the assessment

Overview

12.4.1 This section sets out the scope of the ES assessment for offshore and intertidal ornithology. This scope has been developed as the Rampion 2 design has evolved and responds to feedback received to-date as set out in **Section 12.3**.

12.4.2 An overview of designated sites within close proximity to Rampion 2 is presented in **Figure 12.2, Volume 3** of the ES (Document Reference: 6.3.12). Note that as bird species are highly mobile, there is potential for connectivity to a wider range of designated sites. Further consideration of the potential impact of Rampion 2 on the integrity of designated sites is provided in the **RIAA** (Document Reference: 5.9). Spatial scope and Study Area

12.4.3 The spatial scope of the offshore and intertidal ornithology assessment is defined as the offshore part of the proposed DCO Order Limits together with the Zones of Influence (ZOIs) and is based on an area which is considered to represent a realistic maximum spatial extent of potential impacts on ornithological receptors. The Study Area for the offshore and intertidal ornithology assessment includes the array area with a modified 4km buffer (to exclude Rampion 1), the export cable

corridor and the cable landfall area (**Figure 12.1, Volume 3** of the ES (Document Reference: 6.3.12)). The components are defined below.

Array Area

12.4.4 The array area is located between approximately 13 to 25km offshore covering an area of approximately 159km^2. The array area is where the OWF will be located, which will include the WTGs, array cables and up to three offshore substations. The array area consists of two main areas, but for this ES both are considered together as a single component.

Modified Array Area 4km Buffer

12.4.5 The 4km buffer used to define the Study Area excludes the Rampion 1 OWF array area and the area immediately adjacent to it. This has been agreed with the ETG as the most appropriate buffer zone to use as the basis for impact assessments of ornithological features (see **Section 12.3**).

Offshore cable link area

12.4.6 The offshore cable link area is the area where the permanent linking cable(s), connecting the two parts of the array area, will be located. No permanent infrastructure above sea level will remain in the offshore cable link area during the operational phase.

Export Cable Corridor

12.4.7 The export cable corridor is where the permanent export cable(s) will be located, between the array area and the landfall area.

Cable Landfall Area

12.4.8 The cable landfall area is within the intertidal zone seaward of Mean High Water Spring (MHWS) and landward of Mean Low Water Spring (MLWS) where the offshore export cable will be connected to the onshore export cable. All aspects landward of MHWS are considered in **Chapter 22: Terrestrial ecology and nature conservation, Volume 2** of the ES (Document Reference: 6.2.22).

Temporal scope

12.4.9 The temporal scope of the assessment of offshore and intertidal ornithology is the entire lifetime of Rampion 2, which therefore covers the construction, operation and maintenance, and decommissioning phases. The exact dates are unknown at this stage, but it is assumed that construction will begin no earlier than four years after the date of this report; construction activities will take a maximum of four years; the minimum operational lifetime of the windfarm will be around 30 years; and decommissioning activities will take a maximum of four years.

Potential receptors

12.4.10 The spatial and temporal scope of the assessment enables the identification of receptors which may experience a change as a result of Rampion 2. As presented in **Appendix 12.1: Baseline technical report, Volume 4** of the ES (Document Reference: 6.4.12.1) and **Appendix 12.4: Migratory Collision risk modelling, Volume 4** of the ES (Document Reference: 6.4.12.4) the following potential receptors for offshore and intertidal ornithology were identified (**Table 12-6**), based on their presence within the Study Area during baseline surveys and wider literature reviews.

12.4.11 Natural England agreed with the preliminary findings at PEIR that Rampion 2 does not pose a significant collision risk to common gull, 'commic' terns or Sandwich terns, subject to any changes from the initial 15 months of data to the final full 24 months of data.

12.4.12 Following a review of the final full 24 months of aerial digital survey data, the monthly mean densities for flying common gulls within the array area reduced. Therefore, the associated impacts will be lower than previously predicted and so this species is omitted from detailed assessments in this ES Chapter. However, for completeness, CRM for common gull is provided in **Appendix 12.3: Collision risk modelling, Volume 4** of the ES (Document Reference: 6.4.12.3).

12.4.13 Following a review of the final 24 months of aerial digital survey data there were no additional tern species recorded in flight within the array area in the final nine months of aerial digital survey data. Therefore, the associated impacts from collision risk will be lower than previously predicted, and so 'commic' tern and Sandwich tern are omitted from detailed assessments in this ES Chapter. However, for completeness, CRM for these tern species are provided as part of the migratory collision risk assessment presented in **Appendix 12.4: Migratory Collision risk modelling, Volume 4** of the ES (Document Reference: 6.4.12.4) and summarised in **Section 12.13**.

Table 12-6 Receptors requiring assessment for offshore and intertidal ornithology

Receptor group	Receptors included within group
Bird species identified from site-specific offshore aerial digital surveys	Gannet Fulmar Kittiwake Lesser black-backed gull Herring gull Great black-backed gull Guillemot Razorbill
Bird species identified through literature review and surveys in the intertidal area	Sanderling Mediterranean gull
Migrating bird species and species groups identified with potential connectivity to the Study Area	Little gull Great skua Common, Arctic and Sandwich terns Waders & waterfowl

Potential effects

12.4.14 Potential effects on offshore and intertidal ornithology receptors that have been scoped in for assessment are summarised in **Table 12-7**.

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Table 12-7 Potential effects on offshore and intertidal ornithology receptors scoped in for further assessment

Receptor	Activity or impact	Potential effect
Construction		
Those species identified as sensitive to disturbance and displacement (i.e. gannet and auks).	**Disturbance and displacement: Array** Construction activities within the array area associated with foundations and WTGs may lead to disturbance and displacement of species within the array and potentially within surrounding buffers to a lower extent.	Disturbance and displacement reduces the amount of functional habitat available for foraging, resting and other activities and may therefore reduce survival or reproductive fitness of the birds involved.
Those species identified as sensitive to disturbance and displacement (i.e. divers and sea ducks).	**Disturbance and displacement: Offshore export cable** Construction activities associated with export cable installation may lead to disturbance and displacement of species within the export cable corridor and potentially within surrounding buffers to a lower extent.	Disturbance and displacement reduces the amount of functional habitat available for foraging, resting and other activities and may therefore reduce survival or reproductive fitness of the birds involved.
Those species identified as sensitive to disturbance and displacement (i.e. intertidal waterbirds).	**Disturbance and displacement: Intertidal export cable** Construction activities associated with export cable installation may lead to disturbance and displacement of intertidal waterbird species within the export cable corridor and potentially within close proximity surrounding the works.	Disturbance and displacement reduces the amount of functional habitat available for foraging, resting and other activities and may therefore reduce survival or reproductive fitness of the birds involved.

Receptor	Activity or impact	Potential effect
Those species identified as sensitive to effect.	**Indirect impacts on bird species due to impacts on prey species habitat loss: Array** Impacts include those resulting from underwater noise (e.g. during piling) or the production of suspended sediments (e.g. during preparation of the seabed for foundations) that may alter the distribution, physiology or behaviour of bird prey species and thereby have an indirect effect. These mechanisms could potentially result in less prey being available in the area adjacent to active construction works to foraging seabirds.	A reduction in prey availability may reduce the survival or reproductive fitness of the birds involved.
Those species identified as sensitive to effect.	**Indirect impacts on bird species due to impacts on prey species habitat loss: Export Cable Route** Impacts include the production of suspended sediments (e.g. during installation of cables) that may alter the distribution, physiology or behaviour of bird prey species and thereby have an indirect effect. These mechanisms could potentially result in less prey being available in the area adjacent to active construction works to foraging seabirds.	A reduction in prey availability may reduce the survival or reproductive fitness of the birds involved.
Operation and maintenance		
Those species identified as sensitive to disturbance and displacement (i.e. gannet and auks).	**Disturbance and displacement: Array** Activities associated with the operation and maintenance of WTGs and the presence of WTGs themselves may disturb and displace species within	Disturbance and displacement reduces the amount of functional habitat available for foraging, resting and other activities and may therefore reduce

Receptor	Activity or impact	Potential effect
	the array area and potentially within surrounding buffers to a lower extent.	survival or reproductive fitness of the birds involved.
Those species identified as sensitive to collision (i.e. gulls, gannet, terns).	**Collision risk: Array** Seabirds flying through the array area during the operational phase of the Project may be at risk of collision with WTGs.	Collisions are assumed to be fatal.
Those species identified as sensitive to collision (i.e. migratory seabirds such as skuas, waterbirds such as swans and geese or non-seabirds such as nightjar).	**Collision risk: Array** Migrant seabirds, waterbirds and other non-seabirds flying through the array area during the operational phase of the Project may be at risk of collision with WTGs.	Collisions are assumed to be fatal.
Those species identified as sensitive to effect.	**Barrier effect: Array** The presence of the array area could create a barrier to movements of breeding seabirds during foraging trips or to migratory movements.	A barrier effect increases energy expenditure involved in foraging or migratory movement, and may reduce parental provisioning of dependent chicks. This may therefore reduce survival or reproductive fitness of the birds involved.
Those species identified as sensitive to effect.	**Indirect impacts on ornithological features due to impacts on prey species habitat loss: Array** Impacts include those resulting from underwater noise (e.g. during piling) or the production of suspended sediments (e.g. during preparation of the	A reduction in prey availability may reduce the survival or reproductive fitness of the birds involved.

Receptor	Activity or impact	Potential effect
	seabed for foundations) that may alter the distribution, physiology or behaviour of bird prey species and thereby have an indirect effect. These mechanisms could potentially result in less prey being available in the area adjacent to active construction works to foraging seabirds.	
Those species identified as sensitive to effect.	**Barrier effect: Array.** The presence of the array area could create a barrier to movements of breeding seabirds during foraging trips or to migratory movements. This may result in increased energy expenditure.	A barrier effect increases energy expenditure involved in foraging or migratory movement, and may reduce parental provisioning of dependent chicks. This may therefore reduce survival or reproductive fitness of the birds involved.
Decommissioning		
Those species identified as sensitive to disturbance and displacement (i.e. auks).	**Disturbance and displacement: Array** Decommissioning activities associated with foundations and WTGs may lead to the disturbance and displacement of species within the array area and potentially within surrounding buffers to a lower extent.	Disturbance and displacement reduces the amount of functional habitat available for foraging, resting and other activities and may therefore reduce survival or reproductive fitness of the birds involved.
Those species identified as sensitive to disturbance and displacement (i.e. red-throated diver).	**Disturbance and displacement: Offshore export cable**	Disturbance and displacement reduces the amount of functional habitat available for foraging, resting and other

Receptor	Activity or impact	Potential effect
	Indirect impacts during the decommissioning phase within the offshore export cable corridor and areas of intertidal landfall through effects on habitats and prey species.	activities and may therefore reduce survival or reproductive fitness of the birds involved.
Those species identified as sensitive to effect.	**Indirect impacts on bird species due to impacts on prey species habitat loss: Export Cable Route** Impacts include those resulting from underwater noise or the production of suspended sediments that may alter the distribution, physiology or behaviour of prey species and thereby have an indirect effect. These mechanisms could potentially result in less prey being available in the area adjacent to active decommissioning works to foraging seabirds.	A reduction in prey availability may reduce the survival or reproductive fitness of the birds involved.

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Activities or impacts scoped out of assessment

12.4.15 A number of potential effects have been scoped out from further assessment, resulting from a conclusion of no likely significant effect. These conclusions have been made based on knowledge of the baseline environment, the nature of planned works and the wealth of evidence on the potential for impact from such projects more widely. The conclusions follow (in a site-based context) existing best practice. Each scoped out activity or impact is considered in turn in **Table 12-8**.

Table 12-8 Activities or impacts scoped out of assessment

Activity or impact	Rationale for scoping out
Disturbance and displacement: Offshore export cable. Maintenance activities associated with the export cable during the operational stage of the Project may lead to disturbance and displacement of species within the export cable corridor and potentially within surrounding buffers to a lower extent. (Operation).	Given that potential impacts along the offshore and intertidal Export Cable Route will be highly localised and episodic (i.e. limited to any maintenance or repair of the export cables) and do not overlap with any SPAs or Ramsar sites it was proposed that this impact should be scoped out from further consideration within the EIA in relation to the cable, with the focus of operational disturbance-displacement on the array only. The Planning Inspectorate agreed that disturbance as a result of maintenance of the offshore export cable during operation can be scoped out of the EIA in the Scoping Opinion (Planning Inspectorate, 2020).
Disturbance and displacement: Intertidal export cable. Maintenance activities associated with the export cable during the operational phase of the Project may lead to disturbance and displacement of intertidal waterbird species within the export cable corridor and potentially within close proximity surrounding the works. (Operation).	Given that potential impacts along the offshore and intertidal Export Cable Route will be highly localised and episodic (i.e. limited to any maintenance or repair of the export cables) and do not overlap with any SPAs or Ramsar sites it was proposed that this impact should be scoped out from further consideration within the EIA in relation to the cable, with the focus of operational disturbance-displacement on the array only. The Planning Inspectorate agreed that disturbance and displacement as a result of maintenance of the intertidal export cable during operation can be scoped out of the EIA in the Scoping Opinion (Planning Inspectorate, 2020).

12.5 Methodology for baseline data gathering: intertidal

Overview

12.5.1 Baseline data collection has been undertaken to obtain information over the intertidal study areas described in **Section 12.4**. The current baseline conditions, presented in **Section 12.7,** set out the findings of this baseline data collection.

Desk study

12.5.2 The desk-based data sources that have been collected and used to inform the intertidal ornithology assessment are summarised in **Table 12-9**.

Table 12-9 Desk-based data sources used to inform the intertidal ornithology ES assessment

Source	Date	Summary	Coverage of Study Area
BTO Non-Estuarine Waterbird Surveys (NEWS)	1984 – 2016	NEWS were conducted in 1984/1985, 1997/98, 2006/07 and 2015/16 and provide records focused on intertidal habitats along the UK coastline.	Covers the export cable corridor landfall area.
Wetland Bird Survey (WeBS)	Annual Reports	Annual survey reports of wetland waterbirds. Most recent being Frost *et al.* (2019).	Coverage of UK intertidal and wetland zones. Source contains information which can be drawn upon at a Rampion 2 specific scale, or a wider regional scale.
Local bird reports	Annual Reports	Annual publications produced by local birdwatching groups (e.g. Sussex Ornithological Society) which summarise sightings and surveys results for Sussex and the wider south coast region.	Coverage across region at various intertidal and wetland and coastal areas.
Wildfowl and Wetlands Trust – Aerial surveys of waterbirds in the UK	2004 – 2009	Aerial surveys of waterbirds around the UK. Surveys undertaken by WWT on behalf of DTI (now Department for Energy Security and Netzero but also previously referred to as BEIS).	Coverage of inshore waters relevant to Rampion 2 from survey grids SE3, SE4 and SE5.
Existing OWF grey literature	Various dates	Information obtained from various OWF Environmental Statements (i.e. Rampion 1, Thanet Extension, Kentish Flats, Greater Gabbard).	No coverage of Rampion 2 Study Area but provides information on birds in the context of the English south east coast.

Source	Date	Summary	Coverage of Study Area
Designated sites	Various dates	Information of Special Protection Areas (SPAs) and other designations relevant to ornithological features with potential connectivity to Rampion 2. Key source of information will be Natural England designated sites portal. Available from: https://designatedsites.naturalengland.org.uk/SiteSearch.aspx	Country wide information on designated sites.
National Bird Atlas (Balmer *et al.*, 2013)	2007-2011	Results of five years of breeding season and wintering surveys across the UK at a 10km resolution.	Intertidal export cable corridor overlaps with 20km squares TQ_A and TQ_F.

Intertidal site surveys

12.5.3 Surveys of the intertidal Study Area were undertaken during the winter of 2020/21, as shown in **Table 12-10**. A programme of 14 surveys began in September 2020 and was completed in March 2021. Full details are provided in **Appendix 12.1: Baseline technical report, Volume 4** of the ES (Document Reference: 6.4.12.1).

Table 12-10 Site surveys undertaken

Survey type	Scope of survey	Coverage of Study Area
Intertidal ornithology surveys (winter 2020/21)	A programme of surveys to collect baseline data on bird assemblages associated with the intertidal Study Area.	Full coverage of intertidal Study Area

Data limitations

12.5.4 The biological environment can be highly variable, both spatially and temporally, meaning that bird numbers may fluctuate greatly between months, bio-seasons and between different years at any given location, lowering the probability of being able to detect consistent patterns, directional changes or to generate reliable population estimates. Therefore, a desk study and site-specific surveys were undertaken to inform the baseline characterisation of the Rampion 2 Study Area.

12.5.5 It is noted that the site-specific surveys were carried out over a single winter and therefore may not capture the full range of potential variability in the birds present. However, the results of those site-specific surveys are largely consistent with those obtained through the desk-based study and therefore would appear to be reliable.

12.6 Methodology for baseline data gathering: offshore

Overview

12.6.1 Baseline data collection has been undertaken to obtain information over the offshore study areas described in **Section 12.4**. The current baseline conditions presented in **Section 12.7** set out data currently available from the study areas.

Desk study

12.6.2 The desk-based data sources that have been collected and used to inform the offshore ornithology assessment are summarised in **Table 12-11**.

Table 12-11 Desk-based data sources used to inform the offshore ornithology ES assessment

Source	Date	Summary	Coverage of Study Area
Local bird reports	Annual Reports	Annual publications produced by local birdwatching groups (e.g. Sussex Ornithological Society) which summarise sightings and surveys results for Sussex and the wider south coast region.	Coverage across region at various intertidal and wetland and coastal areas.
Wildfowl and Wetlands Trust – Aerial surveys of waterbirds in the UK	2004 – 2009	Aerial surveys of waterbirds around the UK. Surveys undertaken by WWT on behalf of DTI (now Department for Energy Security and Netzero but also previously referred to as BEIS).	Coverage of inshore waters relevant to Rampion 2 from survey grids SE3, SE4 and SE5.
Existing OWF grey literature	Various dates	Information obtained from various OWF Environmental Statements (i.e. Thanet Extension, Kentish Flats, Greater Gabbard).	No coverage of Rampion 2 Study Area but provides information on birds in the context of the English south east coast.
Designated sites	Various dates	Information of Special Protection Areas (SPAs) and other designations relevant to ornithological features with potential connectivity to Rampion 2. Key source of information will be Natural England designated sites portal. Available from: https://designatedsites.naturalengland.org.uk/SiteSearch.aspx	Country wide information on designated sites.
National Bird Atlas (Balmer *et al.*, 2013)	2007 – 2011	Results of five years of breeding season and wintering surveys across the UK at a 10km resolution.	Cable route proposed DCO Order Limits overlaps with 20km squares TQ_A and TQ_F.
Potential impacts of OWFs on birds	Various dates	Published, peer reviewed scientific literature on bird behaviour and potential impacts from OWF e.g.	Generic information applicable to Rampion 2 ornithological features.

Source	Date	Summary	Coverage of Study Area
		Garthe and Hüppop (2004); Drewitt and Langston (2006); Stienen *et al.* (2007); Speakman *et al.* (2009); Langston (2010); Band (2012); Cook *et al.* (2012); Furness and Wade (2012); Wright *et al.* (2012); Furness *et al.* (2013); Johnston *et al.* (2014a,b); Cook *et al.* (2014); Dierschke *et al.* (2017); SNCB (2022); Jarrett *et al.* (2018); Leopold & Verdaat (2018); Mendel *et al.* (2019); Skov *et al.* (2018); Tjørnløv *et al.* (2023)>	
Large scale survey data sets	2014	Large scale seabird sensitivity mapping as part of the SeaMaST project (Bradbury *et al.*, 2014).	UK wide coverage with information that can be drawn upon at a Rampion 2 specific scale, or a wider regional scale.
Bird distribution	Various dates	Publicly available reports of seabird distribution in UK waters e.g. Stone *et al.* (1995); Brown and Grice (2005); Kober *et al.* (2010); Waggitt *et al.* (2019); Cleasby *et al.* (2020).	UK wide coverage with information that can be drawn upon at a Rampion 2 specific scale, or a wider regional scale.
Bird breeding ecology	Various dates	Information on the breeding ecology of various bird species e.g. Cramp and Simmons (1977-94); Del Hoyo *et al.* (1992-2011); Robinson (2005).	Generic information applicable to Rampion 2 ornithological features.
Bird population estimates and demographic rates	Various dates	Data on seabird populations and demographic rates for use in assessments e.g. Mitchell *et al.*, 2004; BirdLife International, 2004; Holling *et al.*, 2011; Frost *et al.*, 2019; Musgrove *et al.*, 2013; Furness, 2015; Horswill *et al.*, 2017, JNCC, 2020.	These sources contain information which can be drawn upon at a Rampion 2 specific scale, or a wider regional scale.

Source	Date	Summary	Coverage of Study Area
Bird migration and foraging movements	Various dates	Bird movements during breeding season foraging trips and migratory movements e.g. Wernham *et al.*, 2002; Thaxter *et al.*, 2012; Wright *et al.*, 2012; Furness *et al.*, 2018; Woodward *et al.*, 2019; Wakefield *et al.*, 2017; Wakefield *et al.*, 2013; RSPB FAME and STAR tracking data.	These sources contain information which can be drawn upon at a Rampion 2 specific scale, or a wider regional scale.

Offshore site surveys

12.6.3 Species accounts presented on offshore ornithology consist of the data collected during 24 site-specific aerial digital surveys of the Rampion 2 array area plus the 4km buffer carried out between 2019 and 2021, as detailed in **Appendix 12.1: Baseline technical report, Volume 4** of the ES (Document Reference: 6.4.12.1).

12.6.4 Data from aerial visual surveys and boat-based surveys conducted for the existing Rampion 1 project and the wider Zone 6 area overlap with the offshore part of the proposed DCO Order Limits for Rampion 2 and were therefore also used to inform the EIA where appropriate. A summary of these sources is given in **Table 12-12**.

12.6.5 Additional sources of information for the purpose of impact assessment were identified and details are provided in **Appendix 12.1: Baseline technical report, Volume 4** of the ES (Document Reference: 6.4.12.1).

Table 12-12 Site surveys undertaken

Survey type	Scope of survey	Coverage of Study Area
Rampion 2 – Digital aerial survey data (2019 – 2021)	Aerial digital surveys conducted by APEM Ltd. on a monthly basis between April 2019 and March 2021.	Rampion 2 array area plus 4km buffer.
Existing Rampion 1 project – Baseline characterisation surveys (2010 – 2012)	Boat-based surveys across Zone 6 (Rampion 1) and 5km buffer plus an adjacent control zone to the east of the project. Data collection initiated in March 2010 for two years (end date February 2012).	Approximately 40% coverage of the Rampion 2 array area.
	Aerial visual surveys across Rampion zone and 5km buffer plus an adjacent control zone to the east	Approximately 40% coverage of the Rampion 2 array area.

Survey type	Scope of survey	Coverage of Study Area
	of the Proposed Development. Data collected for one year (August 2010 – August 2011).	

Data limitations

12.6.6 The marine environment can be highly variable, both spatially and temporally, meaning that bird numbers may fluctuate greatly between months, bio-seasons and between different years at any given location, lowering the probability of being able to detect consistent patterns, directional changes or to generate reliable population estimates. Therefore, the site-specific data presented in this ES chapter for the purpose of baseline characterisation of Rampion 2, that was collected over a 24-month period, and the method used to collect these data (aerial digital still imagery), may be considered to represent a snapshot of each month.

12.6.7 However, the most recent survey data used for describing the existing baseline are consistent with data obtained from surveys conducted for other OWF applications in UK waters and are in general agreement with information from the desk study literature and previous surveys conducted within the existing Rampion OWF. Thus, these data are considered to be representative of the site for the purpose of baseline characterisation and should be considered to reduce any uncertainties within the impact assessment of Rampion 2.

12.7 Baseline conditions intertidal

Current baseline intertidal

12.7.1 Full details of the intertidal baseline conditions are presented in **Appendix 12.1: Baseline technical report, Volume 4** of the ES (Document Reference: 6.4.12.1). The programme of site-specific winter surveys carried out over the 2020/21 winter period are the most recent and most relevant data, having been carried out with the sole intention of recording baseline conditions. As such, this section focuses on the findings of those surveys, supplemented with relevant information from the desk study.

12.7.2 A total of 39 species were recorded across the site-specific surveys.

12.7.4 **Table** 12-13 includes all bird species recorded within the Study Area during the 2020/21 winter period. Two species highlighted in bold, sanderling and Mediterranean gull, form the basis of detailed accounts for this report. The remainder, in italic font, occurred in trivial numbers or in numbers determined by expert judgement to be too low to warrant detailed species accounts.

Table 12-13 Bird species recorded during the intertidal surveys

Wildfowl	Waders	Gulls / terns	Divers / grebes	Seabirds	Other
Dark-bellied brent goose	*Oystercatcher*	*Black-headed gull*	*Great crested grebe*	*Guillemot*	*Grey heron*
Mute swan	*Lapwing*	**Mediterranean gull**	*Slavonian grebe*	*Guillemot / razorbill*	*Little egret*
Shelduck	*Grey plover*	*Common gull*	*Red-throated diver*	*Gannet*	*Kingfisher*
Gadwall	*Ringed plover*	*Herring gull*	*Great northern diver*	*Cormorant*	*Kestrel*
Wigeon	*Turnstone*	*Lesser black-backed gull*			*Black redstart*
Pintail	*Knot*	*Great black-backed gull*			
Teal	**Sanderling**				
Common scoter	*Dunlin*				
Red-breasted merganser	*Purple sandpiper*				
	Snipe				

Future baseline intertidal

12.7.5 There are currently no known other proposed developments likely to influence the intertidal Study Area. In the absence of significant local impacts, it is likely that the populations of bird species present will evolve in accordance with regional and national trends. It is noted that climate change is likely to impact species' populations and distributions into the future, but the effects are too uncertain to be incorporated into any assessment.

12.8 Baseline conditions offshore

Current baseline offshore

12.8.1 A programme of 24-months of aerial digital surveys has been completed, covering the Rampion 2 array area plus a buffer of at least 4km. Full details of these surveys, along with other data sources considered, are presented in **Appendix 12.1: Baseline technical report, Volume 4** of the ES (Document Reference: 6.4.12.1). A total of 20 species were recorded across the surveys.

12.8.2 The following bird species (**Table 12-14**) were recorded within the Study Area between April 2019 and March 2021. A number of species were only recorded in the Study Area in trivial numbers or numbers determined by expert judgement to be too low to warrant detailed species accounts (these species are in italic font within the table). Those species highlighted in bold in **Table 12-14** form the basis of detailed accounts for this report.

12.8.3 The list of species considered for detailed assessment within this chapter has been refined from that presented at PEIR, as a result of the assessments carried out at PEIR together with a review of the complete baseline data. As detailed in **Section 12.3**, Natural England agreed that on the basis of the information available at PEIR, there will be no significant effect from Rampion 2 on common tern, Arctic tern, Sandwich tern or common gull. At PEIR, 18 months of data were used to inform the assessment, with six additional months being used to inform this final ES. There were no observations of great skua, common tern, Arctic tern or Sandwich tern within the Rampion 2 array area within the final six months of surveys and therefore it is evident that the assessment carried out at PEIR, alongside the additional migratory assessment presented in **Appendix 12.4: Migratory CRM, Volume 4** of the ES (Document Reference: 6.4.12.4), is sufficient to demonstrate no significant effect on these species. Small numbers of common gull were recorded as detailed in **Appendix 12.1: Baseline technical report, Volume 4** of the ES (Document Reference: 6.4.12.1), but in sufficiently small numbers that the impact will not be significantly higher than assessed at PEIR. Given the very low impact at PEIR, in line with a proportionate approach to assessment, common gull has also not been considered in detail in this chapter and the assessment at PEIR is considered to remain valid.

Table 12-14 Bird species recorded in site-specific digital aerial surveys of Rampion 2 Study Area

Divers and pelagic species	Gulls	Terns	Auks	Other
Red-throated diver	**Kittiwake**	Sandwich tern	**Guillemot**	*Cormorant*
Great northern diver	*Little gull*	*Common tern*	**Razorbill**	

Divers and pelagic species	Gulls	Terns	Auks	Other
Gannet	Common gull	*'Commic' tern		
Fulmar	*Mediterranean gull*			
Manx shearwater	**Herring gull**			
	Great black-backed gull			
	Lesser black-backed gull			

* 'Commic' tern represents tern sightings of unidentified Arctic tern and common tern.

12.8.4 Details of the estimated abundances of all species, along with information about recorded behaviours, are presented in **Appendix 12.1: Baseline technical report, Volume 4** of the ES (Document Reference: 6.4.12.1).

Conservation status of offshore ornithology receptors

12.8.5 The conservation status of the key species recorded during the survey programme is provided in **Table 12-15** below. Red list status is from the recently updated fifth Birds of Conservation Concern (BoCC5) (Stanbury *et al*., 2021).

Table 12-15 Summary of nature conservation value of species considered at potential risk of impacts

Species	Conservation status
Fulmar	BoCC5 Amber listed, Birds Directive Migratory Species
Gannet	BoCC5 Amber listed, Birds Directive Migratory Species
Kittiwake	BoCC5 Red listed, Birds Directive Migratory Species
Great black-backed gull	BoCC5 Amber listed, Birds Directive Migratory Species
Herring gull	BoCC5 Red listed, Birds Directive Migratory Species
Lesser black-backed gull	BoCC5 Amber listed, Birds Directive Migratory Species
Guillemot	BoCC5 Amber listed, Birds Directive Migratory Species
Razorbill	BoCC5 Amber listed, Birds Directive Migratory Species

Biological seasons, populations and demographics for offshore ornithology receptors

12.8.6 Bird behaviour and abundance is recognised to differ across a calendar year dependent upon the biological seasons (bio-seasons) that may be applicable to different seabird species. Separate bio-seasons are recognised in this ES in order to establish the level of importance any seabird species has within the offshore ornithology Study Area during any particular period of time. The biologically defined minimum population scale (BDMPS) bio-seasons are based on those in Furness (2015), hereafter referred to as BDMPS bio-seasons or bio-seasons (**Table 12-17**). The bio-seasons are defined within this ES as: return migration, migration-free breeding, post-breeding migration, migration-free winter bio-seasons, extended breeding and extended non-breeding bio-seasons. These six bio-seasons can be applied to different periods within the annual cycle for most seabird species, though not all are applicable for all seabird species, with different combinations used depending on the biology and the life history of a species:

- return migration: when birds are migrating to breeding grounds;
- migration-free breeding: when birds are attending colonies, nesting and provisioning young;
- post-breeding migration: when birds are either migrating to wintering areas or dispersing from colonies;
- migration-free winter: when non-breeding birds are over-wintering in an area;
- breeding and non-breeding: for some species, there is significant overlap between migratory, breeding and wintering periods between colonies and individuals, and so the above bio-seasons cannot be appropriately applied. Therefore, two bio-seasons are defined:
  - breeding from modal arrival to the colony at the beginning of breeding to modal departure from the colony; and
  - non-breeding from modal departure from the colony at the end of breeding to modal return to the colony the following year.

12.8.7 For guillemot, the bio-seasons have been modified from those presented in Furness (2015) by including March in the non-breeding bio-season. This modification was made due to a high number of guillemots moving through the survey area in the March 2021 survey, which cannot plausibly represent birds from local breeding colonies and is therefore deemed to represent a migratory pulse of birds (see **Appendix 12.1: Baseline technical report, Volume 4 of the ES** (Document Reference: 6.4.12.1)).

12.8.8 Furness (2015) also provides population estimates for each species in each non-breeding bio-season in each BDMPS region. Total population sizes for the biogeographic population with connectivity to UK waters are also provided in Furness (2015).

12.8.9 Breeding population sizes are based on colony counts from the national Seabird Monitoring Programme database (JNCC, 2021) for all colonies within mean-max foraging range (Woodward *et al.*, 2019). One apparently occupied nest (AON) was assumed to equal two breeding birds. Where possible, the average count from

2019 and 2020 was used (i.e. corresponding to the same years as the available aerial digital survey data), or the most recent count otherwise.

12.8.10 During the breeding season, in addition to birds associated with breeding colonies, there will be immature birds, juvenile birds and "sabbatical" birds (mature birds not breeding in a given year) present within the region. It was assumed that, of the BDMPS population in the bio-season immediately before the breeding season (usually the return migration bio-season), all mature birds return to breeding colonies, but all immature birds remain within the BDMPS.

12.8.11 The total regional population within the breeding season is therefore the sum of breeding adults associated with nearby colonies plus the proportion of immature birds from the BDMPS population.

12.8.12 Following consultation with Natural England on the most appropriate method for calculation of the breeding population estimates for the relevant Biologically Defined Minimum Population Scale (BDMPS) for all species scoped in for assessment (see **Section 12.3**) updated values are used within this ES Chapter. This updated method follows Natural England's best practice guidance (Parker *et al.,* 2022) on how to derive breeding season population estimates for use in estimating the impacts at the BDMPS scale. The method relies on the breeding bio-season BDMPS populations being calculated using the data in Appendix A of Furness (2015). The numbers of breeding adults and immatures from each individual UK SPA population or UK non-SPA colony with a foraging range within the respective BDMPS region are to be summed to generate a total breeding population. Following this method provides an updated method to use for breeding bio-season impact assessments at the BDMPS level.

12.8.13 Should the updated breeding population estimate for the BDMPS be the largest value for a species in comparison to other bio-season BDMPS population estimates then this may also be used for the purpose of assessing annual total impacts against. However, when considering annual impacts, birds from both the UK and overseas should be accounted for. In order to fulfil this a further step has been added to account for additional bird populations from outside the UK during the non-breeding bio-seasons in order to reflect the spread of potential impacts across the entire population of birds residing within the BDMPS area across the different bio-seasons. The updated values following the above approach are provided in **Table 12-16**, with revised breeding BDMPS and non-breeding BDMPS values using Natural England's methods alongside totals including additional overseas populations based on the values presented in Appendix A of Furness (2015) for each species. For some species the non-breeding BDMPS population in Furness (2015) might be higher than the revised breeding population plus non-UK birds calculated in **Table 12-16**. For the purpose of impact assessments, the largest BDMPS value is used to determine total annual impact levels, the source value of which is highlighted in bold in **Table 12-16.**

12.8.14 The bio-seasons, BDMPS population sizes and biogeographic population for each of the key species are provided in **Table 12-17**.

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Table 12-16 Calculation of regional population during the breeding season. The bold value indicates the source of the value used for the annual BDMPS-scale assessment (given in final column)

Species	UK Breeding Bio-season BDMPS Population (Natural England's method)	UK Breeding Bio-season BDMPS Population plus non-breeding birds from outside UK	Largest non-breeding bio-season BDMPS Population (Furness, 2015)	Largest BDMPS value for use in annual total impacts assessed
Gannet	400,326	445,503	**456,298**	456,298
Kittiwake	245,234	864,746	**911,586**	911,586
Lesser black-backed gull	51,233	114,103	**209,007**	209,007
Herring gull	324,887	460,017	**466,511**	466,511
Great black-backed gull	44,753	**48,832**	17,742	48,832
Guillemot	2,045,078	**2,139,238**	1,617,306	2,139,238
Razorbill	158,031	**592,462**	591,874	592,462

Table 12-17 Bio-seasons, BDMPS population sizes and biogeographic population sizes. Furness (2015) unless stated otherwise

Species	Return Migration	Migration-free Breeding	Post-breeding Migration	Migration-free Winter	Extended Breeding	Extended Non-breeding	Biogeographic population
Fulmar (UK Western waters plus Channel)	December to March (828,194)	April to August (N/A)	September to October (828,194)	November (556,367)	-	-	8,055,000
Gannet (UK North Sea and Channel)	December to March (248,385)	April to August (128,528)	September to November (456,298)	-	-	-	1,180,000
Kittiwake (UK Western waters plus Channel)	January to April (691,526)	May to July (325,037)	August to December (911,586)	-	-	-	5,100,000
Lesser black-backed gull (UK North Sea and Channel)	March to April (197,483)	May to July (51,233)	August to October (209,007)	November to February (39,314)			
Herring gull (UK North Sea and Channel)	-	-	-	-	March to August (5,164)	September to February (246,694)	1,098,000
Great black-backed gull (UK South-west & Channel)	-	-	-	-	April to August (9,940)	September to March (17,742)	235,000

Species	Return Migration	Migration-free Breeding	Post-breeding Migration	Migration-free Winter	Extended Breeding	Extended Non-breeding	Biogeographic population
Guillemot (UK North Sea and Channel)	-	-	-	-	April to July (688,420)	August to March (1,617,306)	4,125,000
Razorbill (UK North Sea and Channel)	January to March (591,874)	April to June (253,660)	August to October (591,874)	November to December (218,622)	-	-	1,707,000

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12.8.15 The method to assess the potential impact from additional mortality to the population due to Rampion 2 is assessed in terms of any change in relation to the baseline mortality rate for any given species within each of the recognised bio-seasons, as advised in the Natural England best practice guidance (Parker *et al.,* 2022). The average mortality across all age classes for each species are presented in **Table 12-18**. The method presented assumes all age classes are at risk from the possible impacts of the Proposed Development equally and as such the baseline mortality rate is a weighted average based on all age classes. Demographic rates for each species were those provided in Horswill and Robinson (2015). These data were used to calculate the expected stable proportions in each age class for each species. Each age class survival rate was then multiplied by its stable age proportion and the total for all ages summed to give the weighted average survival rate converted to an average mortality rate.

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Table 12-18 Demographic rates and population age ratios for each key species assessed in this report

Species	Parameter	Survival (age class)							Productivity (chicks per pair)	Average mortality
		0-1	1-2	2-3	3-4	4-5	5-6	Adult		
Gannet	Demographic rate	0.424	0.829	0.891	0.895	0.895	-	0.919	0.700	0.188
	Population age ratio	0.191	0.081	0.067	0.060	0.054	-	0.547	-	-
Kittiwake	Demographic rate	0.790	0.854	0.854	0.854	-	-	0.854	0.690	0.157
	Population age ratio	0.153	0.121	0.103	0.088	-	-	0.535	-	-
Great black-backed gull*	Demographic rate	0.798	0.930	0.930	0.930	0.930	-	0.930	1.139	0.093
	Population age ratio	0.178	0.142	0.132	0.123	0.114	-	0.312	-	-
Herring gull	Demographic rate	0.798	0.834	0.834	0.834	0.834	-	0.834	0.920	0.172
	Population age ratio	0.177	0.141	0.118	0.098	0.082	-	0.384	-	-
Lesser black-backed gull	Demographic rate	0.820	0.885	0.885	0.885	0.885	-	0.885	0.530	0.124

Species	Parameter	Survival (age class)							Productivity (chicks per pair)	Average mortality
		0-1	1-2	2-3	3-4	4-5	5-6	Adult		
	Population age ratio	0.113	0.109	0.096	0.085	0.075	-	0.501	-	-
Guillemot	Demographic rate	0.560	0.792	0.917	0.917	0.939	0.939	0.939	0.672	0.138
	Population age ratio	0.160	0.090	0.071	0.065	0.061	0.057	0.496	-	-
Razorbill	Demographic rate	0.630	0.630	0.630	0.895	0.895	-	0.895	0.570	0.193
	Population age ratio	0.163	0.103	0.065	0.041	0.037	-	0.591	-	-

* Great black-backed gull juvenile survival rate not provided in Horswill & Robinson (2015) so herring gull rate used.
** Arctic tern juvenile survival rate not provided in Horswill & Robinson (2015) so common tern rate used.

Future baseline offshore

12.8.16 There are currently no known other proposed developments likely to influence the offshore Study Area. In the absence of significant local impacts, it is likely that the populations of bird species present will evolve in accordance with regional and national trends. It is noted that climate change is likely to impact species' populations and distributions into the future, but the effects are too uncertain to be incorporated into any assessment.

12.8.17 However, it is acknowledged that there has been reported bird mortality from Highly Pathogenic Avian Influenza (HPAI) during the 2022 breeding season, which has caused impacts that have varied considerably between species and colonies. At present, it is uncertain what the wider population effects are for individual species or at different bio-geographical scales to interpret changes to the baseline for key species in the assessment. However, as determined by a recent Natural England recommendation to DEFRA in relation to baseline characterisation of offshore renewable projects (Natural England, 2022b), as the baseline data were collected prior to the current outbreak of HPAI, the assessments within this report remain a valid representation of typical seabird distribution and density, which are also able to be assessed against the baseline populations prior to the outbreak.

12.9 Basis for ES assessment

Maximum design scenario

12.9.1 Assessing using a parameter-based design envelope approach means that the assessment considers a maximum design scenario whilst allowing the flexibility to make improvements in the future in ways that cannot be predicted at the time of submission of the DCO Application. The assessment of the maximum adverse scenario for each receptor establishes the maximum potential adverse impact and as a result impacts of greater adverse significance would not arise should any other development scenario (as described in **Chapter 4: The Proposed Development, Volume 2** of the ES (Document Reference: 6.2.4)) to that assessed within this Chapter be taken forward in the final scheme design.

12.9.2 The maximum parameters and assessment assumptions that have been identified to be relevant to offshore and intertidal ornithology are outlined in **Table 12-19** and are in line with the Project Design Envelope (**Chapter 4: The Proposed Development, Volume 2** of the ES (Document Reference: 6.2.4)).

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Table 12-19 Maximum parameters and assessment assumptions for impacts on offshore and intertidal ornithology

Project phase and activity/impact	Maximum parameters	Maximum assessment assumptions	Justification
Construction (Intertidal)	Method: HDD Number of HDD drills: 4 Landfall construction compound (m^2): 100m x 120m Duration of works: 24 months	The maximum design scenario assumes that works will occur for 24 hours a day. This assumption is precautionary, as for health and safety reasons it is likely that the majority of works will be undertaken during daylight conditions and/or periods of clement weather.	The maximum area and duration of works in the intertidal zone will lead to the maximum disturbance of birds.
Operation and Maintenance (Intertidal)	Operational lifetime: 30 years	Routine maintenance: minimal	The maximum amount of routine maintenance and repairs will lead to the greatest disturbance to key ornithological receptors.
Decommissioning (Intertidal)		It is anticipated that the electrical cables passing through the landfall area will be left in-situ with ends cuts, sealed and buried to minimise environmental effects associated with removal.	The maximum area and duration of works in the intertidal zone will lead to the maximum disturbance of birds.
Construction (Offshore Array Area)	Installation vessel - maximum number of vessels: 3 (foundations); 2	Assumes that all foundations are complete before WTG installation commences. Assumes array area cable installation, offshore substation	The greatest number of vessels and greatest total number of trips will lead to the greatest disturbance to ornithological receptors. The greatest

Project phase and activity/impact	Maximum parameters	Maximum assessment assumptions	Justification
	(WTGs) + 3 (offshore substation) = 6. Installation vessel - maximum number of return trips: 60 (foundations) + 33 (WTGs) + 12 (offshore substation) = 105. Support vessels - maximum number of vessels: 10 (foundations); 10 (WTGs) + 13 (array area cables) + 20 (offshore substation) = 43. Support vessels - maximum number of return trips: 60 (foundations) + 100 (WTGs) + 300 (array area cables) + 12 (offshore substation) = 472. Transport vessels - maximum number of vessels: 6 (foundations) + 6 (offshore substation) = 12. Transport vessels - maximum number of return	and foundation/WTG installation may all occur concurrently.	number of vessels on site at any one time may also lead to the greatest displacement impact.

Project phase and activity/impact	Maximum parameters	Maximum assessment assumptions	Justification
	trips: 60 (foundations) + 12 (offshore substation) = 72. Crew Transfer vessels - maximum number of vessels: 6 (foundations); 10 (WTGs) + 6 (offshore substation) = 16 (maximum). Crew Transfer vessels - maximum number of return trips: 500 (foundations) + 900 (WTGs) + 180 (offshore substation) = 1,580. Vessels for commissioning SOV or jack-up - number of vessels: 2. Vessels for commissioning SOV or jack-up – total number of return trips: 12. Helicopters - maximum number of vessels: 2 (WTGs) + 2 (offshore substation) = 4. Helicopters - maximum number of return trips: 500		

Project phase and activity/impact	Maximum parameters	Maximum assessment assumptions	Justification
	(WTGs) + 30 (offshore substation) = 530.		
Operation and Maintenance (Offshore Array Area)	Operational lifetime: 30 years Helicopter total trips (per year): 120 Jack-up WTG visits (per year): 10 Jack-up platform visits (per year): 9 Jack-up total trips (per year): 19 Crew vessels WTG visits (per year): 850 Number of WTGs: 90 Rotor diameter: 250m Minimum height of lowest blade tip above MHWS: 22m	Most scheduled maintenance is expected to occur April – September.	The greatest number of vessels and greatest total number of trips will lead to the greatest disturbance to ornithological receptors. For more details on the vessels involved, see **Chapter 4: The Proposed Development, Volume 2** (Document Reference: 6.2.4). For collision risk, the worst-case scenario is the greatest number of smaller WTGs. Although the total frontal area is higher using larger WTGs, the vast majority of bird flights are at low-heights e.g. for kittiwake 90.7% are below 25m ASL and 99.995% are below 100m ASL (Cook *et al.*, 2012). Therefore, a greater number of smaller WTGs creates a higher collision risk (Johnston *et al.*, 2014).
Decommissioning (Offshore Array Area)	As per construction	The decommissioning sequence will generally be the reverse of the construction sequence and involve	The greatest number of vessels and greatest total number of trips will lead to

Project phase and activity/impact	Maximum parameters	Maximum assessment assumptions	Justification
		similar types and numbers of vessels and equipment.	the greatest disturbance to ornithological receptors.
Construction (Offshore cable export area)	Length of offshore cable corridor, link to shore: 19 km Width of offshore cable corridor, link to shore: 1.5km Main laying vessels: 2 Main laying vessels (return trips): 6 Main jointing vessels: 2 Main jointing vessels (return trips): 6 Main burial vessels: 2 Main burial vessels (return trips): 6 Number of multicat-type vessels: 4 Multicat-type vessels (return trips): 16 Number of spoil barges: 4 Spoil barges (return trips): 60 Support vessels: Number: 10		The greatest number of vessels and greatest total number of trips will lead to the greatest disturbance to ornithological receptors. For more details on the vessels involved, see **Chapter 4: The Proposed Development, Volume 2** (Document Reference: 6.2.4)**.**

Project phase and activity/impact	Maximum parameters	Maximum assessment assumptions	Justification
	Support vessels (return trips): 60 Duration: 6 months		
Operation and Maintenance (Offshore cable export area)	Maximum number of remedial burial events (lifetime quantity): 18. Maximum length of cable subject to jetting remediation per remedial burial event (m): 2,000. Maximum number of cable repairs (lifetime quantity): 4. Predicted duration of each cable repair event: 3 months.		The maximum amount of remedial work will lead to the greatest impact through disturbance.
Decommissioning (Offshore cable export area)	As for construction.	The maximum design scenario assumes all offshore cables will be removed, which will be a similar process to the construction process in reverse. This will therefore entail a similar amount of disturbance over a similar period of time.	The greatest number of vessels and greatest total number of trips will lead to the greatest disturbance to ornithological receptors.

Embedded environmental measures

12.9.3 As part of the Rampion 2 design process, a number of embedded environmental measures have been adopted to reduce the potential for likely significant effects on offshore and intertidal ornithology. These embedded environmental measures have evolved over the development process as the EIA has progressed and in response to consultation.

12.9.4 These measures also include those that have been identified as good or standard practice and include actions that will be undertaken to meet existing legislation requirements. As there is a commitment to implementing these embedded environmental measures, and also to various standard sectoral practices and procedures, they are considered inherently part of the design of Rampion 2 and are set out in this ES.

12.9.5 **Table 12-20** sets out the relevant embedded environmental measures within the design and how these affect the offshore and intertidal ornithology assessment.

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Table 12-20 Relevant offshore and intertidal ornithology embedded environmental measures

ID	Environmental measure proposed	Project phase measure introduced	How the environmental measures will be secured	Relevance to offshore and intertidal ornithology assessment
C - 43	The subsea export cable ducts will be drilled underneath the beach using horizontal directional drilling (HDD) techniques.	Scoping	DCO requirements or DML conditions.	HDD techniques minimise direct disturbance impacts on ornithological features, and also minimise indirect impacts through impacts on prey species and sediments.
C - 52	A piling Marine Mammal Mitigation Protocol (MMMP) will be implemented during construction and will be developed in accordance with Joint Nature Conservation Committee (JNCC, 2010) guidance and with the latest relevant guidance and information and in consultation with stakeholders. The piling MMMP will include details of soft starts to be used during piling operations with lower hammer energies used at the beginning of the piling sequence before increasing energies to higher levels. A **Draft Piling Marine Mammal Protocol** (Document Reference 7.14) has been submitted with this application.	Scoping - updated at PEIR and ES	DCO requirements or DML conditions.	The MMMP also minimises direct disturbance impacts on ornithological features during construction, and indirect impacts through impacts on prey species and sediments.
C - 53	An Outline Marine Pollution Contingency Plan (MPCP) has been submitted with this Application as **Appendix A** of the **Outline Project Environmental Management Plan** (Application Document	Scoping, updated at Es	DCO requirements or DML conditions.	The MPCP aims to minimise potential impacts on ornithological features from potential pollution incidents.

ID	Environmental measure proposed	Project phase measure introduced	How the environmental measures will be secured	Relevance to offshore and intertidal ornithology assessment
	Reference 7.11). This Outline MPCP provides details of procedures to protect personnel working and to safeguard the marine environment and mitigation measures in the event of an accidental pollution event arising from offshore operations relating to Rampion 2. The Final MPCP will include relevant key emergency contact details.			
C - 65	The proposed offshore cable corridor and cable landfall (below MHWS) will avoid all statutory marine designated areas.	Scoping	DCO requirements or DML conditions.	Minimises potential impacts on ornithological features which are designated features of protected areas by avoiding any direct works or operations from being within such sites.
C - 89	There will be a minimum blade tip clearance of at least 22m above MHWS.	Scoping updated at ES	Secured in the description of the development	As bird flight heights tend to be skewed towards lower altitudes, collision risk is reduced if the minimum blade tip height is larger.
C - 94	Marking and lighting the Proposed Development offshore will be undertaken in accordance with relevant industry guidance and as advised by relevant stakeholders, in line with C-49, C-110 and C-157.	Scoping - updated at PEIR	DCO requirements or DML conditions.	Guidance includes designing lighting to minimise attraction of ornithological features, which therefore reduces collision risk.

12.9.6 Further detail on the environmental measures in **Table 12-20** is provided in the **Commitments Register** (Document Reference 7.22) which sets out how and where particular environmental measures will be implemented and secured.

12.10 Methodology for ES assessment

Introduction

12.10.1 The project-wide generic approach to assessment is set out in **Chapter 5: Approach to the EIA, Volume 2** of the ES (Document Reference: 6.2.5). The assessment methodology for offshore and intertidal ornithology for the ES is consistent with that provided in the Scoping Report (RED, 2020) and no changes have been made since the scoping phase and PEIR provided alongside statutory Consultation.

12.10.2 The assessment approach therefore follows the conceptual source-pathway-receptor model. This model identifies any likely environmental impacts on ornithology receptors resulting from the proposed construction, operation and decommissioning of Rampion 2's offshore and intertidal infrastructure. This process enables an easy-to-follow assessment route between identified impact sources and potentially sensitive receptors, ensuring a transparent impact assessment. The parameters of this model are defined as follows.

- Source – the origin of a potential impact (noting that one source may have several pathways and receptors) e.g. an activity such as cable installation and a resultant effect such as re-suspension of sediments.
- Pathway – the means by which the effect of the activity could impact the receptor e.g. for the example above, re-suspended sediment could settle and smother the seabed, killing benthic prey species or burying them out of reach.
- Receptor – the element of the receiving environment that is impacted e.g. for the above example, bird species which are unable to forage effectively due to reduction in prey availability.

Assessment criteria and assignment of significance

12.10.3 The sensitivity of the receptors to sources of effect is defined in **Table 12-21** below, through reference to an example potential impact from disturbance activities.

Table 12-21 Definition of level of sensitivity for ornithological receptors

Sensitivity	Definition used in this chapter
High	Bird species has very limited tolerance of sources of disturbance such as noise, light, vessel movements and the sight of people.
Medium	Bird species has limited tolerance of sources of disturbance such as noise, light, vessel movements and the sight of people.
Low	Bird species has some tolerance of sources of disturbance such as noise, light, vessel movements and the sight of people.
Very Low	Bird species is generally tolerant of sources of disturbance such as noise, light, vessel movements and the sight of people.

12.10.4 The sensitivity of a receptor is one of the core components of the assessment of potential impacts and their effects on ornithological receptors. Account has also to be taken of each receptor's conservation value when coming to a reasoned judgement on the definition of the overall sensitivity of any particular receptor to any potential impact or effect. In that reasoned judgement account has to be taken on a species-by-species basis, noting that a particular species with a high conservation value may not be sensitive to a specific effect and vice versa. An example of this is herring gull. Herring gulls are an interest feature of some SPAs and have a conservation concern listing of 'Red' (because of recent population declines), but cannot be judged to be sensitive to disturbance given their propensity to exploit food resources made available by people and to nest on buildings even while considerable efforts are made to deter them. This reasoned judgement is an important part of the overall narrative used to determine the potential impact significance and can be used where relevant as a mechanism for modifying the sensitivity of an effect assigned to a specific receptor.

12.10.5 The conservation value of ornithological receptors is based on the population from which individuals are predicted to be drawn. This reflects current understanding of the movements of species, with site-based protection (e.g. SPAs) generally limited to specific periods of the year (e.g. the breeding season). Therefore, conservation value can vary through the year depending on the relative sizes of the number of individuals predicted to be at risk of impact and the population from which they are estimated to be drawn. Ranking, therefore, corresponds to the degree of connectivity which is predicted between the wind farm site and protected populations. Using this approach, the conservation importance of a species seen at different times of year may fall into any of the defined categories. Therefore, example criteria for defining conservation value in this chapter are outlined in **Table 12-22** below. Additional consideration may be provided to the current national conservation status of particular species, where appropriate, according to the Birds of Conservation Concern 5 (BoCC5) Stanbury *et al.* (2021), from which the status from BoCC5 for the main seabird species assessed within this ES chapter are presented in **Table 12-15**.

Table 12-22 Definition of conservation value levels for ornithological receptors

Value	Definition used in this chapter
High	A species for which individuals at risk can be clearly connected to a particular SPA or is found in numbers of international importance within the Rampion 2 array area during a particular season.
Medium	A species for which individuals at risk are probably drawn from particular SPA populations or found in numbers of national importance within the Rampion 2 array area during a particular season, although other colonies (both SPA and non-SPA) may also contribute to individuals observed in the offshore and intertidal ornithology Study Area.
Low	A species for which it is not possible to attribute to particular SPAs and may be found in regionally or locally important numbers during specific seasons within the offshore and intertidal ornithology Study Area.

12.10.6 For assessment, expert judgement is used to combine both the sensitivity given in **Table 12-21** with the value given in **Table 12-22** to produce an overall score for value, importance, and sensitivity for each receptor.

12.10.7 The criteria for defining magnitude in this chapter are outlined in **Table 12-23** below. In addition to those levels of magnitude defined in **Table 12-23**, additional consideration is given to circumstances of no change, where no loss of (or gain) in the size or extent of distribution of the relevant biogeographic population that is the interest feature of a protected site may occur.

Table 12-23 Definition of levels of potential magnitude of change for ornithological receptors

Magnitude	Definition Used in This Chapter
Major	A change in the size or extent of distribution of the relevant biogeographic population or the population that is the interest feature of a specific protected site that is predicted to irreversibly alter the population in the short to long-term and to alter the long-term viability of the population and/ or the integrity of the protected site. Recovery from that change predicted to be achieved in the long-term (i.e. more than five years) following cessation of the development activity.
Moderate	A change in the size or extent of distribution of the relevant biogeographic population or the population that is the interest feature of a specific protected site that occurs in the short and long-term, but which is not predicted to alter the long-term viability of the population and/ or the integrity of the protected site. Recovery from that change predicted to be achieved in the medium-term (i.e. no more than five years) following cessation of the development activity.

Magnitude	Definition Used in This Chapter
Minor	A change in the size or extent of distribution of the relevant biogeographic population or the population that is the interest feature of a specific protected site that is sufficiently small-scale or of short duration to cause no long-term harm to the feature/ population. Recovery from that change predicted to be achieved in the short-term (i.e. no more than one year) following cessation of the development activity.
Negligible	Very slight change from the size or extent of distribution of the relevant biogeographic population or the population that is the interest feature of a specific protected site. Recovery from that change predicted to be rapid (i.e. no more than circa six months) following cessation of the development activity.

12.10.8 The potential significance of the effect upon offshore and intertidal ornithology receptors is determined by correlating the magnitude of the change and the sensitivity of the receptor. The method employed for this assessment is guided by the matrix approach presented in **Table 12-24**, where determination of the level of any significance of effect is initially identified through the matrix and use of expert judgement. Where a range of significance of effect is presented in **Table 12-24**, the final assessment for each effect is also based upon expert judgement. The use of expert judgement is an important element of the impact assessment process as the matrix approach to determining the significance of any potential effects should only be used as a framework to aid understanding of how a judgement has been informed and reached for each specific receptor to any given impact being assessed.

12.10.9 Wherever possible and practical, the assessments within this chapter for offshore and intertidal ornithology are based upon quantitative and accepted criteria as well as methods and best practice guidance (Parker *et al.,* 2022) from Natural England (e.g. for collision risk modelling and analysis of displacement. The assessments also rely on, where necessary, species-specific biological removal thresholds determined through population modelling. Together, these practices provide for a balanced approach, alongside with the use of expert and value judgement and to allow for meaningful interpretation to establish to what extent an impact is significant for Rampion 2.

12.10.10 For the purposes of this assessment, any effects with a significance level of 'minor' or less have been concluded to be not significant in terms of the EIA Regulations.

Table 12-24 Matrix used for the assessment / assignment of the potential significance of effect

Value, Importance, Sensitivity	Magnitude of Change: Negligible	Minor	Moderate	Major
Low	Negligible (Not Significant)	Negligible (Not Significant)	Minor (Not Significant)	Minor (Not significant)
Medium	Negligible (Not Significant)	Minor (Not Significant)	Minor (Not Significant)	Moderate (Potentially significant)
High	Minor (Not Significant)	Minor (Not Significant)	Moderate (Potentially significant)	Major (Significant)
Very high	Minor (Not Significant)	Moderate (Potentially significant)	Major (Significant)	Major (Significant)

12.10.11 Further modifications have been introduced in the interest of proportionate assessment and in accordance with guidance presented in PD 6900:2015 Environmental impact assessment for offshore renewable energy projects - Guide (British Standards Institute (BSI) 2015) such that:

- a magnitude of change of **no change** is not assessed since it will always lead to a not significant effect;
- a magnitude of change of **negligible** is not considered further since it will always lead to a not significant effect; and
- resources and receptors of **low** value, importance or sensitivity are not considered further since any magnitude of change on them will not lead to a significant effect.

12.10.12 Where Special Protection Areas (SPAs) and Ramsar Sites (i.e. internationally designated sites) are considered, this chapter summarises the assessments made on the interest features of internationally designated sites as described within this chapter (with the assessment on the site itself deferred to the **RIAA** (Document Reference: 5.9)).

12.10.13 With respect to nationally and locally designated sites, where these sites fall within the boundaries of an internationally designated site (e.g. SSSIs which have not been assessed within the HRA Report for Rampion 2), only the international site has been taken forward for assessment. This is because potential effects on the integrity and conservation status of the nationally designated site are assumed to be inherent within the assessment of the internationally designated site (i.e. a separate assessment for the national site is not undertaken). However, where a nationally designated site falls outside the boundaries of an international site, but within the offshore and intertidal Study Area, an assessment of the impacts on the overall site is made in this chapter using the EIA methodology.

12.10.14 The **RIAA** (Document Reference: 5.9) has been prepared in accordance with Advice Note Ten: Habitats Regulations Assessment Relevant to Nationally Significant Infrastructure Projects (Planning Inspectorate, 2017) and is submitted as part of this Application for Development Consent.

12.11 Assessment of effects: Construction phase – intertidal

Disturbance and displacement: Intertidal cable corridor

12.11.1 Construction activities associated with export cable laying through the intertidal zone may lead to disturbance and displacement of species within the export cable corridor and different extents of buffers surrounding it.

12.11.2 The baseline assessment of the intertidal environment within and in close proximity to the cable landfall area shows that few waterbirds of any species reside within this coastal region in anything other than numbers of local importance. In this instance, the cable landfall area is the area of intertidal beach landward of MLWS tide level and seaward of MHWS tide level. Of those bird species recorded in peak numbers on migration or during the non-breeding (wintering) period, only sanderling and Mediterranean gull may occur at levels exceeding 1% of the national population, the threshold widely considered as the basis for including a species in an impact assessment. All other intertidal bird species were recorded well below the national and international population level 1% importance thresholds, so are not considered further in this ES.

12.11.3 The assessment of the potential impacts and effects on intertidal ornithology receptors arising from the construction of Rampion 2 within the landfall area therefore includes two receptor species: sanderling and Mediterranean gull.

Summary of assessment confidence levels

12.11.4 With respect to disturbance and displacement assessments through the intertidal zone during the construction phase, confidence in assessment conclusions is considered high. This is due to the high level of confidence in the baseline data (see **Appendix 12.1: Baseline technical report, Volume 4** of the ES (Document Reference 6.4.12.1)). It indicates the overall outcome of this assessment is still considered precautionary when following the approach and, as such, the assessment is considered robust.

Sanderling

12.11.5 Based on the Maximum Design Scenario (MDS) (**Table 12-19**), the key potential impacts from the construction activities within the intertidal environment are in relation to disturbance and displacement of sanderlings feeding or roosting within and near the construction site. Such potential impacts may be caused by noise and physical presence of workers, vehicles and machinery deployed during the construction phase within the active landfall works area, those within any works compounds immediately landward of the MHWS mark, and vehicles and people moving between the two areas.

12.11.6 The MDS states that HDD will be used, and this is confirmed in Commitment C-43 (**Table 12-20**). The maximum duration of works is 24 months which would span two winter periods.

Magnitude of impact

12.11.7 The use of HDD means that no machinery or construction workers will need to directly access the intertidal area, and HDD will not be carried out during winter months. However, it is possible that there will be some disturbance as a result of visual or acoustic disturbance from the onshore compound or from offshore vessels.

12.11.8 The potential disturbance and displacement of sanderling through construction activities is spatially limited as the extent of the construction activities is limited to a very narrow corridor in relation to the length and width of the wider intertidal zone available to sanderling. As there is no pattern suggesting that sanderling occurrence is consistently at levels of national importance, within or in close proximity to the cable landfall area, it is likely that this area is not of primary importance for either feeding or resting. A peak count of 80 birds were recorded in November 2020, below the 1% GB population threshold of 200 individuals (Frost *et al.*, 2021). Sanderling records fluctuate both in abundance and spatially along the coast. As a consequence, considering that this species spends large amounts of time along the active tideline during low water periods, it demonstrates that the food resources they utilise are widely distributed. Consequently, the limited zone of possible visual and acoustic influences from which sanderling may be displaced will not result in a significant reduction in the overall area available for them to forage or rest.

12.11.9 It is therefore concluded that any direct disturbance and/or displacement of sanderling caused by the planned construction activities (physical presence and noise of workers, vehicles, and machinery) is of local spatial extent, of short-term duration, intermittent and reversible. The magnitude of change is therefore considered to be **negligible**.

12.11.10 Given a magnitude of change of **negligible**, following the matrix approach set out in **Table 12-24**, the potential effect of construction in the intertidal zone on sanderlings has been assessed as **Not Significant** regardless of the sensitivity of the receptor.

Mediterranean gull

12.11.11 Mediterranean gull numbers at breeding colonies on the south coast have increased dramatically in recent years, with a minimum of 1,737 breeding pairs within the Chichester and Langstone Harbour SPA alone in 2018 (RSPB, 2018). In comparison, Woodward *et al.* (2020) report a total UK population of only 1,200 breeding pairs based on data from 2013 – 2017. It is therefore important to consider the rapidly changing national and regional population when assessing any potential impact. Frost *et al.* (2021) gives a 1% GB population threshold of 40 individuals. The peak count recorded on site was 149 birds in September 2020, exceeding the 1% threshold.

12.11.12 It is likely that significant numbers of birds recorded in and around the intertidal Study Area (see **Appendix 12.1: Baseline technical report, Volume 4** of the ES (Document Reference: 6.4.12.1)) consist primarily of post-breeding aggregations from local colonies. An unknown proportion may be non-resident passage migrants or wintering birds from mainland Europe.

Magnitude of impact

12.11.13 The use of HDD means that no machinery or construction workers will need to directly access the intertidal area and a commitment is also in place to ensure HDD will not be carried out during winter months. However, it is possible that there will be some disturbance as a result of visual or acoustic disturbance from the onshore compound or from offshore vessels.

12.11.14 The potential disturbance and displacement of Mediterranean gulls through construction activities is spatially limited as the extent of the construction activities is limited to a very narrow corridor in relation to the length and width of the wider intertidal zone available to Mediterranean gulls.

12.11.15 In addition, Mediterranean gulls are generalist feeders (Robinson, 2005; BirdLife International, 2021) and not dependent on the intertidal zone for foraging. The amount of habitat unavailable at any point is therefore a negligible proportion of the total available habitat.

12.11.16 It is therefore concluded that any direct disturbance and/or displacement of Mediterranean gulls caused by the planned construction activities (physical presence and noise of workers, vehicles, and machinery) is of local spatial extent, of short-term duration, intermittent and reversible. The magnitude of change is therefore considered to be **negligible**.

12.11.17 Given a magnitude of change of **negligible**, following the matrix approach set out in **Table 12-24** the potential effect of construction in the intertidal zone on Mediterranean gulls has been assessed as **Not Significant** regardless of the sensitivity of the receptor.

12.12 Assessment of effects: Construction phase – offshore

Disturbance and displacement: Offshore cable corridor

12.12.1 Construction activities associated with export cable laying may lead to disturbance and displacement of species within the export cable corridor and different degrees of buffers surrounding it.

12.12.2 The laying of the export cable between the array area and the cable landfall area for Rampion 2 would involve up to two cable laying vessels being in situ for the entire construction period of up to six months (**Table 12-20**). There is the potential for construction activities associated with export cable laying, namely the physical presence of the cable laying vessel(s), to lead to disturbance and displacement of more sensitive species surrounding the cable laying vessel and out to differing buffers surrounding it dependent upon the species present.

12.12.3 This potential impact is only considered where an export cable corridor runs through offshore areas that play host to higher densities of the more sensitive seabird species, so is not regularly included within OWF EIAs. Data sourced through the desk study for this assessment did not identify any vulnerable species in significant numbers (see **Appendix 12.1: Baseline technical report, Volume 4** of the ES (Document Reference: 6.4.12.1)).

Summary of assessment confidence levels

12.12.4 With respect to disturbance and displacement assessments during the construction phase within the offshore cable corridor, confidence in assessment conclusions is considered high. This is due to the displacement and mortality rates within the approach being robust and used in previous assessments. When consideration is provided to the high level of confidence in the baseline data (see **Appendix 12.1: Baseline technical report, Volume 4** of the ES (Document Reference: 6.4.12.1)) and additional evidence in support of the approach (**Section 12.12 and 12.13**) it indicates the overall outcome of this assessment is still considered precautionary when following the approach and, as such, the assessment is considered robust.

12.12.5 Therefore, no significant effect on any species is predicted.

Disturbance and displacement: Array area

12.12.6 The activities within an array area associated within the construction of WTGs has the potential to directly disturb and displace seabirds that would normally reside within and around the area of sea where Rampion 2 is proposed to be developed. During this phase of the development, this in effect represents a temporary indirect habitat loss, which would potentially reduce the area available to those seabirds to forage, loaf and / or moult that currently occur within and around Rampion 2 and may be susceptible to displacement from such a development.

12.12.7 Displacement may contribute to individual birds experiencing fitness consequences, which at an extreme level could lead to the mortality of individuals, though during the construction phase of an OWF such activities are spatially and temporally restricted.

12.12.8 Some species are more susceptible than others to disturbance, from construction activities, 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. A selection process was undertaken for Rampion 2 to identify those species that may be more susceptible than others and therefore which species may be considered for further assessment (**Table 12-25**). Of the seabirds recorded in significant numbers within the array area, fulmar, gannet, large and small gulls are not considered susceptible to disturbance, as they are often associated with fishing boats (e.g. Camphuysen, 1995; Hüppop and Wurm, 2000) and have been noted in association with construction vessels at the Greater Gabbard Offshore Wind Farm (GGOWL, 2011) and close to active foundation piling activity at the Egmond aan Zee (OWEZ) wind farm, where they showed no noticeable reactions to the works (Leopold and Camphuysen, 2007). Therefore, these species, with the exception of gannet, are

not considered further for the potential effect of displacement from the array area during the proposed construction phase of Rampion 2.

12.12.9 Gannet has also been selected in for assessment of potential displacement during the construction phase of Rampion 2. This is on a precautionary basis as this species may be influenced by construction activities and in order to provide Natural England and the RSPB with confidence that any potential effects on gannet during the construction phase are considered in a quantitative manner.

12.12.10 Auk species, in this instance guillemot and razorbill, have been noted to respond to OWF construction activities and be displaced as a consequence. Therefore, these species are considered further for the potential effect of displacement from the array area during the proposed construction phase of Rampion 2.

12.12.11 There are a number of different measures used to assess bird disturbance and displacement from areas of sea in response to activities associated with an OWF. Garthe and Hüppop (2004) developed a scoring system for such disturbance factors, which is used widely in OWF EIAs. Furness and Wade (2012) developed disturbance ratings for particular species, alongside scores for habitat flexibility and conservation importance in Scottish waters. These factors were used to define an index value that highlights the sensitivity of a species to disturbance and displacement. As many of these references relate to disturbance from helicopter and vessel activities, these are considered relevant to this assessment. Bradbury *et al.* (2014) provided an update to the Furness and Wade (2012) paper to consider seabirds in English waters. More recently a joint SNCB interim displacement advice note (SNCBs, 2022) provides the latest advice for UK development applications on how to consider, assess and present information and potential consequences of seabird displacement from OWFs.

Table 12-25 Selection of seabird species recorded within Rampion 2 array area for risk of disturbance and displacement during the construction phase

Receptor	Sensitivity to Disturbance & Displacement (During Construction Phase)	Maximum bio-season mean peak density	Selection Result (In or Out)
Fulmar	Very low	0.03 birds/km^2 Very low	Out
Gannet	Low to medium	0.33 birds/km^2 Low	In
Kittiwake	Very low	1.79 birds/km^2 Medium	Out
Great black-backed gull	Very low	0.40 birds/km^2 Low	Out
Herring gull	Very low	0.45 birds/km^2 Low	Out

Receptor	Sensitivity to Disturbance & Displacement (During Construction Phase)	Maximum bio-season mean peak density	Selection Result (In or Out)
Guillemot	Medium	18.99 birds/km^2 High	In
Razorbill	Medium	17.79 birds/km^2 High	In

12.12.12 Following the selection process an assessment of displacement has been carried out for Rampion 2, though the methods and results are based on the following set of scenarios that recognise construction activities being restricted:

- Construction activities being undertaken within only a small portion of the array area at any one time;
- Any potential displacement is likely to only occur, where vessels and construction activities are present; and
- Construction activities are temporally restricted (over approximately 36 months).

12.12.13 Disturbance from activities during the construction phase, such as piling, are higher than during operation but localised to the area around the WTG site. However, the disturbance effects do not apply to the entire site from the start of the construction period, but accumulate as WTGs are constructed and the site transitions to an operational site reaching its peak during construction of the last WTG. Therefore, displacement rates during the construction period are at their highest for only a short period of time.

12.12.14 A few studies have provided empirical displacement rates for the construction phase of OWF developments. For gannet, displacement rates during construction have been shown to be either lower (Walls *et al.*, 2013 and Ecology Consulting, 2012) or comparable to rates reported during the operational phase (Percival and Ford, 2018). Displacement rates for auks during construction have been shown to be predominantly comparable to the operation phase (RWE Npower Renewables Ltd., 2008; Royal Haskoning, 2013; and Vanermen *et al.*, 2013). The range in reported displacement rates during the construction period for various studies reflects differences between sites in construction schedule, when peak numbers of birds occur and the period during the construction phase assessments are made, such as the first season compared to the last season.

12.12.15 Disturbance during the construction phase is primarily centred around where construction vessels and piling activities are occurring and at a reduced level around the constructed but non-operational WTGs. These studies support that although the level of disturbance from construction activities can be high it is localised around a limited area of the development site. Therefore, displacement rates during the construction period account for reduced displacement within the site away from construction areas including areas where built non-operational turbines are present.

12.12.16 Given the available evidence that displacement rates during the construction period are reported to be either considerably lower or comparable to the operational phase, the following methodology has been adopted. The method considers that as the construction phase of Rampion 2 is limited both spatially and temporarily and that any potential effects would be unlikely to reach the same level across the entire site as those estimated during the operational phase of Rampion 2 until towards the end of the construction period. Therefore, for the purpose of providing a precautionary approach to assessing the potential effects on gannets and auks during the construction phase of Rampion 2, the level to be used is half that of the operational phase assessments. This precautionary rate is derived from the logical assumption that the displacement rate for the entire site is low at the start of the construction period, increasing gradually to reach a rate comparable to the operational phase at the end of the construction period.

12.12.17 Therefore, reference to the assessments within the operational and maintenance phase (**paragraph 12.13.158**) should be considered to understand the assessments for the construction phase in this section. For gannet, following clarification from Natural England as detailed in **paragraph 12.13.14** displacement is considered within the array area and 2km buffer instead of the array area only. For auk species, the evidence-based approach as detailed in **paragraph 12.13.34** suggests that displacement should be considered for the array area plus a 2km buffer. The level of displacement for gannets and auk species are provided below:

- For gannet consideration is provided to half of the operation and maintenance displacement rates (60-80%), so displacement rates during the construction phase are therefore taken to be 30-40% displacement.
- For auk species (guillemot and razorbill) consideration is also provided to half of the operation and maintenance displacement rate of 50% displacement (with a range of 30-70%), which is 25% displacement (with a range of 15-35%) during the construction phase; and
- As recommended by Natural England in their S42 responses a range of mortality levels (1-10% of those displaced) are applied for this assessment as a worst-case scenario.

Summary of assessment confidence levels

12.12.18 With respect to disturbance and displacement assessments during the construction phase within the array area, confidence in assessment conclusions is considered high. This is due to the displacement and mortality rates within the approach being robust and used in previous assessments. When consideration is provided to the high level of confidence in the baseline data (see **Appendix 12.1: Baseline technical report, Volume 4** of the ES (Document Reference: 6.4.12.1)) and additional evidence in support of the approach (**Section 12.12 and 12.13**) it indicates the overall outcome of this assessment is still considered precautionary when following the approach and, as such, the assessment is considered robust.

Gannet

Magnitude of impact

12.12.19 For gannet, the annual estimated mortality rate during the construction phase for gannet is approximately one individual. When considering a worst-case scenario with maximum displacement rate of 40% and a mortality rate of 10%, this will increase the annual estimated mortality rate to 13 individuals. This is further broken down into relevant bio-seasons in **Table 12-26**. The magnitude of change is estimated by calculating the increase in baseline mortality within each bio-season with respect to the regional populations. The overall baseline mortality rates are based on age specific demographic rates and age class proportions as presented in **Table 12-18**.

Table 12-26 Construction phase bio-season displacement estimates for gannet from Rampion 2

Bio-season (months)	Seasonal abundance (array area plus 2km buffer	Regional baseline population	Regional baseline mortality	Estimated number of gannet subject to mortality (individuals)		Increase in baseline mortality (%)	
				30-40% disp., 1% mort.	30-40% disp., 10% mort.	30-40% disp., 1% mort.	30-40% disp., 10% mort.
Return migration (Dec – Mar)	123	248,385	46,696	0.4 – 0.5	3.7 – 4.9	0.001 – 0.001	0.008 – 0.011
Migration – free breeding (Apr – Aug)	111	400,326	75,261	0.3 – 0.4	3.3 – 4.4	0.000 – 0.001	0.004 – 0.006
Post – breeding migration (Sep – Nov)	102	456,298	85,784	0.3 – 0.4	3.1 – 4.1	0.000 – 0.000	0.004 – 0.005
Annual (BDMPS)	336	456,298	85,784	1.0 – 1.3	10.1 – 13.4	0.001 – 0.002	0.012 – 0.016
Annual (biogeographic)	336	1,180,000	221,840	1.0 – 1.3	10.1 – 13.4	0.000 – 0.001	0.005 – 0.006

12.12.20 During the return migration bio-season a peak abundance of 123 gannets are estimated to be at risk of displacement. Using displacement rates between 30 – 40% and a mortality rate of 1% would result in less than one gannet being subject to mortality. Using maximum displacement and mortality rates (40% and 10% respectively) would result in five gannets being subject to mortality. As this represents a negligible change, there is little effect in the return migration bio-season.

12.12.21 During the migration-free breeding bio-season, a peak abundance of 111 gannets within the array area plus 2km buffer are estimated to be at risk of displacement. Using displacement rates of 30 – 40% and a mortality rate of 1% would result in less than one gannet being subject to mortality. Using maximum displacement and mortality rates (40% and 10% respectively) would result in approximately 4 gannets being subject to mortality. As this represents a negligible change, there is little effect in the migration-free breeding bio-season.

12.12.22 During the post-breeding migration bio-season, a peak abundance of 102 gannets within the array area plus 2km buffer are estimated to be at risk of displacement. Using displacement rates of between 30 – 40% and a mortality rate of 1%, would result in less than one gannet being subject to mortality. Using maximum displacement and mortality rates (40% and 10% respectively) would result in approximately four gannets being subject to mortality. As this represents a negligible change, there is little effect in the post-breeding migration bio-season.

12.12.23 For all seasons combined, the annual number of gannets subject to mortality due to displacement from the Rampion 2 array plus 2km buffer is approximately one when considering a displacement rate of 30 – 40% and a mortality rate of 1%. Using maximum displacement and mortality rates of 40% and 10% respectively, would result in 13 gannets being subject to mortality due to displacement by Rampion 2 per annum. Using the largest UK North Sea and English Channel BDMPS of 456,298 individuals (**Table 12-17**) and using the average baseline mortality rate of 0.188 (**Table 12-18**), the natural predicted mortality across all seasons is 85,784. The addition of approximately one mortality would increase the baseline mortality rate by between 0.001% and 0.002%. As a worst-case scenario, the addition of 13 mortalities would increase the baseline mortality rate by 0.016%. When considering displacement effects at the wider biogeographic population scale, then based on a population of 1,180,000, the natural annual mortality rate would be 221,840 individuals. The addition of approximately one mortality would increase the biogeographic baseline mortality rate by less than 0.001%. The addition of the maximum 13 mortalities, would increase the biogeographic baseline mortality rate by 0.006%.

12.12.24 This level of impact is considered to be of **negligible** magnitude overall, as it represents only a very slight increase to baseline mortality levels as a result of displacement.

12.12.25 Given a magnitude of change of negligible, following the matrix approach set out in **Table 12-24**, the potential effect of displacement and disturbance from construction activities in the array area plus 2 km buffer on gannets has been assessed as **Not Significant** regardless of the sensitivity of the receptor.

Guillemot

Magnitude of impact

12.12.26 The annual estimated mortality rate during the construction phase for guillemot is 15 individuals. When considering a worst-case scenario with maximum displacement and mortality rates of 35% and 10% respectively, this will increase the annual estimated mortality rate to 205 individuals. This is further broken down into relevant bio-seasons in **Table 12-27**. The magnitude of change is estimated by calculating the increase in baseline mortality within each bio-season with respect to the regional populations. The overall baseline mortality rates are based on age specific demographic rates and age class proportions as presented in **Table 12-18.**

Table 12-27 Construction phase bio-season displacement estimates for guillemot from Rampion 2

Bio-season (months)	Seasonal abundance (array area plus 2km buffer	Regional baseline populations and baseline mortality rates (individuals per annum)		Estimated number of guillemot subject to mortality (individuals)			Increase in baseline mortality (%)		
		Population	Baseline Mortality	25% Displacement Rate; 1% Mortality Rate	15 – 35% Displacement Rate; 1% Mortality Rate	35% Displacement Rate; 10% Mortality Rate	25% Displacement Rate; 1% Mortality Rate	15 – 35% Displacement Rate; 1% Mortality Rate	35% Displacement Rate; 10% Mortality Rate
Breeding (Apr-Jul)	134	2,045,078	292,446	0.3	0.2 – 0.5	4.7	0.000	0.000 – 0.000	0.002
Non-breeding (Aug-Mar)	5,723	2,139,238	305,911	14.3	8.6 – 20.0	200.3	0.005	0.003 – 0.007	0.065
Annual (BDMPS)	5,857	2,139,238	305,911	14.6	8.8 – 20.5	205.0	0.005	0.003 – 0.007	0.067
Annual (biogeographic)	5,857	4,125,000	589,875	14.6	8.8 – 20.5	205.0	0.002	0.001 – 0.003	0.035

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12.12.27 During the breeding bio-season a peak abundance of 134 guillemots are estimated to be at risk of displacement. Using displacement and mortality rates of 25% and 1% respectively, will result in approximately zero guillemots being subject to mortality. When considering maximum displacement and mortality rates of 35% and 10% respectively, this will result in five guillemots being subject to mortality. As there is little effect in the breeding bio-season, this represents a negligible change.

12.12.28 During the non-breeding bio-season, the mean peak abundance for guillemot is 5,723 individuals within the array area and 2km buffer. When considering displacement and mortality rates of 25% and a 1% respectively, this will result in approximately 14 guillemots being subject to mortality. Using maximum displacement and mortality rates (35% and 10% respectively), will result in approximately 200 guillemots being subject to mortality. The UK North Sea and English Channel BDMPS for the non-breeding bio-season is defined as 2,139,238 individuals (**Table 12-17**) and using the average baseline mortality rate of 0.143 (**Table 12-18**), the natural predicted mortality in the non-breeding bio-season is 305,197. The addition of 14 mortalities will increase the baseline mortality rate by 0.005%. As a worst-case scenario the addition of 200 mortalities will increase the baseline mortality rate by 0.065%.

12.12.29 This level of change is considered to be negligible during the non-breeding and breeding bio-season, as it represents only a slight difference to the baseline conditions due to the small number of individuals subject to potential mortality as a result of displacement.

12.12.30 For all seasons combined, the estimated number of guillemots subject to mortality due to displacement from the Rampion 2 array plus 2km buffer is approximately 15 individuals per annum. Using maximum displacement and mortality rates of 35% and 10% respectively, would result in 205 individuals being subject to mortality due to displacement per annum. Using the largest UK North Sea and English Channel BDMPS population of 2,139,238 individuals (**Table 12-17**) as a proxy for the total BDMPS population across the year, with an average baseline mortality rate of 0.143 (**Table 12-18**), the natural predicted mortality across all seasons is 305,197. The addition of 15 mortalities would increase the baseline mortality rate by 0.005%. As a worst-case scenario, the addition of 205 mortalities would increase the baseline mortality rate by 0.067%. When considering the annual potential magnitude of change at the biogeographic scale, the natural predicted mortality of the biogeographic population of 4,125,000 across all seasons is 588,499 individuals per annum. The addition of 15 mortalities would increase the biogeographic baseline mortality rate by 0.002%. The addition of the maximum 205 mortalities would increase the biogeographic baseline mortality rate by 0.035%.

12.12.31 This level of change is considered to be of **negligible** at the UK North Sea and English Channel BDMPS scale and **negligible** at the biogeographic scale, as it represents between a slight to a minor difference to the baseline conditions due to the number of individuals subject to potential mortality as a result of displacement.

12.12.32 Given a magnitude of change of **negligible**, following the matrix approach set out in **Table 12-24**, the potential effect of displacement and disturbance from

construction activities in the array area on guillemots has been assessed as **Not Significant** regardless of the sensitivity of the receptor.

Razorbill

Magnitude of impact

12.12.33 The annual estimated mortality rate during the construction phase for razorbill is 19 individuals. When considering a worst-case scenario with maximum displacement and mortality rates of 35% and 10% respectively, this will increase the annual estimated mortality rate to 264 individuals. This is further broken down into relevant bio-seasons in **Table 12-28**. The magnitude of change is estimated by calculating the increase in baseline mortality within each bio-season with respect to the regional populations. The overall baseline mortality rates are based on age specific demographic rates and age class proportions as presented in **Table 12-18**.

Table 12-28 Bio-season displacement estimates for razorbill from Rampion 2 during the construction phase

Bio-season (months)	Seasonal abundance (array area plus 2km buffer	Regional baseline populations and baseline mortality rates (individuals per annum)		Estimated number of razorbill subject to mortality (individuals)			Increase in baseline mortality (%)		
		Population	Baseline Mortality	25% Displacement Rate; 1% Mortality Rate	15 – 35% Displacement Rate; 1% Mortality Rate	35% Displacement Rate; 10% Mortality Rate	25% Displacement Rate; 1% Mortality Rate	15 – 35% Displacement Rate; 1% Mortality Rate	35% Displacement Rate; 10% Mortality Rate
Return Migration (Jan-Mar)	6,303	592,462	105,651	15.8	9.5 – 22.1	220.6	0.015	0.009 – 0.021	0.209
Migration-free Breeding (Apr-Jul)	32	158,031	28,130	0.1	0.0 – 0 .1	1.1	0.000	0.000 – 0.000	0.004
Post-breeding Migration (Aug-Oct)	26	592,462	105,458	0.1	0.0 – 0.1	0.9	0.000	0.000 – 0.000	0.001
Migration-free Winter (Nov-Dec)	1,193	218,622	38,915	3.0	1.8 – 4.2	41.8	0.08	0.005 – 0.011	0.107
Annual (BDMPS)	7,554	592,462	105,458	18.9	11.3 – 26.4	264.4	0.018	0.011 – 0.025	0.251
Annual (biogeographic)	7,554	1,707,000	303,846	18.9	11.3 – 26.4	264.4	0.006	0.004 – 0.009	0.087

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12.12.34 During the return migration bio-season, the mean peak abundance for razorbill is 6,303 individuals within the array area and 2km buffer. When considering displacement and mortality rates of 25% and a 1% respectively, this would result in approximately 16 razorbills being subject to mortality. Using maximum displacement and mortality rates of 35% and 10% respectively, would result in approximately 221 razorbills being subject to mortality. The UK North Sea and English Channel BDMPS for the return migration bio-season is defined as 592,462 (**Table 12-17**) and using the average baseline mortality rate of 0.178 (**Table 12-18**), the natural predicted mortality in the return migration bio-season is 105,458. The addition of 16 mortalities would increase the baseline mortality rate by 0.015%. As a worst-case scenario the addition of 221 mortalities would increase the baseline mortality rate by 0.209%.

12.12.35 This level of change is considered to be of negligible magnitude during the return migration bio-season, as it represents only a slight difference to the baseline conditions due to the small number of individuals subject to potential mortality as a result of displacement.

12.12.36 During the migration-free breeding bio-season, the mean peak abundance for razorbill is 32 individuals within the array area and 2km buffer. When considering displacement and mortality rates of 25% and a 1% respectively, this will result in approximately zero razorbills being subject to mortality. Using maximum displacement and mortality rates (35% and 10% respectively), will result in approximately one razorbill being subject to mortality. As this represents a negligible change, there is little effect in the migration-free breeding bio-season.

12.12.37 During the post-breeding migration bio-season, the mean peak abundance for razorbill is 26 individuals within the array area and 2km buffer. When considering displacement and mortality rates of 25% and 1% respectively, this will result in approximately zero razorbills being subject to mortality. Using maximum displacement and mortality rates (35% and 10% respectively), will result in approximately one razorbill being subject to mortality. As this represents a negligible change, there is little effect in the post-breeding migration bio-season.

12.12.38 During the migration-free winter bio-season, the mean peak abundance for razorbills is 1,193 individuals within the array area plus 2km buffer. When considering displacement and mortality rates of 25% and a 1% respectively, this would result in approximately three razorbills being subject to mortality. Using maximum displacement and mortality rates (35% and 10% respectively), would result in approximately 42 razorbills being subject to mortality. The UK North Sea and English Channel BDMPS for the migration-free winter bio-season is defined as 218,622 (**Table 12-17**) and using the average baseline mortality rate of 0.178 (**Table 12-18**), the natural predicted mortality in the migration-free winter bio-season is 38,915. The addition of three mortalities would increase the baseline mortality rate by 0.008%. As a worst-case scenario the addition of 42 mortalities will increase the baseline mortality rate by 0.107%.

12.12.39 For all seasons combined, the estimated number of razorbills subject to mortality due to displacement from the Rampion 2 array plus 2km buffer is approximately 21 individuals per annum. Using maximum displacement and mortality rates (35% and 10% respectively), would result in 290 individuals being subject to mortality due to displacement per annum. Using the largest UK North Sea and English

Channel BDMPS population of 592,462 individuals (**Table 12-17**), as a proxy for the total BDMPS population across the year, with an average baseline mortality rate of 0.178 (**Table 12-18**), the natural predicted mortality across all seasons is 105,458. The addition of 21 mortalities would increase the baseline mortality rate by 0.020%. As a worst-case scenario, the addition of 290 mortalities would increase the baseline mortality rate by 0.275% at the BDMPS scale. When considering the annual potential level of change at the biogeographic scale, the natural predicted mortality of the biogeographic population of 1,707,000 across all seasons is 303,846 per annum. The addition of 21 mortalities would increase the biogeographic baseline mortality rate by 0.007%. The addition of the maximum 290 mortalities would increase the biogeographic baseline mortality rate by 0.095%.

12.12.40 This level of change is considered to be **negligible** at the UK North Sea and English Channel BDMPS scale and **negligible** at the biogeographic scale, as it represents only a slight to a minor difference to the baseline conditions due to the number of individuals subject to potential mortality as a result of displacement.

12.12.41 Given a magnitude of change of **negligible**, following the matrix approach set out in **Table 12-24**, the potential effect of displacement and disturbance from construction activities in the array area on razorbills has been assessed as **Not Significant** regardless of the sensitivity of the receptor.

Indirect effects: Offshore cable corridor

12.12.42 During the construction phase of Rampion 2 there is the potential for indirect effects arising from the displacement of prey species due to increased disturbance, or to disturbance of habitats from increased suspended sediment and physical disturbance to the seabed. Underwater noise may cause fish and mobile invertebrates to avoid the construction area and also affect their physiology and behaviour. Suspended sediments may cause fish and mobile invertebrates to avoid the construction area and may smother and hide immobile benthic prey. These mechanisms may result in less prey being available within the construction area to foraging seabirds.

12.12.43 However, as no significant effects were identified to potential prey species (fish or benthic) or on the habitats that support them in the assessments on fish and benthic ecology (**Chapter 8: Fish and shellfish ecology, Volume 2** of the ES (Document Reference: 6.2.8) and **Chapter 9: Benthic, subtidal and intertidal ecology, Volume 2** of the ES (Document Reference: 6.2.9), respectively) then there is no potential for any indirect effects of an adverse significance to occur on offshore and intertidal ornithology receptors.

Summary of assessment confidence levels

12.12.44 With respect to indirect effects during construction within the offshore cable corridor during, confidence in assessment conclusions is considered high. This is due to the displacement and mortality rates within the approach being robust and used in previous assessments. When consideration is provided to the high level of confidence in the baseline data (see **Appendix 12.1: Baseline technical report, Volume 4** of the ES (Document Reference: 6.4.12.1)) and additional evidence in support of the approach (**Section 12.12 and 12.13**) it indicates the overall

outcome of this assessment is still considered precautionary when following the approach and, as such, the assessment is considered robust.

Indirect effects: Array area

12.12.45 During the construction phase of Rampion 2 there is the potential for indirect effects arising from the displacement of prey species due to increased noise and disturbance, or to disturbance of habitats from increased suspended sediment and physical disturbance to the seabed. Underwater noise may cause fish and mobile invertebrates to avoid the construction area and also affect their physiology and behaviour. Suspended sediments may cause fish and mobile invertebrates to avoid the construction area and may smother and hide immobile benthic prey. These mechanisms may result in less prey being available within the construction area to foraging seabirds.

12.12.46 However, as no significant effects were identified to potential prey species (fish or benthic) or on the habitats that support them in the assessments on fish and benthic ecology (**Chapter 8: Fish and shellfish ecology, Volume 2** of the ES (Document Reference: 6.2.8) and **Chapter 9: Benthic, subtidal and intertidal ecology, Volume 2** of the ES (Document Reference: 6.2.9), respectively) then there is no potential for any indirect effects of an adverse significance to occur on offshore and intertidal ornithology receptors.

Summary of assessment confidence levels

12.12.47 With respect to indirect effects during construction within the array area during, confidence in assessment conclusions is considered high. This is due to the displacement and mortality rates within the approach being robust and used in previous assessments. When consideration is provided to the high level of confidence in the baseline data (see **Appendix 12.1: Baseline technical report, Volume 4** of the ES (Document Reference: 6.4.12.1)) and additional evidence in support of the approach (**Section 12.12** and **12.13**) it indicates the overall outcome of this assessment is still considered precautionary when following the approach and, as such, the assessment is considered robust.

12.13 Assessment of effects: Operation and maintenance phase

12.13.1 The potential effects of the offshore operation and maintenance of Rampion 2 have been assessed on offshore and intertidal ornithology. The potential environmental effects arising from the operation and maintenance of Rampion 2 are listed in **Table 12-7** and the MDS against which each operation and maintenance phase impact has been assessed is presented in **Table 12-19**.

Disturbance and displacement: Array area

12.13.2 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 Rampion 2 is proposed to be developed. This in effect represents indirect habitat loss, which would potentially reduce the area available to those seabirds to forage, rest and /

or moult that currently occur within and around Rampion 2 and may be susceptible to displacement from such a development. Displacement may contribute to individual birds experiencing higher energetic costs for survival and reproduction, which at an extreme level could lead to increased mortality and population declines.

12.13.3 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 (APEM (2022a, 2022b)). OWFs are a relatively 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. Although there are indications of habituation to operational OWFs by species such as gannet and auks (Degraer *et al*., 2021 and Vallejo *et al*., 2017), unequivocal evidence is still lacking. Comprehensive reviews of post-construction monitoring studies at OWFs have recently been presented on the current evidence available on displacement rates for gannet and auks (APEM (2022a and 2022b)). These reviews present evidence-based revised displacement ranges for both gannet and auks from more 20 OWF studies (APEM (2022a, 2022b)).

12.13.4 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.

12.13.5 Natural England and JNCC issued a joint Interim Displacement Guidance Note (Natural England and JNCC 2012), which provides 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 (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 have shaped the assessment provided below.

12.13.6 Some species are more susceptible than others to disturbance, from construction activities, 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. A selection process was undertaken for Rampion 2 to identify those species that may be more susceptible than others and therefore which species may be considered for further assessment (**Table 12-29**). Of the seabirds recorded in significant numbers within the array area fulmar, large gulls, small gulls and terns are not considered susceptible to disturbance. They are often associated with fishing boats (e.g. Camphuysen, 1995; Hüppop and Wurm, 2000), and have been noted in association with construction vessels at the Greater Gabbard Offshore Wind Farm (GGOWL, 2011) and close to active foundation piling activity at the Egmond aan Zee wind farm, where they showed no noticeable reactions to the works (Leopold and Camphuysen, 2007). Therefore, these species are not considered further for the potential effect of displacement from the array area during the proposed operational phase of Rampion 2.

Table 12-29 Selection of seabird species recorded within Rampion 2 array area for risk of disturbance and displacement during the operational phase

Receptor	Sensitivity to Disturbance & Displacement (During Operational Phase)	Maximum bio-season mean peak density	Selection Result (In or Out)
Fulmar	Very low	0.03 birds/km^2 Very low	Out
Gannet	Low to medium	0.33 birds/km^2 Low	In
Kittiwake	Very low	1.79 birds/km^2 Medium	Out
Great black-backed gull	Very low	0.40 birds/km^2 Low	Out
Herring gull	Very low	0.45 birds/km^2 Medium	Out
Guillemot	Medium	18.99 birds/km^2 High	In
Razorbill	Medium	17.79 birds/km^2 High	In

12.13.7 Following the selection process, an assessment of displacement was carried out for Rampion 2, with detailed methods and results presented in **Appendix 12.2: Displacement analysis, Volume 4** of the ES (Document Reference: 6.4.12.2), to provide information for seabird species of interest identified as potentially at risk and of interest for impact assessment.

12.13.8 The three species that were identified as the species of focus for displacement are gannet, guillemot and razorbill.

12.13.9 For each of the three species a review was undertaken of recent displacement rates applied by other assessments of displacement for OWFs. Further reviews of the displacement values derived from multiple post-consent monitoring reports was undertaken to quantify a suitable evidence-led approach and to provide SNCBs with transparency on how the displacement rates were calculated for this assessment (APEM 2022a, 2022b).

Summary of assessment confidence levels

12.13.10 With respect to disturbance and displacement effects within the array area during Operation and maintenance, confidence in assessment conclusions is considered high. This is due to the displacement and mortality rates within the approach being robust and used in previous assessments. When consideration is provided to the high level of confidence in the baseline data (see **Appendix 12.1: Baseline technical report, Volume 4** of the ES (Document Reference: 6.4.12.1)) and

additional evidence in support of the approach (**Section 12.12 and 12.13**) it indicates the overall outcome of this assessment is still considered precautionary when following the approach and, as such, the assessment is considered robust.

Gannet

12.13.11 A review of the current available evidence on gannet displacement effects and reported rates has recently been published (APEM 2022a). The report is the most comprehensive to date, having collated and critically appraised studies from 25 OWFs encompassing 34 years of combined data from 30 reports and publications. The report showed that a significant number of OWFs report displacement rates of 60-80%, the range currently advocated by Statutory Nature Conservation Bodies (SNCBs) for impact assessment. However, the report identified that 42% of OWF had reported or inferred rates of less than 60%. This suggested that the current range used for impact assessment may be overly precautionary for some OWFs.

12.13.12 Meta-analysis of the collated OWF data implied that the variable displacement rates report for different OWFs could be attributed to various OWF design metrics and environmental variables. Of importance was that a seasonal difference in the rate of displacement was identified with a significantly lower displacement rate in the breeding season compared to the non-breeding season across the data. Displacement rates for the breeding season in general ranged from 40-60%, with the lower assigned rate being precautionary (APEM, 2022a).

12.13.13 For the purpose of this assessment, after considering the evidence reviewed in APEM (2022a) an approach using displacement rates across all bio-seasons of 60-80% is considered.

12.13.14 **Table 12-30** has been populated with data for gannets during each of the return migration, non-migratory and post-breeding migration bio-seasons within the Rampion 2 array area plus 2km, as per clarification from Natural England in their S42 responses.

12.13.15 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 loss of habitat within the Rampion 2 array area. However, following recommendation from Natural England in their S42 responses a range of mortality levels (1-10%) were selected for this assessment.

Magnitude of impact

12.13.16 The standard approach using displacement rates across all bio-seasons of 60-80%, the annual estimated mortality rate during the operational phase for gannet, is between two and three individuals. When considering a worst-case scenario with maximum displacement and mortality rates of 80% and 10% respectively, this would increase the annual estimated mortality rate to 27 individuals, which is further broken down into relevant bio-seasons in **Table 12-30**.

12.13.17 The magnitude of change is estimated by calculating the increase in baseline mortality within each bio-season with respect to the regional populations.

12.13.18 The alternate approach using bio-season specific rates, the annual estimated mortality rate during the operational phase for gannet is approximately between two and three individuals. When considering a worst-case scenario with maximum displacement and mortality rates of 60% and 10% respectively, this will increase the annual estimated mortality rate to between approximately 18 and 25 individuals. which is further broken down into relevant bio-seasons in **Table 12-30**. The magnitude of change is estimated by calculating the increase in baseline mortality within each bio-season with respect to the regional populations. The overall baseline mortality rates are based on age specific demographic rates and age class proportions as presented in **Table 12-18**.

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Table 12-30 Bio-season displacement estimates for gannet for Rampion 2 array area plus 2km buffer (operation & maintenance)

Bio-season (months)	Seasonal abundance (array area plus 2km buffer	Displacement rate	Regional baseline populations and baseline mortality rates (individuals per annum)		Estimated number of gannet subject to mortality (individuals)		Increase in baseline mortality (%)	
			Population	Baseline Mortality	1% Mortality Rate	10% Mortality Rate	1% Mortality Rate	10% Mortality Rate
Return migration (Dec-Mar)	123	60 – 80	248,385	46,604	0.7 – 1.0	7.4 – 9.8	0.002 – 0.002	0.016 – 0.021
Migration-free breeding (Apr-Aug)	111	60 – 80	400,326	75,112	0.7– 0.9	6.7 – 8.9	0.001 – 0.001	0.009 – 0.012
Post-breeding migration (Sep-Nov)	102	60 – 80	456,298	85,614	0.6 – 0.8	6.1 – 8.2	0.001 – 0.001	0.007 – 0.010
Annual (BDMPS)	336	60 – 80	456,298	85,614	2.0 – 2.7	20.2 – 26.9	0.002 – 0.003	0.024 – 0.031
Annual (biogeographic)	336	60 – 80	1,180,000	221,400	2.0 – 2.7	20.2 – 26.9	0.001 – 0.001	0.009 – 0.012

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12.13.19 During the return migration bio-season a peak abundance of 123 gannets are estimated to be at risk of displacement. Using displacement rates between 60 – 80% and a mortality rate 1% would result in approximately one gannet being subject to mortality. Using maximum displacement and mortality rates (80 % and 10% respectively), will result in approximately 10 gannets being subject to mortality.

12.13.20 This level of potential change during the return migration bio-season is considered to be of negligible magnitude.

12.13.21 During the migration-free breeding bio-season, a peak abundance of 111 gannets within the array area plus 2km buffer are estimated to be at risk of displacement. When considering displacement rates between 60 – 80% and a mortality rate of 1%, this will result in less than one gannet being subject to mortality. Using maximum displacement and mortality rates (80% and 10%, respectively), will result in nine individuals, being subject to mortality. During the migration-free breeding bio-season, the total regional baseline population of breeding adults and immature gannets is predicted to be 400,326 individuals (**Table 12-17**). When the average baseline mortality rate of 0.188 (**Table 12-18**) is applied, the natural predicted mortality in the migration-free breeding bio-season is 75,112. The addition of less than one mortality will increase the mortality relative to the baseline mortality rate by between 0.001%. As a worst-case scenario the addition of between seven and nine mortalities will increase the baseline mortality rate by 0.009% or 0.012%, respectively.

12.13.22 This level of potential change is considered to be of negligible magnitude during the migration-free breeding bio-season, as it represents no discernible increase to baseline mortality levels due to the very small number of individuals subject to potential mortality as a result of displacement.

12.13.23 During the post-breeding migration bio-season, a peak abundance of 102 gannets within the array area are estimated to be at risk of displacement. When considering displacement rates between 60 – 80% and a mortality rate of 1%, this would result in less than one gannet being subject to mortality. Using maximum displacement and mortality rates (80% and 10% respectively), would result in eight individuals being subject to mortality. The UK North Sea and English Channel BDMPS for the post-breeding migration bio-season is defined as 456,298 individuals (**Table 12-17**) and using the average baseline mortality rate of 0.188 (**Table 12-18**), the natural predicted mortality in the return migration bio-season is 85,784. The addition of less than one mortality would increase the mortality relative to the baseline mortality rate by 0.001%. As a worst-case scenario the addition of eight mortalities would increase the baseline mortality rate by 0.010%.

12.13.24 This level of potential change is considered to be of negligible magnitude during the post-breeding migration bio-season, as it represents no discernible increase to baseline mortality levels as a result of displacement.

12.13.25 For all seasons combined, the annual number of gannets subject to mortality due to displacement from the Rampion 2 array is between two and three individuals. Using a maximum displacement and mortality rates of 80% and 10%, respectively, would result in 27 gannets being subject to mortality due to displacement by Rampion 2 per annum. Using the largest UK North Sea and English Channel BDMPS of 456,298 individuals (**Table 12-17**) and using the average baseline

mortality rate of 0.188 (**Table 12-18**), the natural predicted mortality across all seasons is 85,784. The addition of between two and three additional mortalities would increase the mortality relative to the baseline mortality rate by up to 0.003%. As a worst-case scenario, the addition of 27 mortalities, would increase the baseline mortality rate by 0.031%. When considering displacement impacts at the wider biogeographic population scale, then based on a population of 1,180,000, the natural annual mortality rate would be 221,840 individuals. On a biogeographic scale the addition of between two and three mortalities would increase mortality relative to the baseline mortality rate by up to 0.001%. The addition of the maximum 27 mortalities, would increase the biogeographic baseline mortality rate by 0.012%.

12.13.26 This level of potential change per annum is considered to be of **negligible** at the UK North Sea and English Channel BDMPS scale and **negligible** at the biogeographic scale, as it represents only a slight to a minor difference to the baseline conditions due to the number of individuals subject to potential mortality as a result of displacement.

12.13.27 In each bio-season and on an annual basis, the potential change is considered to be of **negligible** magnitude, as it represents no discernible increase to baseline mortality levels as a result of displacement.

12.13.28 Given a magnitude of change of **negligible**, following the matrix approach set out in **Table 12-24**, the potential effect of displacement and disturbance from construction activities in the array area on gannets has been assessed as **Not Significant** regardless of the sensitivity of the receptor.

Auk Species

12.13.29 A comprehensive review of studies on auks in response to OWFs was recently carried out by APEM, which collates and summarises displacement rates reported at 21 operational OWF sites for guillemot and razorbill (APEM, 2022b). Displacement studies on auks have previously been summarised in a published review by Dierschke *et al.* (2016), including the results of auk displacement effects from 13 OWF.

12.13.30 While Dierschke *et al.* (2016) conclude that the mean outcome across all OWFs was a 50% reduction in density post-construction compared to pre-construction data, a range in displacement rates from 0% to 95% for the operational phase is reported. Likewise, APEM (2022b) found that displacement effects varied from strong attraction to strong avoidance. However, OWFs could be separated into two groups: 1) OWFs with inferred avoidance or displacement rates higher than 50%, 2) OWFs with no significant displacement effect or suggested weak avoidance of <25% displacement

12.13.31 Variability in reported displacement rates can be explained by differences in ecological conditions between studies, such as the season in which data were collected, distance of site from breeding colony, number of years of post-construction data used, together with turbine layout and methodology used to assess the displacement rate itself (APEM, 2022b).

12.13.32 A review of the analysis methods and data inputs used in individual displacement studies identified that OWFs reporting high displacement rates were associated

with low count data which included high zero counts within the data set (APEM 2022b). Hence, the use of statistical methods that are unable to manage such zero-inflated data sets may lead to displacement rates that are misleading.

12.13.33 It is evident that deriving a displacement rate for assessing a development site should only use evidence from sites that are directly comparable to the site being assessed (APEM 2022b). For instance, the high auk displacement rates of 55% to 75% reported from non-UK waters (Bligh Bank, Thorntonbank, Prinses Amalia and Alpha Ventus) and which have considerably smaller footprint sizes (<17km²), are therefore not applicable, considering that their site configurations and ecology are not comparable to the Rampion 2 site. By considering OWF site attributes the displacement rate can be refined from the broad range reported across all OWFs and tailored to an individual development based on similar attributes known to effect displacement rate and thereby removing a high level of uncertainty (APEM 2022b).

12.13.34 A recent submission to provide an update to the operational displacement assessment for Norfolk Vanguard (MacArthur Green 2019) and also applied in Norfolk Boreas, East Anglia One North and East Anglia Two, reviewed the same evidence (Dierschke et al. 2016) for displacement effects for guillemot and razorbill. The report concluded that appropriate rates of displacement for these species are 50% from within the wind farm itself and 30% within a 1km buffer.

12.13.35 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). Therefore, by applying a single displacement rate across all bio-seasons of 50% within the Rampion 2 array area and out to a 2km buffer will ensure a precautionary rate is used for the assessment of displacement.

12.13.36 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 would suggest that displacement rates are expected to diminish over the operational life of OWFs. Given that Rampion 2 is immediately adjacent to Rampion 1, some habituation may already have occurred within local populations that would transfer to reduced avoidance of Rampion 2 compared to a new windfarm in a previously unimpacted region.

12.13.37 Therefore, there is good evidence to support a displacement rate of 50% within OWF array areas and out to a 2km buffer for auks.

12.13.38 However, in their S42 responses Natural England clarify a range of displacement rates (30%-70%) is agreed in both the Evidence Plan Process (EPP), ETG and the RED Method Statement, and therefore a 50% displacement and the range of 30%-

70% are presented in the following sections. In addition, Natural England recommend applying a range of mortality levels (1%-10%) as a worst-case scenario of maximum displacement and mortalities.

12.13.39 Given that Rampion 2 is immediately adjacent to Rampion 1, it is evident that an appropriate method needs to be devised to account for buffer effects. A 2km buffer around Rampion 2 will extend into Rampion 1. It is unlikely that birds which remain within the footprint of the existing, operational Rampion 1 would then be displaced by the operation of WTGs within Rampion 2 that are further away than Rampion 1 wind turbines which the birds are already tolerating.

12.13.40 Furthermore, if there is a displacement effect up to 2km out from Rampion 1, then the density of birds currently within the portion of the Rampion 2 within 2km of Rampion 1 will already have been reduced by displacement, and it is likely that the remaining birds are more tolerant of WTGs and therefore less likely to be displaced by the presence of Rampion 2's WTGs.

12.13.41 The solution, which in light of the above is considered to be precautionary, is to apply the standard displacement rates as discussed above to all birds within the Rampion 2 footprint and a 2km buffer, except for the area of buffer that directly overlaps with Rampion 1. **Figure 12.3, Volume 3** of the ES (Document Reference: 6.3.12) shows the buffer areas considered in calculating displacement.

Guillemot

12.13.42 For the purpose of this assessment, an evidence-led displacement and mortality rate of 50% and 1% respectively was applied to each bio-season based on evaluation of the published literature and in line with values used by other OWF displacement assessments (cf. APEM 2022b). Additional consideration is provided by reference to Natural England's preferred method of assessing potential impacts from displacement using a range of between 30% to 70% displacement and between 1% and 10% mortality rates.

12.13.43 However, it should be noted that due to the large expanse of available habitat outside of the array area, the mortality rate due to displacement could be as low as 0% as the increase in density outside of the array area in comparison to the whole of the English Channel will be negligible.

12.13.44 A complete range of displacement matrices are presented in **Appendix 12.2: Displacement analysis, Volume 4** of the ES (Document Reference: 6.4.12.2), whilst **Table 12-31** has been populated with data for guillemots during the breeding and non-breeding season within the Rampion 2 array area as well as out to a 2km buffer (excluding Rampion 1).

Magnitude of impact

12.13.45 The annual estimated mortality rate as a consequence of displacement during the operation and maintenance phase of Rampion 2 for guillemot is 29 individuals, which is further broken down into relevant bio-seasons in **Table 12-31**. The magnitude of change is estimated by calculating the increase in baseline mortality within each bio-season with respect to the most appropriate regional / BDMPS population scales. The overall baseline mortality rates are based on age specific demographic rates and age class proportions as presented in **Table 12-18**.

Table 12-31 Bio-season displacement estimates for guillemot for Rampion 2 Array area plus 2km buffer (operation & maintenance)

Bio-season (months)	Seasonal abundance (array area plus 2km buffer	Regional baseline populations and baseline mortality rates (individuals per annum)		Estimated number of guillemot subject to mortality (individuals)			Increase in baseline mortality (%)		
		Population	Baseline Mortality	50% Displacement Rate; 1% Mortality Rate	30 – 70% Displacement Rate; 1% Mortality Rate	70% Displacement Rate; 10% Mortality Rate	50% Displacement Rate; 1% Mortality Rate	30 – 70% Displacement Rate; 1% Mortality Rate	70% Displacement Rate; 10% Mortality Rate
Breeding (Apr-Jul)	134	2,045,078	292,446	0.7	0.4 – 0.9	9.4	0.000	0.000 – 0.000	0.003
Non-breeding (Aug-Mar)	5,723	2,139,238	305,911	28.6	17.2 – 40.1	400.6	0.009	0.006 – 0.013	0.131
Annual (BDMPS)	5,857	2,139,238	305,911	29.3	17.6 – 41.0	410.0	0.010	0.006 – 0.013	0.134
Annual (biogeographic)	5,857	4,125,000	589,875	29.3	17.6 – 41.0	410.0	0.005	0.003 – 0.007	0.070

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12.13.46 During the breeding bio-season, the mean peak abundance for guillemot is 134 individuals within the array area plus 2km buffer. When considering evidence-based displacement and mortality rates of 50% and 1%, respectively, this would result in approximately one guillemot being subject to mortality. During the breeding bio-season the total guillemot regional baseline population, including breeding adults and immature birds, is predicted to be 2,045,078 individuals (**Table 12-17**). Using the average baseline mortality rate of 0.143 (**Table 12-18**), the natural predicted mortality of guillemots in the breeding bio-season is 292,446. The addition of one mortality would increase the mortality relative to the baseline mortality rate by 0.000%.

12.13.47 This level of potential change is considered to be of **Negligible** magnitude during the breeding bio-season, as it represents only a slight difference to the baseline conditions due to the small number of individuals subject to potential mortality as a result of displacement.

12.13.48 During the non-breeding bio-season, the mean peak abundance for guillemot is 5,723 individuals within the array area and 2km buffer. When considering evidence-based displacement and mortality rates of 50% and 1%, respectively, this would result in approximately 29 guillemots being subject to mortality. The UK North Sea and English Channel BDMPS for the non-breeding bio-season is defined as 2,139,238 individuals (**Table 12-17**) and using the average baseline mortality rate of 0.143 (**Table 12-18**), the natural predicted mortality in the non-breeding bio-season is 305,197. The addition of 29 mortalities would increase the mortality relative to the baseline mortality rate by 0.09%.

12.13.49 This level of potential change is considered to be of **Negligible** magnitude during the non-breeding and breeding bio-season, as it represents only a slight difference to the baseline conditions due to the small number of individuals subject to potential mortality as a result of displacement.

12.13.50 For all seasons combined, the estimated number of guillemots subject to mortality due to displacement from the Rampion 2 array area plus 2km buffer is approximately 29 individuals per annum. Using the largest UK North Sea and English Channel BDMPS population of 2,139,238 individuals (**Table 12-17**) as a proxy for the total BDMPS population across the year, with an average baseline mortality rate of 0.143 (**Table 12-18**), the natural predicted mortality across all seasons is 305,911. The addition of 29 mortalities would increase the mortality relative to the baseline mortality rate by 0.010% at the BDMPS scale. When considering the annual potential level of change at the biogeographic scale, the natural predicted mortality of the biogeographic population of 4,125,000 across all seasons is 588,875 individuals per annum. On a biogeographic scale, the addition of 29 mortalities would increase the mortality relative to the baseline mortality rate by 0.005%.

12.13.51 This level of potential change per annum is considered to be of **Negligible** at the UK North Sea and English Channel BDMPS scale and **Negligible** at the biogeographic scale, as it represents only a slight to a minor difference to the baseline conditions due to the number of individuals subject to potential mortality as a result of displacement.

12.13.52 In each bio-season and on an annual basis, the magnitude of the potential change is therefore considered to be **Negligible**, as it represents no discernible increase to baseline mortality levels as a result of displacement.

12.13.53 Given a magnitude of change of **Negligible**, following the matrix approach set out in **Table 12-24**, the potential effect of displacement and disturbance from construction activities in the array area on guillemots has been assessed as **Not Significant** regardless of the sensitivity of the receptor.

Razorbill

12.13.54 For the purpose of this assessment, an evidence led displacement and mortality rate of 50% and 1% respectively was applied to each bio-season based on evaluation of the published literature and in line with values used by other OWF displacement assessments (APEM 2022b). Additional consideration is given to Natural England's preferred method of assessing potential impacts from displacement using a range of between 30% to 70% displacement and between 1% and 10% mortality rates.

12.13.55 However, it should be noted that due to the large expanse of available habitat outside of the OWF area, the mortality rate due to displacement could be as low as 0% as the increase in density outside of the OWF area, in comparison to the whole of the English Channel, will be negligible.

12.13.56 A complete range of displacement matrices are presented in **Appendix 12.2: Displacement analysis, Volume 4** of the ES (Document Reference: 6.4.12.2), whilst **Table 12-32** has been populated with data for razorbills during each of the return migration, non-migratory breeding, post-breeding migration and non-migration wintering bio-seasons within the Rampion 2 array area as well as out to a 2km buffer (excluding Rampion 1).

Magnitude of impact

12.13.57 The annual estimated mortality rate for razorbill is approximately 38 individuals, which is further broken down into relevant bio-seasons in **Table 12-32**. The magnitude of change is estimated by calculating the increase in baseline mortality within each bio-season with respect to the regional populations. The overall baseline mortality rates are based on age specific demographic rates and age class proportions as presented in **Table 12-18**.

Table 12-32 Bio-season displacement estimates for razorbill for Rampion 2 Array area plus 2km buffer (operation & maintenance)

Bio-season (months)	Seasonal abundance (array area plus 2km buffer	Regional baseline populations and baseline mortality rates (individuals per annum)		Estimated number of razorbills subject to mortality (individuals)			Increase in baseline mortality (%)		
		Population	Baseline Mortality	50% Displacement; 1% Mortality Rate	30-70% Displacement Rate; 1% Mortality Rate	70% Displacement Rate; 10% Mortality Rate	50% Displacement; 1% Mortality Rate	30-70% Displacement Rate; 1% Mortality Rate	70% Displacement Rate; 10% Mortality Rate
Return Migration (Jan-Mar)	6,303	592,462	105,458	31.5	18.9 – 44.1	441.2	0.030	0.018 – 0.042	0.418
Migration-free Breeding (Apr-Jul)	32	158,031	28,130	0.2	0.1 – 0.2	2.2	0.001	0.000 – 0.001	0.008
Post-breeding Migration (Aug-Oct)	26	592,462	105,458	0.1	0.1 – 0.2	1.8	0.000	0.000 – 0.000	0.002
Migration-free Winter (Nov-Dec)	1,193	218,622	38,925	6.0	3.6 – 8.4	83.5	0.015	0.009 – 0.021	0.215
Annual (BDMPS)	7,554	592,462	105,458	37.8	22.7 – 52.9	528.8	0.036	0.021 – 0.050	0.501
Annual (biogeographic)	7,554	1,707,000	303,846	37.8	22.7 – 52.9	528.8	0.012	0.007 – 0.017	0.174

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12.13.58 During the return migration bio-season, the mean peak abundance for razorbill is 6,303 individuals within the array area and 2km buffer. When considering evidence-based displacement and mortality rates of 50% and 1%, respectively, this would result in approximately 38 razorbills being subject to mortality. The UK North Sea and English Channel BDMPS for the return migration bio-season is defined as 52,462 (**Table 12-17**) and using the average baseline mortality rate of 0.178 **(Table 12-18**), the natural predicted mortality in the return migration bio-season is 105,458. The addition of 38 mortalities would increase the mortality relative to the baseline mortality rate by 0.030%.

12.13.59 This level of potential change is considered to be of **Negligible** magnitude during the return migration bio-season, as it represents only a slight difference to the baseline conditions due to the small number of individuals subject to potential mortality as a result of displacement.

12.13.60 During the migration-free breeding bio-season, the mean peak abundance for razorbill is 32 individuals within the array area and 2km buffer. When considering displacement rates between 30 - 70% and mortality rate of 1%, this would result in approximately zero (0.2) razorbills being subject to mortality. As this represents no change, there is no effect in the migration-free breeding bio-season.

12.13.61 During the post-breeding migration bio-season, the mean peak abundance for razorbill is 26 individuals within the array area and 2km buffer. When considering displacement rates between 30 - 70% and mortality rate of 1%, this would result in approximately zero (0.1) razorbills being subject to mortality. As this represents no change, there is no effect in the migration-free breeding bio-season.

12.13.62 During the migration-free winter bio-season, the mean peak abundance for razorbill is 1,193 individuals within the array area and 2km buffer. When considering evidence-based displacement and mortality rates of 50% and 1%, respectively, this would result in 6 razorbills being subject to mortality. The UK North Sea and English Channel BDMPS for the migration-free winter bio-season is defined as 218,622 (**Table 12-17**) and using the average baseline morality rate of 0.178 (**Table 12-18),** the natural predicted mortality in the migration-free winter bio-season is 38,915. The addition of seven mortalities would increase the morality relative to the baseline rate by 0.015%.

12.13.63 This level of potential change is considered to be of **Negligible** magnitude during the migration-free winter bio-season, as it represents only a slight difference to the baseline conditions due to the small number of individuals subject to potential mortality as a result of displacement.

12.13.64 For all seasons combined, the maximum number of razorbills subject to mortality due to displacement from the Rampion 2 array area plus 2km buffer is approximately 39 individuals per annum. Using the largest UK North Sea and English Channel BDMPS population of 592,462 individuals (**Table 12-17**), as a proxy for the total BDMPS population across the year, with an average baseline mortality rate of 0.178 (**Table 12-18**), the natural predicted mortality across all seasons is 105,458. The addition of 39 mortalities would increase the mortality relative to the baseline mortality rate by 0.036% at the BDMPS scale. When considering the annual potential level of change at the biogeographic scale, the natural predicted mortality of the biogeographic population of 1,707,000 across all seasons is 303,846 per annum. On a biogeographic scale, the addition of 39

mortalities would increase the mortality relative to the baseline mortality rate by 0.012%.

12.13.65 This level of potential change per annum is considered to be of **Negligible** magnitude at the UK North Sea and English Channel BDMPS scale and **Negligible** magnitude at the biogeographic scale, as it represents only a slight to a minor difference to the baseline conditions due to the small number of individuals subject to potential mortality as a result of displacement.

12.13.66 In each bio-season and on an annual basis, the magnitude of the potential change is therefore considered to be **Negligible**, as it represents no discernible increase to baseline mortality levels as a result of displacement.

12.13.67 Given a magnitude of change of **Negligible**, following the matrix approach set out in **Table 12-24**, the potential effect of displacement and disturbance from construction activities in the array area on razorbills has been assessed as **Not Significant** regardless of the sensitivity of the receptor.

Collision risk: Array area

12.13.68 There is potential risk to birds from OWFs through collision with WTGs and associated infrastructure described in the MDS (**Table 12-19**) resulting in injury or fatality. This may occur when birds fly through the Rampion 2 array area whilst foraging for food, commuting between breeding sites and foraging areas, or during migration.

12.13.69 CRM has been carried out for Rampion 2, with detailed methods and results presented in **Appendix 12.3: Collision risk modelling, Volume 4** of the ES (Document Reference: 6.4.12.3), to provide information for six seabird species of interest identified as potentially at risk and of interest for impact assessment. A selection process was undertaken based on the density of flying birds recorded within the array area, consideration of their perceived risk from collision (identified from the published literature), and the results of the CRM undertaken at PEIR stage. The results of this selection exercise are presented in **Table 12-33**. This screening process screened out the species for which the risk of collision is considered as very low, such as for fulmar that fly very close to the sea surface so are unlikely to interact with WTGs. Species were also screened out if their densities in flight within the array area were very low, as this also provides evidence of very low risk of collision. Following this selection process, four species were identified as following the screening criteria for CRM assessment; gannet, kittiwake, great black-backed gull and herring gull. In addition, lesser black-backed gull was screened in following Natural England's S42 comments relating to a potentially significant cumulative impact on this species.

12.13.70 Little gull, common gull, 'commic' tern and Sandwich tern were included in the CRM at PEIR stage, but subsequently removed following the proportional approach to EIA on the grounds that the PEIR CRM demonstrated no prospect of a significant effect, and the additional survey data considered in this ES demonstrates no significant increase in densities that will alter that conclusion. Natural England agreed that the assessment at PEIR indicated Rampion 2 alone does not pose a significant risk to these species (Natural England's S42 response Points 6.10, 6.11, 6.15, 6.16). With the full baseline data available it is clear that

these results are confirmed, with no little gulls, 'commic' terns or Sandwich terns observed within the array area in the final nine months' survey results (i.e. the surveys not analysed at PEIR; **Appendix 12.1: Baseline technical report, Volume 4** of the ES (Document Reference: 6.4.12.1)). Small numbers of common gull were observed and therefore for completeness CRM has been carried on that species with results presented in **Appendix 12.3: Collision risk modelling, Volume 4** of the ES (Document Reference: 6.4.12.3), although it has still not been assessed further within this chapter.

12.13.71 Note that Sandwich tern and Arctic tern were both screened into the Migratory CRM assessment and so are considered in **paragraph 12.13.137.** Common tern was also considered as part of the Migratory CRM screening process but not screened in for detailed modelling (see **Appendix 12.4: Migratory CRM, Volume 4** of the ES (Document Reference: 6.4.12.4)).

Summary of assessment confidence levels

12.13.72 With respect to collision effects within the array area during Operation and maintenance, confidence in assessment conclusions is considered high. This is due to the displacement and mortality rates within the approach being robust and used in previous assessments. When consideration is provided to the high level of confidence in the baseline data (see **Appendix 12.1: Baseline technical report, Volume 4** of the ES (Document Reference: 6.4.12.1)) and additional evidence in support of the approach (**Section 12.12** and **12.13**) it indicates the overall outcome of this assessment is still considered precautionary when following the approach and, as such, the assessment is considered robust.

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Table 12-33 Collision risk selection table.

Receptor	Risk of collision (Garthe & Huppop, 2004; Furness & Wade, 2012; Wade et al, 2016)	Estimated peak density of birds in flight in Rampion 2 array area	Annual total collision estimate at PEIR (mean BO2)	Selection Result (In or Out)
Fulmar	Low	0.00 birds/km^2 Very low	N/A	Out
Gannet	Medium	0.38 birds/km^2 Low to medium	15.13	In
Kittiwake	Medium	1.50 birds/km^2 Medium	10.63	In
Great black-backed gull	High	0.13 birds/km^2 Low	4.01	In
Herring gull	High	0.79 birds/km^2 Low to medium	29.61	In
Lesser black-backed gull	High	0.06 birds/km^2 Very low	1.84	In at Natural England's request
Guillemot	Very low	0.51 birds/km^2 Low to medium	N/A	Out
Razorbill	Very low	1.87 birds/km^2 Medium	N/A	Out

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12.13.73 CRM was undertaken using the sCRM, developed by Marine Scotland (McGregor, 2018), to determine the risk of collision when in flight. The development and testing of the sCRM was funded by MSS and provides the most up-to-date version of the CRM originally created by Band (2012) and addresses the uncertainty in developments and other key input parameters as progressed initially by Masden (2015).

12.13.74 CRM accounts for a number of 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 12.3: Collision risk modelling, Volume 4** of the ES (Document Reference: 6.4.12.3).

12.13.75 The assessment of collision risk follows an evidence-led approach making use of a mixture of site-specific data collected from within the Rampion 2 array area and the most recent literature on seabirds and their behaviour in relation to OWFs (**Appendix 12.3: Collision risk modelling, Volume 4** of the ES (Document Reference: 6.4.12.3)).

12.13.76 The sCRM was run stochastically, following the advice given in the latest interim guidance from Natural England (Natural England, 2022). Running the model stochastically produces a probability distribution of possible collision rates; the rates reported in this document are the mean and the 95% confidence limits (i.e. lower 2.5% quantile and upper 97.5% quantile). Full details of the parameters used to calculate each estimate are given in **Appendix 12.3: Collision risk modelling, Volume 4** of the ES (Document Reference: 6.4.12.3).

12.13.77 All estimates are presented using “Band Option 2” (BO2). BO2 applies a uniform distribution of bird flights between the lowest and the highest levels of the rotors. The 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 proposed project’s wind turbine parameters.

12.13.78 For gannet, a macro-avoidance rate of 70% has been applied to the monthly density estimates used as input to the sCRM, as recommended by Natural England (2022).

12.13.79 The monthly collision rates and total annual collisions for all species assessed is shown in **Table 12-34**.

12.13.80 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 the Bird Collision Avoidance Study funded by ORJIP (Offshore Renewables Joint Industry Programme), which undertook a study to understand seabird behaviour at sea around offshore wind farms (Skov et al., 2018). The ORJIP project studied birds around thanet offshore wind farm 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 and avoidance behaviour from an empirical data source, which it recommended for future incorporation in CRM. 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 precautionary nature of collision risk modelling for all species of seabirds.

12.13.81 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.

Table 12-34 Monthly and annual collision estimates for each species considered. Collision estimates are Mean (95% Confidence Limits).

Month	Gannet	Kittiwake	Herring gull	Lesser black-backed gull	Great black-backed gull
Jan	0.13 (0.00 – 0.40)	9.80 (0.78 – 22.57)	12.4 (0.95 – 30.44)	0.00 (0.00 – 0.00)	3.2 (0.23 – 8.48)
Feb	0.00 (0.00 – 0.00)	1.61 (0.13 – 3.75)	1.13 (0.06 – 3.11)	0.00 (0.00 – 0.00)	0.00 (0.00 – 0.00)
Mar	0.16 (0.01 – 0.52)	5.85 (0.31 – 14.11)	5.82 (0.39 – 14.77)	1.23 (0.05 – 3.53)	0.00 (0.00 – 0.00)
Apr	0.97 (0.04 – 3.10)	0.00 (0.00 – 0.00)	0.00 (0.00 – 0.00)	0.00 (0.00 – 0.00)	1.8 (0.11 – 4.52)
May	0.51 (0.04 – 1.50)	0.79 (0.04 – 1.98)	5.05 (0.24 – 13.4)	1.51 (0.09 – 4.69)	0.00 (0.00 – 0.00)
Jun	0.46 (0.03 – 1.27)	0.42 (0.07 – 0.86)	15.61 (0.79 – 42.68)	0.00 (0.00 – 0.00)	0.00 (0.00 – 0.00)
Jul	0.32 (0.02 – 0.91)	0.00 (0.00 – 0.00)	8.03 (0.25 – 20.71)	0.00 (0.00 – 0.00)	2.32 (0.14 – 5.87)
Aug	0.63 (0.04 – 1.94)	0.00 (0.00 – 0.00)	0.00 (0.00 – 0.00)	1.63 (0.08 – 4.74)	2.13 (0.13 – 5.78)
Sep	0.56 (0.03 – 1.63)	0.67 (0.05 – 1.72)	0.00 (0.00 – 0.00)	0.00 (0.00 – 0.00)	4.09 (0.17 – 11.06)
Oct	0.44 (0.02 – 1.31)	0.65 (0.03 – 1.65)	0.00 (0.00 – 0.00)	0.00 (0.00 – 0.00)	3.74 (0.23 – 9.74)
Nov	0.41 (0.02 – 1.29)	1.55 (0.14 – 3.64)	0.00 (0.00 – 0.00)	0.00 (0.00 – 0.00)	0.00 (0.00 – 0.00)
Dec	0.32 (0.02 – 0.95)	6.92 (0.70 – 15.73)	14.57 (0.88 – 37.69)	0.00 (0.00 – 0.00)	2.55 (0.13 – 6.66)
Annual Total	4.92 (0.26 – 14.81)	28.25 (2.25 – 66.01)	62.62 (3.56 – 162.8)	4.37 (0.22 – 12.95)	19.84 (1.14 – 52.11)

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Gannet

sCRM Outputs

12.13.82 The monthly estimated mortality rates are presented in **Table 12-34**, which vary from a minimum of zero individuals in February to a maximum of approximately one individual in April. On an annual basis, the estimated mortality rate for collision risk from Rampion 2 is approximately five individuals, with a range of between zero and 15 individuals using the stochastic 95% confidence limits (**Table 12-34**), which is further broken down into relevant bio-seasons in **Table 12-35**. The magnitude of change is estimated by calculating the increase in baseline mortality within each bio-season with respect to the regional BDMPS populations and their overall baseline mortality rates as described in **paragraph 12.8.6**, which are based on age specific demographic rates and age class proportions as presented in **Table 12-18**.

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Table 12-35 Bio-seasons collision risk estimates for gannet Rampion 2

Bio-season (months)	Collisions (95% Confidence Limits)	Regional baseline populations and baseline mortality rates (individuals per annum)		Increase in baseline mortality (%)
		Population	Baseline Mortality	
Return Migration (December -March)	0.61 (0.03 – 1.87)	248,385	46,696	0.001% (0.000% – 0.004%)
Migration-free Breeding (April - August)	2.9 (0.16 – 8.72)	400,326	75,261	0.004% (0.000% – 0.012%)
Post-breeding migration (September -November)	1.41 (0.07 – 4.23)	456,298	85,784	0.002% (0.000% – 0.005%)
Annual (BDMPS)	4.92 (0.26 – 14.81)	456,298	85,784	0.006% (0.000% – 0.017%)
Annual (biogeographic)	4.92 (0.26 – 14.81)	1,180,000	221,840	0.002% (0.000% – 0.007%)

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Magnitude of impact

12.13.83 During the return migration bio-season, less than one (0.61) gannet may be subject to mortality. The BDMPS for the return migration bio-season is defined as 248,385 (Furness, 2015) and using the average baseline mortality rate of 0.188 (**Table 12-18**), the natural predicted mortality in the return migration bio-season is 46,696. The addition of less than one mortality would increase the mortality relative to the baseline mortality rate by 0.001%.

12.13.84 This level of potential change is considered to be of **Negligible** magnitude during the return migration bio-season, as it represents no discernible increase to baseline mortality levels due to a very small number of estimated collisions.

12.13.85 During the migration-free breeding bio-season, approximately three (2.90) gannets may be subject to mortality. During the migration-free breeding bio-season, the BDMPS population is calculated to be 400,326 gannets (**Table 12-17**). When the average baseline mortality rate of 0.188 (**Table 12-18**) is applied, the natural predicted mortality in the migration-free breeding bio-season is 75,261. The addition of three mortalities would increase the mortality relative to the baseline mortality rate by 0.004%.

12.13.86 This level of potential change is considered to be of **Negligible** magnitude during the migration-free breeding bio-season, as it represents only a slight difference to the baseline conditions due to the small number of estimated collisions.

12.13.87 During the post-breeding migration bio-season, approximately one (1.41) gannet may be subject to mortality. The BDMPS for the post-breeding migration bio-season is defined as 456,298 (Furness, 2015) and using the average baseline mortality rate of 0.188 (**Table 12-18**), the natural predicted mortality in the post-breeding migration bio-season is 85,784. The addition of one mortality would increase the mortality relative to the baseline mortality rate by 0.002%.

12.13.88 This level of potential change is considered to be of **Negligible** magnitude during the post-breeding migration bio-season, as it represents no discernible increase to baseline mortality levels due to a very small number of estimated collisions.

12.13.89 The annual total of gannets subject to mortality due to collision is estimated to be approximately five. Using the largest BDMPS population of 456,298, as a proxy for the annual BDMPS population, with an average baseline mortality rate of 0.188 (**Table 12-18**), the natural predicted mortality is 85,784. The addition of five mortalities would increase the mortality relative to the baseline mortality rate by 0.006%. When considering the annual potential level of change at the biogeographic scale, the natural predicted mortality for the biogeographic population of 1,180,000 across all seasons is 221,840. On a biogeographic scale, the addition of five mortalities would increase the mortality relative to the baseline mortality rate by 0.002%.

12.13.90 Consideration has also been given to the range of uncertainty surrounding collision risk. Considering the 95% confidence limits, the possible total annual range of gannets subject to mortality due to collision is estimated between zero and 15. Using the largest BDMPS population of 456,298, as a proxy for the annual BDMPS population, with an average baseline mortality rate of 0.188 (**Table 12-18**), the natural predicted mortality is 85,784. The addition of between zero and

15 mortalities would increase the mortality relative to the baseline mortality rate by 0.000% to 0.017%. When considering the annual potential level of change at the biogeographic scale, the natural predicted mortality for the biogeographic population of 1,180,000 across all seasons is 221,840. The addition of between zero and 15 mortalities would increase the mortality relative to the biogeographic baseline mortality rate by 0.000% to 0.007%.

12.13.91 This level of potential change is considered to be **Negligible** on an annual basis at both the BDMPS and bio-geographic scales, as it represents no discernible increase to baseline mortality levels due to the small number of estimated collisions.

12.13.92 Therefore, the magnitude of change resulting from collision risk in each bio-season alone and on an annual basis is considered to be **Negligible**. Irrespective of the sensitivity of the receptor, the significance of the effect is **Not Significant** as defined in the assessment of significance matrix (**Table 12-24**) and is not considered further in this assessment.

12.13.93 In order to determine the magnitude of impact at the population level over the life span of Rampion 2, Population Viability Analysis (PVA) has been conducted against the largest North Sea and English Channel BDMPS population. PVA was conducted using Natural England PVA Tool (Searle *et al.*, 2019). Full details of the methodology are presented in **Appendix 12.5: Population viability analysis, Volume 4** of the ES (Document Reference: 6.4.12.5)**.** The predicted annual mortality rate due to collisions associated with wind turbine blades from Rampion 2 alone is approximately five (4.92) individuals per annum. The lowest value for predicted impact (mortality per annum) which was considered for gannet was set to 300 impacts per annum. When assessing this increase in mortality against the North Sea and English Channel BDMPS population of 456,298 individuals (adults and immatures), the population growth rate is expected to decline to 0.08% of the counterfactual (no impact) growth rate, which after 30 years will have resulted in a reduction in population size by 2.37% compared to the counterfactual. Further details regarding the approach taken and the expected reductions in growth rates under differing levels of predicted impacts can be found in **Appendix 12.5: Population viability analysis, Volume 4** of the ES (Document Reference: 6.4.12.5).

Kittiwake

sCRM Outputs

12.13.94 The monthly estimated mortality rates are presented in **Table 12-34**, which vary from a minimum of zero individuals in April, July and August to a maximum of approximately seven individuals in December. On an annual basis, the estimated mortality rate for collision risk from Rampion 2 is approximately 28 individuals, with a 95% confidence interval of between 2 and 66 individuals (**Table 12-34**), which is further broken down into relevant bio-seasons in **Table 12-36**. The magnitude of change is estimated by calculating the increase in baseline mortality within each bio-season with respect to the regional BDMPS populations and their overall baseline mortality rates as described in **Section 12.8**, which are based on age

specific demographic rates and age class proportions as presented in **Table 12-18**.

Table 12-36 Bio-seasons collision risk estimates for kittiwake for Rampion 2

Bio-season (months)	Collision (min – max)	Regional baseline populations and baseline mortality rates (individuals per annum)		Increase in baseline mortality (%)
		Population	Baseline Mortality	
Return Migration (January - April)	17.25 (1.22 – 40.43)	691,526	108,570	0.016% (0.001% – 0.037%)
Migration-free Breeding (May - July)	1.21 (0.11 – 2.84)	245,234	38,502	0.003% (0.000% – 0.007%)
Post-breeding migration (August - December)	9.78 (0.92 – 22.74)	911,586	143,119	0.007% (0.001% – 0.016%)
Annual (BDMPS)	28.25 (2.25 – 66.01)	911,586	143,119	0.02% (0.002% – 0.046%)
Annual (biogeographic)	28.25 (2.25 – 66.01)	5,100,000	800,700	0.004% (0.000% – 0.008%)

Magnitude of impact

12.13.95 During the return migration bio-season, approximately 17 kittiwakes may be subject to mortality. The BDMPS for the return migration bio-season is defined as 691,526 (Furness, 2015) and using the average baseline mortality rate of 0.157 (**Table 12-18**), the natural predicted mortality in the return migration bio-season is 108,570. The addition of 17 mortalities would increase the mortality relative to the baseline mortality rate by 0.016%.

12.13.96 This level of potential change is considered to be of **Negligible** magnitude during the return migration bio-season, as it represents no discernible increase to baseline mortality levels due to a very small number of estimated collisions.

12.13.97 During the migration-free breeding bio-season, approximately one kittiwake may be subject to mortality. During the migration-free breeding bio-season, the total regional baseline population of breeding adults and immature birds is predicted to be 245,234 kittiwakes (**Table 12-17**). When the average baseline mortality rate of 0.157 (**Table 12-18**) is applied, the natural predicted mortality in the migration-free

breeding bio-season is 38,502. The addition of one mortality would increase the mortality relative to the baseline mortality rate by 0.003%.

12.13.98 This level of potential change is considered to be of **Negligible** magnitude during the non-migratory breeding bio-season, as it represents only a slight difference to the baseline conditions due to the small number of estimated collisions.

12.13.99 During the post-breeding migration bio-season, approximately 10 kittiwakes may be subject to mortality. The BDMPS for the post-breeding migration bio-season is defined as 911,586 (**Table 12-17**) and using the average baseline mortality rate of 0.157 (**Table 12-18**), the natural predicted mortality in the post-breeding migration bio-season is 143,119. The addition of 10 mortalities would increase the mortality relative to the baseline mortality rate by 0.007%.

12.13.100 This level of potential change is considered to be of negligible magnitude during the post-breeding migration bio-season, as it represents no discernible increase to baseline mortality levels due to a very small number of estimated collisions.

12.13.101 The annual total of kittiwakes subject to mortality due to collision is estimated to be approximately 28 individuals. Using the largest BDMPS population of 911,586, as a proxy for the annual BDMPS population, with an average baseline mortality rate of 0.157 (**Table 12-18**), the natural predicted mortality is 143,119. The addition of 28 mortalities would increase the mortality relative to the baseline mortality rate by 0.020%. When considering the annual potential level of change at the biogeographic scale, the natural predicted mortality for the biogeographic population of 5,100,000 across all seasons is 800,700. The addition of 28 mortalities would increase the mortality relative to the biogeographic baseline mortality rate by 0.004%.

12.13.102 Consideration has also been given to the range of uncertainty surrounding collision risk. Considering the 95% confidence limits, the possible total annual range of kittiwakes subject to mortality due to collision is estimated between two and 66. Using the largest BDMPS population of 911,586, as a proxy for the annual BDMPS population, with an average baseline mortality rate of 0.157 (**Table 12-18**), the natural predicted mortality is 143,119. The addition of between two and 66 mortalities would increase the mortality relative to the baseline mortality rate by 0.002% to 0.046%. When considering the annual potential level of change at the biogeographic scale, the natural predicted mortality for the biogeographic population of 5,100,000 across all seasons is 800,700. The addition of between two and 66 mortalities would increase the mortality relative to the biogeographic baseline mortality rate by 0.000% to 0.008%.

12.13.103 This level of potential change is considered to be **Negligible** on an annual basis at both the BDMPS and bio-geographic scales, as it represents no discernible increase to baseline mortality levels due to the small number of estimated collisions.

12.13.104 Therefore, the magnitude of change resulting from collision risk in each bio-season alone and on an annual basis is considered to be **Negligible**. Irrespective of the sensitivity of the receptor, the significance of the effect is **Not Significant** as defined in the assessment of significance matrix (**Table 12-24**) and is not considered further in this assessment.

Lesser black-backed gull

sCRM Outputs

12.13.105 The monthly estimated mortality rates are presented in **Table 12-34**, which vary from a minimum of zero individuals in several months to a maximum of approximately two individuals in May and August. On an annual basis, the estimated mortality rate for collision risk from Rampion 2 is approximately four individuals with a range of between zero and 13 individuals using the 95% confidence limits (**Table 12-34**), which is further broken down into relevant bio-seasons in **Table 12-37**. The magnitude of change is estimated by calculating the increase in baseline mortality within each bio-season with respect to the regional BDMPS populations and their overall baseline mortality rates as described in **Section 12.8**, which are based on age specific demographic rates and age class proportions as presented in **Table 12-18**.

Table 12-37 Bio-season collision risk estimates for lesser black-backed gull for Rampion 2

Bio-season (months)	Collision (min – max)	Regional baseline populations and baseline mortality rates (individuals per annum)		Increase in baseline mortality (%)
		Population	Baseline Mortality	
Return Migration (March - April)	1.23 (0.05 – 3.53)	197,483	24,488	0.005% (0.000% – 0.014%)
Migration-free Breeding (May - July)	1.51 (0.09 – 4.69)	51,233	6,353	0.024% (0.001% – 0.074%)
Post-breeding migration (August - October)	1.63 (0.08 – 4.74)	209,007	25,917	0.006% (0.000% – 0.018%)
Migration-free Winter (November – February)	0.00 (0.00 – 0.00)	39,314	4,875	0.000% (0.000% – 0.000%)
Annual (BDMPS)	4.37 (0.22 – 12.95)	209,007	25,917	0.017% (0.001% – 0.050%)
Annual (biogeographic)	4.37 (0.22 – 12.95)	864,000	107,136	0.004% (0.000% – 0.012%)

Magnitude of impact

12.13.106 During the return migration bio-season, approximately one (1.23) lesser black-backed gull is predicted to be subject to mortality. The BDMPS for the return migration bio-season is defined as 197,483 (Furness, 2015) and using the average baseline mortality rate of 0.124 (**Table 12-18**), the natural predicted mortality in the return migration bio-season is 24,488. The addition of one mortality will increase the mortality relative to the baseline mortality rate by 0.005%.

12.13.107 This level of potential change is considered to be of **Negligible** magnitude during the return migration bio-season, as it represents no discernible increase to baseline mortality levels due to a very small number of estimated collisions.

12.13.108 During the migration-free breeding bio-season, approximately two (1.51) lesser black-backed gulls are estimated to be subject to mortality. The regional breeding population was calculated as 51,233 (**Table 12-17**) and using the average baseline mortality rate of 0.124 (**Table 12-18**), the natural predicted mortality in the migration-free breeding bio-season is 6,353. The addition of two mortalities would increase the mortality relative to the baseline mortality rate by 0.024%.

12.13.109 This level of potential change is considered to be of **Negligible** magnitude during the migration-free breeding bio-season, as it represents no discernible increase to baseline mortality levels due to the very small number of estimated collisions.

12.13.110 During the post-breeding migration bio-season, two (1.63) lesser black-backed gulls are estimated to be subject to mortality. The BDMPS population is defined as 209,007 (**Table 12-17**) and using the average baseline mortality rate of 0.124 (**Table 12-18**), the natural predicted mortality in the post-breeding migration bio-season is 25,917. The addition of two mortalities would increase the mortality relative to the baseline mortality rate by 0.006%.

12.13.111 This level of potential change is considered to be of **Negligible** magnitude during the migration-free breeding bio-season, as it represents no discernible increase to baseline mortality levels due to the very small number of estimated collisions.

12.13.112 During the migration-free winter bio-season, zero lesser black-backed gulls are predicted to be subject to mortality. This represents no change and therefore those bio-seasons are not assessed further.

12.13.113 The annual total of lesser black-backed gulls subject to mortality due to collision is estimated to be approximately four (4.37). Using the largest BDMPS population of 209,007, as a proxy for the annual BDMPS population, with an average baseline mortality rate of 0.124 (**Table 12-18**), the natural predicted mortality is 25,917. The addition of four mortalities would increase the mortality relative to the baseline mortality rate by 0.017%. When considering the annual potential level of change at the biogeographic scale, the natural predicted mortality for the biogeographic population of 864,000 across all seasons is 107,136. The addition of four mortalities would increase the mortality relative to the biogeographic baseline mortality rate by 0.004%.

12.13.114 Consideration has also been given to the range of uncertainty surrounding collision risk. Considering the 95% confidence limits, the possible total annual range of lesser black-backed gulls subject to mortality due to collision is estimated between zero and 13. Using the largest BDMPS population of 209,007, as a proxy

for the annual BDMPS population, with an average baseline mortality rate of 0.124 (**Table 12-18**), the natural predicted mortality is 25,917. The addition of between zero and 13 mortalities would increase the mortality relative to the baseline mortality rate by 0.001% to 0.050%. When considering the annual potential level of change at the biogeographic scale, the natural predicted mortality for the biogeographic population of 864,000 across all seasons is 107,136. The addition of between zero and 13 mortalities would increase the mortality relative to the biogeographic baseline mortality rate by 0.000% to 0.012%.

12.13.115 This level of potential change is considered to be **Negligible** on an annual basis at both the BDMPS and bio-geographic scales, as it represents no discernible increase to baseline mortality levels due to the small number of estimated collisions.

12.13.116 Therefore, the magnitude of change resulting from collision risk in each bio-season alone and on an annual basis is considered to be **Negligible**. Irrespective of the sensitivity of the receptor, the significance of the effect is **Not Significant** as defined in the assessment of significance matrix (**Table 12-24**) and is not considered further in this assessment.

Herring gull

sCRM Outputs

12.13.117 The monthly estimated mortality rates are presented in **Table 12-34**, which vary from a minimum of zero individuals in several months to a maximum of approximately 15 individuals in June and December. On an annual basis, the estimated mortality rate for collision risk from Rampion 2 is approximately 63 individuals with a range of between four and 163 individuals using the 95% confidence limits from the sCRM outputs (**Table 12-34**), which is further broken down into relevant bio-seasons in **Table 12-38**.The magnitude of change is estimated by calculating the increase in baseline mortality within each bio-season with respect to the regional BDMPS populations and their overall baseline mortality rates as described in **Section 12.8**, which are based on age specific demographic rates and age class proportions as presented in **Table 12-18**.

Table 12-38 Bio-seasons collision risk estimates for herring gull for Rampion 2

Bio-season (months)	Collision (min – max)	Regional baseline populations and baseline mortality rates (individuals per annum)		Increase in baseline mortality (%)
		Population	Baseline Mortality	
Breeding (March – August)	34.52 (1.67 – 91.56)	324,887	55,881	0.062% (0.003% – 0.164%)

Bio-season (months)	Collision (min – max)	Regional baseline populations and baseline mortality rates (individuals per annum)		Increase in baseline mortality (%)
		Population	Baseline Mortality	
Non-breeding (September – February)	28.11 (1.89 – 71.25)	466,511	80,240	0.035% (0.002% – 0.089%)
Annual (BDMPS)	62.62 (3.56 – 162.8)	466,511	80,240	0.078% (0.004% – 0.203%)
Annual (biogeographic)	62.62 (3.56 – 162.8)	1,098,000	188,856	0.033% (0.002% – 0.086%)

Magnitude of impact

12.13.118 During the breeding bio-season, approximately 35 herring gulls are estimated to be subject to mortality. The regional population during the breeding bio-season is 324,887 (**Table 12-17**) and using the average baseline mortality rate of 0.172 (**Table 12-18**), the natural predicted mortality in the breeding bio-season is 55,881. The addition of 35 mortalities would increase the mortality relative to the baseline mortality rate by 0.062%.

12.13.119 This level of potential change is considered to be of **Negligible** magnitude during the breeding bio-season, as it represents only a slight increase to baseline mortality levels due to the small number of estimated collisions.

12.13.120 During the non-breeding bio-season, approximately 28 herring gulls are estimated to be subject to mortality. The BDMPS for the non-breeding bio-season is defined as 466,511 (**Table 12-17**) and using the average baseline mortality rate of 0.172 (**Table 12-18**), the natural predicted mortality in the non-breeding bio-season is 80,240. The addition of 28 mortalities would increase the mortality relative to the baseline mortality rate by 0.035%.

12.13.121 This level of potential change is considered to be of **Negligible** magnitude during the non-breeding bio-season, as it represents no discernible increase to baseline mortality levels due to a very small number of estimated collisions.

12.13.122 The annual total of herring gulls subject to mortality due to collision is estimated to be approximately 63. Using the largest BDMPS population of 466,511, as a proxy for the annual BDMPS population, with an average baseline mortality rate of 0.172 (**Table 12-18**), the natural predicted mortality is 80,240.The addition of 63 mortalities would increase the mortality relative to the baseline mortality rate by 0.078%. When considering the annual potential level of change at the biogeographic scale, the natural predicted mortality for the biogeographic population of 1,098,000 across all seasons is 188,856. The addition of 63

mortalities would increase the mortality relative to the biogeographic baseline mortality rate by 0.033%.

12.13.123 Consideration has also been given to the range of uncertainty surrounding collision risk. Considering 95% confidence limits, the possible total annual range of herring gulls subject to mortality due to collision is estimated between four and 163. Using the largest BDMPS population of 466,511, as a proxy for the annual BDMPS population, with an average baseline mortality rate of 0.172 (**Table 12-18**), the natural predicted mortality is 80,240. The addition of between four and 163 mortalities will increase the mortality relative to the baseline mortality rate by 0.004% to 0.160%. When considering the annual potential level of change at the biogeographic scale, the natural predicted mortality for the biogeographic population of 1,098,000 across all seasons is 188,856. The addition of between four and 163 mortalities will increase the mortality relative to the biogeographic baseline mortality rate by 0.002% to 0.086%.

12.13.124 This level of potential change is considered to be **Negligible** on an annual basis at both the BDMPS and bio-geographic scales, as it represents no discernible increase to baseline mortality levels due to the small number of estimated collisions.

12.13.125 Therefore, the magnitude of change resulting from collision risk in each bio-season alone and on an annual basis is considered to be **Negligible**. Irrespective of the sensitivity of the receptor, the significance of the effect is **Not Significant** as defined in the assessment of significance matrix (**Table 12-24**) and is not considered further in this assessment.

12.13.126 In order to determine the magnitude of impact at the population level over the life span of Rampion 2, Population Viability Analysis (PVA) has been conducted against the largest North Sea and English Channel BDMPS population. PVA was conducted using Natural England PVA Tool (Searle *et al.*, 2019). Full details of the methodology are presented in **Appendix 12.5: Population viability analysis, Volume 4** of the ES (Document Reference: 6.4.12.5). The predicted annual mortality rate due to collisions associated with wind turbine blades from Rampion 2 alone is approximately **634** individuals per annum. The PVA was ran for a range of annual mortalities, between 600 and 1200 individuals per annum. Assessing the additional mortality using the 650 level against the North Sea and English Channel BDMPS population of 466,511 individuals (adults and immatures), the population growth rate is expected to decline to 0.17% of the counterfactual (no impact) growth rate, which after 30 years will have resulted in a reduction in population size by 5.09% compared to the counterfactual. Further details regarding the approach taken and the expected reductions in growth rates under differing levels of predicted impacts can be found in **Appendix 12.5: Population viability analysis, Volume 4** of the ES (Document Reference: 6.4.12.5).

Great black-backed gull

sCRM Outputs

12.13.127 The monthly estimated mortality rates are presented in **Table 12-34** which vary from a minimum of zero individuals in several months to a maximum of approximately four individuals in September and October. On an annual basis, the

estimated mortality rate for collision risk from Rampion 2 is approximately 20 individuals with a range of between one and 52 individuals using the 95% confidence limits from the sCRM outputs (**Table 12-34**), which is further broken down into relevant bio-seasons in **Table 12-39**. The magnitude of change is estimated by calculating the increase in baseline mortality within each bio-season with respect to the regional BDMPS populations and their overall baseline mortality rates as described in **Section 12.8**, which are based on age specific demographic rates and age class proportions as presented in **Table 12-18**.

Table 12-39 Bio-seasons collision risk estimates for great black-backed gull for Rampion 2

Bio-season (months)	Collision (min – max)	Regional baseline populations and baseline mortality rates (individuals per annum)		Increase in baseline mortality (%)
		Population	Baseline Mortality	
Breeding (April - August)	6.25 (0.38 – 16.18)	44,753	4,162	0.15% (0.009% – 0.389%)
Non-breeding (September - March)	13.59 (0.76 – 35.94)	17,742	1,650	0.823% (0.046% – 2.178%)
Annual (BDMPS)	19.84 (1.14 – 52.11)	48,832	4,541	0.437% (0.025% – 1.148%)
Annual (biogeographic)	19.84 (1.14 – 52.11)	235,000	21,855	0.091% (0.005% – 0.238%)

Magnitude of impact

12.13.128 During the breeding bio-season, approximately six great black-backed gulls are estimated to be subject to mortality. The BDMPS population for the migration-free breeding bio-season is defined as 44,753 (**Table 12-17**) and using the average baseline mortality rate of 0.093 (**Table 12-18**), the natural predicted mortality in the migration-free breeding bio-season is 4,162. The addition of six mortalities would increase the mortality relative to the baseline mortality rate by 0.150%.

12.13.129 This level of potential change is considered to be of **Negligible** magnitude during the post-breeding migration bio-season, as it represents no discernible increase to baseline mortality levels due to a very small number of estimated collisions.

12.13.130 During the non-breeding bio-season, approximately 14 great black-backed gulls are estimated to be subject to mortality. The BDMPS for the post-breeding migration bio-season is defined as 17,742 (**Table 12-17**) and using the average

baseline mortality rate of 0.093 (**Table 12-18**), the natural predicted mortality in the post-breeding migration bio-season is 1,650. The addition of 14 mortalities would increase the mortality relative to the baseline mortality rate by 0.823%.

12.13.131 This level of potential change is considered to be of **Negligible** magnitude during the post-breeding migration bio-season, as it represents no discernible increase to baseline mortality levels due to a very small number of estimated collisions.

12.13.132 The annual total of great black-backed gulls subject to mortality due to collision is estimated to be approximately 20. Using the BDMPS population of 48,832 as a proxy for the annual BDMPS population, with an average baseline mortality rate of 0.093 (**Table 12-18**), the natural predicted mortality is 4,541. The addition of 20 mortalities would increase the mortality relative to the baseline mortality rate by 0.437%. When considering the annual potential level of change at the biogeographic scale, the natural predicted mortality for the biogeographic population of 235,000 across all seasons is 21,855. The addition of 20 mortalities would increase the mortality relative to the biogeographic baseline mortality rate by 0.091%.

12.13.133 Consideration has also been given to the range of uncertainty surrounding collision risk. Considering the 95% confidence limits, the possible total annual range of great black-backed gulls subject to mortality due to collision is estimated between one and 52. Using the BDMPS population of 48,832 as a proxy for the annual BDMPS population, with an average baseline mortality rate of 0.093 (Table 12.16), the natural predicted mortality is 4,541. The addition of between one and 52 mortalities would increase the mortality relative to the baseline mortality rate by 0.025% to 1.148%. When considering the annual potential level of change at the biogeographic scale, the natural predicted mortality for the biogeographic population of 235,000 across all seasons is 21,855. The addition of between one and 52 mortalities would increase the mortality relative to the biogeographic baseline mortality rate by 0.005% to 0.238%.

12.13.134 This level of potential change is considered to be very low on an annual basis at both the BDMPS and bio-geographic scales, as it represents at most a very slight increase to baseline mortality levels due to the small number of estimated collisions. However, as the upper 95% confidence limit exceeds a 1% increase compared to baseline mortality, a Population Viability Analysis (PVA) has been conducted.

12.13.135 The PVA has been conducted against the largest South-west and English Channel BDMPS population. PVA was conducted using Natural England PVA Tool (Searle *et al.*, 2019). Full details of the methodology are presented in **Appendix 12.5: Population viability analysis, Volume 4** of the ES (Document Reference 6.4.12.5)**.** The predicted annual mortality rate due to collisions associated with wind turbine blades from Rampion 2 alone is 19.8 individuals per annum. The closest value for predicted impact (mortality per annum) which was considered for great black-backed gull was 20 mortalities per annum. When assessing this increase in mortality against the South-west and English Channel BDMPS population of 17,742 individuals (adults and immatures), the population growth rate is expected to decline by 0.14% compared to the counterfactual (no impact) growth rate, which after 30 years will have resulted in a population size 4.13% smaller compared to the counterfactual. Further details regarding the approach

taken and the expected reductions in growth rates under differing levels of predicted impacts can be found in **Appendix 12.5: Population viability analysis, Volume 4** of the ES (Document Reference 6.4.12.5). This decrease in growth rate and population size is considered to be negligible.

12.13.136 Therefore, the magnitude of change resulting from collision risk to great black-backed gull is considered to be **Negligible**. Irrespective of the sensitivity of the receptor, the significance of the effect is **Not Significant** as defined in the assessment of significance matrix (**Table 12-24**) and is not considered further in this assessment.

Collision risk: migratory seabirds and non-seabirds

12.13.137 Migrant birds flying through the array area during the operational phase are at risk of collision with WTG rotors and associated infrastructure. The result of such collisions may be fatal to the bird concerned. Migratory birds may not be reliably detected using aerial digital surveys or any other existing generally applied survey method. Migratory birds may move through in short pulses, in poor weather or at night (when no surveys take place), or at high altitudes, which makes recording their numbers extremely complex.

12.13.138 An assessment of the risk of collision to migratory birds has been carried out for Rampion 2, with detailed methods and results presented in **Appendix 12.4: Migratory CRM, Volume 4** of the ES (Document Reference: 6.4.12.4). This assessment follows Natural England's latest guidance (Parker et al., 2022). An initial selection exercise was carried out to identify species potentially at risk from collision during migration. A list of 38 species of birds (the majority of which were waterfowl and wader species) were identified based on the selection exercise for assessment of migratory collision risk (selection rationale provided in **Annex A** of **Appendix 12.4: Migratory CRM, Volume 4** of the ES (Document Reference: 6.4.12.4)). Migrant birds were then assessed using either a 'broad front' approach or APEM's bespoke modelling approach, using Migropath, to estimate the number of individuals expected to pass through the array area each year. For species assessed using Migropath, where the number of individuals predicted to pass through the array area exceeded 1% of the UK population, CRM was carried out using the Band (2012) CRM. Based on this assumption the following species were not taken forward for further assessment: 'dark bellied' brent goose, shelduck, red-breasted merganser, osprey, oystercatcher (wintering only), avocet (wintering only), stone-curlew and golden plover (wintering only), as less than 1% of the UK population was predicted to pass through the array area, and therefore the maximum impact would be of negligible magnitude.

12.13.139 The use of Migropath cannot be applied to all species, typically those species which do not display point-to-point migration patterns are unsuitable to be modelled using this procedure (Alerstam, 1990). Many seabird species fall into this category (Wernham *et al.* 2002), as many seabirds are known to undertake longer migratory routes, for example following the coastline in preference to a more direct route over land. For those species which display this migratory behaviour, a 'broad front' pathway might better describe the movements of these species as they travel through the English Channel. Consequently, the risks to which this population is exposed relates to the proportion of the 'broad front' pathway

crossing, in this instance, the location of the Rampion 2 array area. Within that 'broad front', birds might be distributed evenly, or they might have a distribution that is skewed, such as a bias towards the coast. Further details on this method are provided in **Section 4** of **Appendix 12.5: Population viability analysis, Volume 4** of the ES (Document Reference: 6.4.12.5), which are in accordance with Natural England's S42 comments recommending consideration of assessments of migratory seabird species be undertaken using the approach described by WWT Consulting and MacArthur Green Ltd (2014).

12.13.140 CRM was carried out using Band Option 1 for all species and Band Option 2 for species where species-specific flight height distribution data were available in Johnston *et al.* (2014). For BO1, the proportion at PCH values for Arctic skua, Arctic tern and Sandwich tern were taken from Cook *et al.* (2012). For the remaining species when run under BO1 the generic species group values put forward by Wright *et al.* (2012) were selected in the absence of any species-specific proportion at PCH data. As there was no specific avoidance rate calculated for a range of species in **Table 12-40** and **Table 12-41** an avoidance rate of 98% was adopted for the evaluation of collision risk as recommended in Cook *et al.* (2012).

12.13.141 Following the Natural England and the RSPB's S42 comments (see **Table 12-5**), the cumulative impact from both Rampion 1 and Rampion 2 is also considered in **Table 12-40**. Note that the Rampion 1 Migratory Collision Risk estimates are based on the results presented in that project's examination (APEM, 2013). Not all species assessed as part of the Rampion 2 Migratory CRM were considered in detail for Rampion 1. Furthermore, it should be noted that the modelling approach may not align exactly, and Rampion 1 results have not been altered to account for the fact that the as-built design for Rampion 1 was reduced from the maximum design consented.

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Table 12-40 Summary of collision risk assessment on migrant waterbirds from Rampion 2 and cumulatively for Rampion 1 & Rampion 2 where applicable. All results are Band Option 1.

Species	UK Population	Adult Baseline Mortality (Robinson, 2005)	UK Baseline Mortality	Avoidance Rate	Annual Collision Rate Rampion 2 alone (*Rampion 1+2)*	Increase in Baseline Mortality (%) Rampion 2 alone (*Rampion 1+2)*
European White-fronted goose	2,400	0.276	662	98.0%	0.04	0.01
Wigeon	440,000	0.470	206,800	98.0%	2.18	0.00
Gadwall	25,000	0.280	7,000	98.0%	0.22	0.00
Teal	210,000	0.470	98,700	98.0%	0.94	0.00
Pintail	29,000	0.337	9,773	98.0%	0.12	0.00
Shoveler	18,000	0.420	7,560	98.0%	0.11	0.00
Pochard	38,000	0.350	13,300	98.0%	0.31	0.00
Little egret	4,500	0.288	1,296	98.0%	0.18	0.01
Marsh harrier	201	0.260	52	98.0%	0.02 *(0.16)*	0.04 *(0.31)*
Hen harrier	750	0.190	143	98.0%	0.02	0.01
Oystercatcher	226,000	0.120	27,120	98.0%	2.39	0.01

Species	UK Population	Adult Baseline Mortality (Robinson, 2005)	UK Baseline Mortality	Avoidance Rate	Annual Collision Rate Rampion 2 alone (*Rampion 1+2)*	Increase in Baseline Mortality (%) Rampion 2 alone (*Rampion 1+2)*
Avocet	877	0.220	193	98.0%	0.04	0.02
Ringed plover	44,876	0.228	10,232	98.0%	0.04 *(3.81)*	0.00 *(0.04)*
Golden plover	45,200	0.270	12,204	98.0%	0.61	0.01
Grey plover	43,000	0.270	11,610	98.0%	0.23 *(3.28)*	0.00 *(0.03)*
Lapwing	620,000	0.295	182,900	98.0%	5.56	0.00
Knot	320,000	0.159	50,880	98.0%	1.75	0.00
Sanderling	16,000	0.170	2,720	98.0%	0.07	0.00
Dunlin	18,300	0.260	4,758	98.0%	0.06 – 0.07 *(0.23 – 0.24)*	0.00 *(0.00)*
Ruff	800	0.476	381	98.0%	0.01	0.00
Snipe	1,000,000	0.519	519,000	98.0%	10.00	0.00
Black-tailed godwit (Icelandic)	43,000	0.060	2,580	98.0%	0.72 *(1.32)*	0.03 *(0.05)*
Bar-tailed godwit	38,000	0.285	10,830	98.0%	0.08	0.00

Species	UK Population	Adult Baseline Mortality (Robinson, 2005)	UK Baseline Mortality	Avoidance Rate	Annual Collision Rate Rampion 2 alone (*Rampion 1+2)*	Increase in Baseline Mortality (%) Rampion 2 alone (*Rampion 1+2)*
Redshank	120,000	0.260	31,200	98.0%	1.28 *(3.20)*	0.00 *(0.01)*
Whimbrel	3,840	0.110	422	98.0%	0.01	0.00
Turnstone	48,000	0.140	6,720	98.0%	0.30	0.01
Nightjar	25,000	0.300	7,500	98.0%	0.08	0.00

Table 12-41 Summary of collision risk assessment on migrant seabirds from Rampion 2 and cumulatively for Rampion 1 & Rampion 2 where applicable.

Species	Population Assessed	Adult Baseline Mortality (Robinson, 2005)	UK Baseline Mortality	Avoidance Rate	Annual Collision Rate (BO1) Rampion 2 alone (*Rampion 1+2*)	Increase in Baseline Mortality (%) Rampion 2 alone (*Rampion 1+2*)	Annual Collision Rate (BO2) Rampion 2 alone (*Rampion 1+2*)	Increase in Baseline Mortality (%)Rampion 2 alone (*Rampion 1+2*)
Arctic skua	725	0.09*	10	98.0%	0.04	0.00	0.01	0.00
Mediterranean gull	833	0.18**	146	98.0%	0.19	0.13	N/A	N/A
Little tern	1,057	0.20*	211	98.0%	0.20	0.09	N/A	N/A
Roseate tern	24	0.15	3	98.0%	0.00	0.00	N/A	N/A
Arctic tern	49,179	0.16*	8,016	98.0%	3.89 *(4.05)*	0.05 *(0.05)*	2.36 *(2.52)*	0.03 *(0.03)*
Sandwich tern	11,475	0.10*	1,170	98.0%	1.21	0.10	1.15	0.10

Table note: * denotes species that have adult mortality rates derived from Horswill & Robinson (2015) ** denotes species which have had to refer to a related species as a proxy for adult mortality rates (in this instance black-headed gull has been used as a proxy for Mediterranean gull).

Magnitude of impact

12.13.142 The predicted collision risk values attributed to Rampion 2 as presented in **Table 12-40** and **Table 12-41** range from a minimum of zero predicted annual mortalities to a maximum of 10 predicted annual mortalities. For all migratory receptors the predicted increase in baseline mortality due to collision was found to be at most 0.13% per annum.

12.13.143 This level of potential impact is considered to be **negligible** on an annual basis, as it represents no discernible increase to baseline mortality levels due to the small number of estimated collisions.

12.13.144 Therefore, the magnitude of impact of **negligible** irrespective of the receptor's sensitivity, following the matrix approach set out in **Table 12-24**, the significance of effect has been assessed as minor at most, which is **Not Significant**.

Barrier effect: Array area

12.13.145 In the operational phase of Rampion 2, the presence of WTGs could create a barrier to the movements of birds. This may result in permanent changes in flight routes for the birds concerned and an increase in energy demands associated with those movements. This might result in a lower rate of breeding success or in reduced survival chances for the individuals affected.

12.13.146 This could affect seabirds migrating along the English Channel (east-west movement), non-seabirds migrating across the English Channel (north-south movement) and breeding seabirds on foraging trips.

Migrating Seabirds

12.13.147 For seabirds migrating along the English Channel, the Rampion 2 array area is roughly parallel with the typical flight direction, with a frontage width of 12km compared to the entire width of the channel of approximately 130km. Of this, the existing Rampion 1 already occupies a frontage width of approximately 7km. The number of additional migrating seabirds encountering Rampion 2 would therefore be a small proportion of the total number of migrating seabirds. Furthermore, the change in route would require a maximum deviation of 6km, which is a negligible distance for migratory seabirds and the increase in energy demand is minor and would be insignificant compared to unsuitable wind conditions or changes in prey density (Masden *et al.*, 2010). The magnitude of change would therefore be, at most, **negligible** and so, regardless of the sensitivity of the receptor involved, the effect is assessed as **Not Significant** as defined in the assessment of significance matrix (**Table 12-24**).

Migrating Non-seabirds

12.13.148 For birds migrating across the English Channel (i.e. between England and France), Rampion 2 may create a barrier effect. Unlike seabirds, most non-seabirds are unable to rest or forage at sea and are therefore required to complete the crossing in a single flight. With a frontal area of 32.9km, the maximum deviation required would be 16.5km. A direct flight line across the English Channel

at that point would be approximately 128km. This would therefore represent an increase in flight distance of 14.8%. This is a relatively small increase, and unlikely to be significant compared to the effect of unfavourable winds or cold weather.

12.13.149 The English Channel is approximately 560km long, and therefore only a small proportion of birds crossing the Channel are likely to encounter Rampion 2 at all. If birds were distributed evenly, approximately 6% might be expected to encounter Rampion 2. Birds that are most sensitive to energy constraints are more likely to cross at the narrowest point (the Strait of Dover), which would avoid Rampion 2 entirely.

12.13.150 However, it should be noted that most migratory non-seabirds fly at heights well above the maximum turbine blade height (Alerstam, 1990) and therefore are likely to fly over the OWF, rather than around it.

12.13.151 The magnitude of change would therefore be, at most, **negligible** and so, regardless of the sensitivity of the receptor involved, the effect is assessed as **Not Significant** as defined in the assessment of significance matrix (**Table 12-24**).

Breeding Seabirds

12.13.152 Ecological theory suggests that birds, while they are breeding, will take the shortest (energetically most efficient) route to and from known areas that provide good foraging resources. Any deviation from this route may lead to an increase in energy demands associated with those movements. This might result in a lower rate of breeding success or in reduced survival chances for the individuals affected.

12.13.153 Of the species identified as breeding within the region surrounding Rampion 2 (see **Appendix 12.1: Baseline technical report, Volume 4** of the ES (Document Reference: 6.4.12.1)), only kittiwakes breeding on the south coast of Sussex at Splash Point, Seaford, have been identified as vulnerable to this impact.

12.13.154 Following a review of the available foraging area for kittiwake at Splash Point, any barrier effect would only be of consequence to a small proportion of the total available foraging area from this site. The total at-sea area within a mean-max foraging range of 156.1km (Woodward *et al.*, 2019) is approximately 37,285km^2. Of this, approximately 6,550km^2 (17.6%) at the outer reach of their foraging range would require some deviation as a result of Rampion 2. The maximum deviation required would be to a point immediately south of Rampion 2, to which the shortest route in the absence of Rampion 2 would be approximately 38km, and the shortest route avoiding both would be 44km, an increase of 15.8%. Further away from the colony, the proportional deviation declines. Even at the maximum deviation of 15.8%, the effect is minor and would be insignificant compared to unsuitable wind conditions or changes in prey density (Masden *et al.* 2010).

12.13.155 Furthermore, a barrier effect requires foraging birds to avoid the OWF. Kittiwakes show relatively low avoidance of OWFs, and are often seen flying within OWFs, perching on offshore structures and even nesting on offshore structures (Garthe & Hüppop, 2004; Vanermen *et al.*, 2015; Skov *et al.*, 2018).

12.13.156 On the basis that there would be no barrier effect to the majority of potential foraging locations, that deviations required as a result of a barrier effect would be

relatively small, and that kittiwakes show low avoidance and may therefore be willing to fly through the OWF anyway, the potential magnitude of change has been assessed as **negligible**. Regardless of the sensitivity of the receptor involved, the effect is assessed as **Not Significant** as defined in the assessment of significance matrix (**Table 12-24**).

Indirect effects: Array area

12.13.157 During the operation phase of Rampion 2 there is the potential for indirect effects arising from the displacement of prey species due to increased noise and disturbance, or to disturbance of habitats from increased suspended sediment and physical disturbance to the seabed. Underwater noise may cause fish and mobile invertebrates to avoid the array area and also affect their physiology and behaviour. Suspended sediments may cause fish and mobile invertebrates to avoid the construction area and may smother and hide immobile benthic prey. These mechanisms may result in less prey being available within the construction area to foraging seabirds.

12.13.158 However, as no significant effects were identified to potential prey species (fish or benthic) or on the habitats that support them in the assessments on fish and benthic ecology (**Chapter 8: Fish and shellfish ecology, Volume 2** of the ES (Document Reference: 6.2..8) and **Chapter 9: Benthic subtidal and intertidal ecology, Volume 2** of the ES (Document Reference: 6.2.9), respectively) then there is no potential for any indirect effects of an adverse significance to occur on offshore and intertidal ornithology receptors.

Combined effects

12.13.159 Due to gannet being scoped for both collision risk and displacement assessments during the operational phase, it is possible that these two impacts could adversely affect gannet populations when they are combined. Previous sections have concluded that displacement has an overall low magnitude of impact when compared when addressing the increase from baseline mortality. Similarly, assessing the collisions for bio-seasons concludes a low magnitude of impact. However, the combined impact of collision risk and displacement may be greater than either of these risks acting alone and so further consideration of how they act together is necessary.

Potential magnitude of impact

12.13.160 As detailed in **Table 12-30**, the annual total estimated mortality from displacement is 2.5 birds per year (using bio-season specific avoidance rates of 60% in the breeding season and 80% in the non-breeding season, and a 1% mortality rate) with a range of 1.8 – 24.7 (using bio-season specific avoidance rates of 40 – 60% in the breeding season and 60 – 80% in the non-breeding season, and a 1 – 10% mortality rate).

12.13.161 As detailed in **Table 12-35**, the annual total estimated mortality from collision is 4.9 (95% confidence limits: 0.3 – 14.8).

12.13.162 Therefore, the combined annual total mortality has a central estimate of 7.4, and using the range of displacement/mortality rates and the 95% confidence limits for collision, a range of 2.1 – 39.5.

12.13.163 Using the largest BDMPS population of 456,298, as a proxy for the annual BDMPS population, with an average baseline mortality rate of 0.188 (**Table 12-18**), the natural predicted mortality is 85,784. The addition of 7.4 (2.1 – 39.5) mortalities will increase the mortality relative to the baseline mortality rate by 0.009% (0.002% – 0.046%). When considering the annual potential level of change at the biogeographic scale, the natural predicted mortality for the biogeographic population of 1,180,000 across all seasons is 221,840. On a biogeographic scale, the addition of 7.4 (2.1 – 39.5) mortalities will increase the mortality relative to the baseline mortality rate by 0.003% (0.001% – 0.018%).

12.13.164 This level of potential change is considered to be **negligible** on an annual basis at both the BDMPS and bio-geographic scales, as it represents no discernible increase to baseline mortality levels due to the small number of estimated collisions.

12.13.165 Therefore, the magnitude of change resulting from collision risk and displacement combined is considered to be **negligible**. Irrespective of the sensitivity of the receptor, the significance of the effect is **Not Significant** as defined in the assessment of significance matrix (**Table 12-24**) and is not considered further in this assessment.

12.14 Assessment of effects: Decommissioning phase

12.14.1 Decommissioning activities within the offshore cable corridor associated with decommissioning the export cable may lead to disturbance and displacement of species within the offshore cable corridor and different degrees of buffers surrounding it.

12.14.2 The MDS for decommissioning activities within the offshore cable corridor is equal to the MDS for the construction phase within the offshore cable corridor (**Table 12-19**). Therefore, the impacts are likely to be similar.

12.14.3 As all potential effects within the construction phase were deemed to be **Not Significant** (see **Section 12.11** and **Section 12.12**), no significant effects are expected for the decommissioning phase either.

Disturbance and displacement: Array

12.14.4 Decommissioning activities within the array area associated with foundations and WTGs may lead to disturbance and displacement of species within the array and different degrees of buffers surrounding it.

12.14.5 The MDS for decommissioning activities within the array area is equal to the MDS for the construction phase within the array area (**Table 12-19**). Therefore, the impacts are likely to be similar.

12.14.6 As all potential effects within the construction phase were deemed to be **Not Significant** (see **Section 12.12**), no significant effects are expected within the decommissioning phase.

Summary of assessment confidence levels

12.14.7 With respect to disturbance and displacement within the offshore cable corridor, confidence in assessment conclusions is considered high. This is due to the displacement and mortality rates within the approach being robust and used in previous assessments. When consideration is provided to the high level of confidence in the baseline data (see **Appendix 12.1: Baseline technical report, Volume 4** of the ES (Document Reference: 6.4.12.1)) and additional evidence in support of the approach (**Section 12.12 and 12.13**) it indicates the overall outcome of this assessment is still considered precautionary when following the approach and, as such, the assessment is considered robust.

Disturbance and displacement: Offshore Cable Corridor

12.14.8 Decommissioning activities within the offshore cable corridor associated with decommissioning the export cable may lead to disturbance and displacement of species within the offshore cable corridor and different degrees of buffers surrounding it.

12.14.9 The MDS for decommissioning activities within the offshore cable corridor is equal to the MDS for the construction phase within the offshore cable corridor (**Table 12-19**). Therefore, the impacts are likely to be similar.

12.14.10 As all potential effects within the construction phase were deemed to be **Not Significant** (see **paragraph 12.12.1**), no significant effects are expected for the decommissioning phase either.

Summary of assessment confidence levels

12.14.11 With respect to disturbance and displacement within the offshore cable corridor, confidence in assessment conclusions is considered high. This is due to the displacement and mortality rates within the approach being robust and used in previous assessments. When consideration is provided to the high level of confidence in the baseline data (see **Appendix 12.1: Baseline technical report, Volume 4** of the ES (Document Reference: 6.4.12.1)) and additional evidence in support of the approach (**Section 12.12 and 12.13**) it indicates the overall outcome of this assessment is still considered precautionary when following the approach and, as such, the assessment is considered robust.

12.14.12

Indirect effects: Offshore Cable Corridor

12.14.13 During the decommissioning phase of Rampion 2 there is the potential for indirect effects arising from the displacement of prey species due to increased disturbance, or to disturbance of habitats from increased suspended sediment and physical disturbance to the seabed. Underwater noise may cause fish and mobile invertebrates to avoid the construction area and also affect their physiology and behaviour. Suspended sediments may cause fish and mobile invertebrates to avoid the construction area and may smother and hide immobile benthic prey. These mechanisms may result in less prey being available within the construction area to foraging seabirds.

12.14.14 The only significant effect predicted is an adverse effect on black seabream, though this is not a common prey species of any of the seabirds considered (MCCIP, 2018; Krystalli *et al.*, 2019; ICES, 2021a, b; van der Kooij *et al.*, 2021). Therefore, as no significant effects were identified to the main potential prey species (fish or benthic) or on the habitats that support them in the assessments on fish and benthic ecology (**Chapter 8: Fish and shellfish ecology, Volume 2** of the ES (Document Reference: 6.2.8) and **Chapter 9: Benthic subtidal and intertidal ecology, Volume 2** of the ES (Document Reference: 6.2.9), respectively) then there is no potential for any indirect effects of an adverse significance to occur on offshore and intertidal ornithology receptors.

Summary of assessment confidence levels

12.14.15 With respect to indirect effects of the offshore cable corridor, confidence in assessment conclusions is considered high. This is due to the displacement and mortality rates within the approach being robust and used in previous assessments. When consideration is provided to the high level of confidence in the baseline data (see **Appendix 12.1: Baseline technical report, Volume 4** of the ES (Document Reference: 6.4.12.1)) and additional evidence in support of the approach (**Section 12.12** and **12.13**) it indicates the overall outcome of this assessment is still considered precautionary when following the approach and, as such, the assessment is considered robust.

12.15 Assessment of cumulative effects

Approach

12.15.1 A cumulative effects assessment (CEA) examines the combined impacts of Rampion 2 in combination with other developments on the same single receptor or resource and the contribution of Rampion 2 to those impacts. The overall method followed in identifying and assessing potential cumulative effects in relation to the offshore environment is set out in **Chapter 5: Approach to the EIA, Volume 2** of the ES (Document Reference: 6.2.5).

12.15.2 The offshore screening approach is based on the PINS Advice Note Seventeen (Planning Inspectorate, 2019b, with relevant components of the RenewableUK (RenewableUK, 2013) accepted guidance, which includes aspects specific to the marine elements of an offshore wind farm, addressing the need to consider mobile wide-ranging species (foraging species, migratory routes etc).

Summary of assessment confidence levels

12.15.3 With both disturbance/displacement and collision risk assessments, confidence in assessment conclusions is considered high. Although for some projects, impact totals are not available, due to the age of these projects, it is likely that any potential impact would be included within the regional baseline. Further to this, a precautionary assessment has been undertaken for cumulative impacts as detailed within. When assessed for all projects combined, the overall outcome of this assessment is considered sufficiently robust and still considered precautionary

when considering both the approach detailed and evidence from previous assessments on the same populations.

Cumulative effects assessment

12.15.4 For offshore and intertidal ornithology, a Zone of Influence (ZOI) has been applied for the CEA to ensure direct and indirect cumulative effects can be appropriately identified and assessed. The ZOI has been defined as the area within the mean-max foraging range (Woodward *et al.*, 2019) of each receptor during the breeding bio-season, and within the BDMPS region as defined by Furness (2015) outside the breeding bio-season.

12.15.5 A short list of 'other developments' that may interact with the Rampion 2 ZOIs during their construction, operation or decommissioning is presented in **Appendix 5.5: Cumulative effects assessment shortlisted developments, Volume 4 of** the ES (Document Reference: 6.4.5.5) and on **Figure 5.4.1 /5.4.2, Volume 3 of** the ES (Document Reference 6.3.5). This list has been generated applying criteria set out in **Chapter 5 Approach to the EIA, Volume 2** of the ES (Document Reference: 6.2.5) and has been collated up to the finalisation of the ES through desk study, consultation and engagement.

12.15.6 Only those 'other developments' in the short list that fall within the offshore and intertidal ornithology ZOI have the potential to result in cumulative effects with Rampion 2. All 'other developments' falling outside the offshore and intertidal ornithology ZOI are excluded from this assessment. The following types of 'other development' have the potential to result in cumulative effects on offshore and intertidal ornithology:

- other developments that could results in loss or change (permanent and/or temporary) to habitats through displacement and disturbance which could potentially also be affected by Rampion 2; and
- other renewable developments that could lead to a risk of collision with turbine blades during the operational phase, where the operational phase overlaps with the operational phase of Rampion 2.

12.15.7 In assessing the potential cumulative impacts for Rampion 2, it is important to bear in mind that some projects, predominantly those 'proposed' or identified in development plans, may not actually be taken forward, or fully built out as described within their MDS. There is therefore a need to build in some consideration of certainty (or uncertainty) with respect to the potential impacts which might arise from such proposals. For example, those projects under construction are likely to contribute to cumulative impacts (providing effect or spatial pathways exist), whereas those proposals not yet approved are less likely to contribute to such an impact, as some may not achieve approval or may not ultimately be built due to other factors.

12.15.8 With this in mind, all projects and plans considered alongside Rampion 2 have been allocated into 'tiers' and 'sub-tiers' reflecting their current stage within the planning and development process. This allows the cumulative impact assessment to present several future development scenarios, each with a differing potential for being ultimately built out. This approach also allows appropriate weight to be given to each scenario (tier) when considering the potential cumulative impact. The

proposed tier structure is intended to ensure that there is a clear understanding of the level of confidence in the cumulative assessments provided in this report. An explanation of each tier is included in **Table 12-42**.

Table 12-42 Other developments for CEA

Tier 1	Tier 1a	Project in Operation
	Tier 1b	Project under construction
	Tier 1c	Permitted applications, whether under Planning Act 2008 or other regimes, but not yet implemented
	Tier 1d	Submitted applications, whether under the Planning Act 2008 or other regimes, but not yet determined
Tier 2		Projects on the Planning Inspectorate's Programme of Projects where a Scoping Report has been submitted
Tier 3	Tier 3a	Projects on the Planning Inspectorate's Programme of Projects where a Scoping Report has not been submitted
	Tier 3b	Identified in the relevant Development Plan (and emerging Development Plans with appropriate weight being given as they move closer to adoption) recognising that much information on any relevant proposals will be limited
	Tier 3c	Identified in other plans and programmes (as appropriate) which set the framework for future development consents/ approvals, where such development is reasonably likely to come forward

12.15.9 On the basis of the above, the 'other developments' that are scoped into the offshore and intertidal ornithology CEA are outlined in **Table 12-43**. Note that all 'other developments' are OWFs with the exception of Morlais, which is a tidal stream project.

Table 12-43 Other developments considered as part of the offshore and intertidal ornithology CEA. Status as at May 2023

Project	Status	Tier
Barrow	Operational	1a
Beatrice	Operational	1a
Blyth Demonstration Site	Operational	1a
Burbo Bank	Operational	1a
Burbo Bank Extension	Operational	1a

Project	Status	Tier
Dudgeon	Operational	1a
East Anglia One	Operational	1a
EOWDC	Operational	1a
Galloper	Operational	1a
Greater Gabbard	Operational	1a
Gunfleet Sands	Operational	1a
Gwynt y Môr	Operational	1a
Hornsea Project One	Operational	1a
Humber Gateway	Operational	1a
Hywind 2 Demonstration	Operational	1a
Kentish Flats	Operational	1a
Kentish Flats Extension	Operational	1a
Kincardine	Operational	1a
Lincs, Lynn & Inner Dowsing	Operational	1a
London Array	Operational	1a
Methil	Operational	1a
North Hoyle	Operational	1a
Ormonde	Operational	1a
Race Bank	Operational	1a
Rampion	Operational	1a
Rhyl Flats	Operational	1a
Robin Rigg	Operational	1a
Scroby Sands	Operational	1a
Sheringham Shoal	Operational	1a
Teesside	Operational	1a
Thanet	Operational	1a

Project	Status	Tier
Walney Phase 1	Operational	1a
Walney Phase 2	Operational	1a
Walney Extension	Operational	1a
West of Duddon Sands	Operational	1a
Westermost Rough	Operational	1a
Dogger Bank A	Under construction	1b
Dogger Bank B	Under construction	1b
East Anglia Three	Under construction	1b
Hornsea Project Two	Under construction	1b
Moray East	Under construction	1b
Morlais	Under construction	1b
Neart na Gaoithe	Under construction	1b
Seagreen Alpha & Bravo	Under construction	1b
Triton Knoll	Under construction	1b
Dogger Bank C (formerly Dogger Bank Teeside A)	Consented- Construction expected 2023-2026	1c
East Anglia ONE North	Consented	1c
East Anglia TWO	Consented	1c
Hornsea Three	Consented- Construction expected 2024-2030	1c
Inch Cape	Consented	1c
Moray West	Consented- Construction expected 2023-2025	1c
Norfolk Vanguard	Consented	1c
Norfolk Boreas	Consented	1c
Sofia (formerly Dogger Bank Teeside B)	Consented- Construction expected 2023-2026	1c

Project	Status	Tier
TwinHub	Consented	1c
AyM	Application under examination	1d
Hornsea Four	Application under examination	1d
Dudgeon Extension Project and Sheringham Shoal Extension Project (DEP & SEP)	Application under examination	1d
Erebus	Application under examination	1d
Berwick Bank	Application under examination	1d
Green Volt	Application under examination	1d
ForthWind Offshore Wind Demonstration Project - phase 1	Application under examination	1d
Morgan	PEIR published	2
Mona	PEIR published	2
Morecambe	PEIR published	2
Five Estuaries	PEIR published	2

12.15.10 The cumulative MDS described in **Table 12-44** has been selected as having the potential to result in the greatest cumulative effect on an identified receptor group. The cumulative impacts presented and assessed in this section have been selected from the details provided in the project description for Rampion 2 as well as the information available on other projects and plans in order to inform a cumulative maximum design scenario. Effects of greater adverse significance are not predicted to arise should any other development scenario, based on details within the project design envelope compared to that assessed here, be taken forward in the final design scheme.

Table 12-44 Cumulative maximum design scenario for offshore and intertidal ornithology

Project phase and activity/impact	Scenario	Justification
Cumulative effect of displacement on guillemot, razorbill and gannet (operational phase)	Maximum design scenario for Rampion 2 plus the cumulative full development of the following projects within the UK Relevant ZOI:	Maximum potential for interactive effects from maintenance activities associated with and the operational effects of the

Project phase and activity/impact	Scenario	Justification
	Tier 1: - Operational projects in the relevant ZOI; - Projects under construction in the relevant ZOI; - Permitted projects not yet implemented; and - Projects with submitted applications not yet determined. Tier 2: - Tier 2 projects identified, as quantitative data available on displacement of seabirds as presented in PEIR documents. Tier 3: - No Tier 3 projects identified, as quantitative data not available on displacement of seabirds at this stage.	project(s) considered within the relevant ZOI. This region was chosen as seabirds associated with Rampion 2 are expected to come from or move to other areas within the ZOI, that are also subject to interaction with other projects within this region.
Cumulative effect of collision risk on gannet, kittiwake, herring gull, lesser black-backed gull and great black-backed gull (operational phase)	Maximum design scenario for Rampion 2 plus the cumulative full development of the following projects within the relevant ZOI: Tier 1: - Operational projects in the relevant ZOI; - projects under construction in the relevant ZOI; - Permitted project projects not yet implemented; and - project projects with submitted applications not yet determined. Tier 2: - Tier 2 projects identified, as quantitative data available on collision risk of seabirds as presented in PEIR documents. Tier 3: - No Tier 3 projects identified, as quantitative data not available on displacement of seabirds at this stage.	Maximum potential for interactive effects from maintenance activities associated with and the operational effects of the project(s) considered within the relevant ZOI. This region was chosen as seabirds associated with Rampion 2 are expected to come from or move to other areas within the ZOI, that are also subject to interaction with other projects within this region.

Cumulative effects assessment

12.15.11 A description of the significance of cumulative effects upon offshore and intertidal ornithology arising from each identified impact is given below. The cumulative effects assessment has been based on information available in ESs and it is noted that the project parameters quoted within ESs are often refined during the determination period and in the post-consent phase. Where formal project refinements have been applied for and granted for any projects the outcomes of their revised assessments were incorporated wherever possible. The assessment presented here is therefore considered to be conservative, with the level of impacts expected to be reduced compared to those presented here.

Operational Phase CEA – Potential impact from cumulative displacement

12.15.12 There is potential for cumulative displacement as a result of operational and maintenance activities associated with Rampion 2 and other projects. The only projects identified for this CEA are those defined as being within Tier 1 (sub-tiers 1a to 1d), as described in **Table 12-42**.

12.15.13 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 OWFs are located. This in effect represents indirect habitat loss, which would potentially reduce the area available to those seabirds to forage, loaf and / or moult that currently occur within and around OWFs and may be susceptible to displacement from such developments. Displacement may contribute to individual birds experiencing fitness consequences, which at an extreme level could lead to the mortality of individuals. Cumulative displacement therefore has the potential to lead to effects on a wider scale, which in this case is defined as the wider non-breeding BDMPS populations of gannet and auk species (adults and immature) within the UK North Sea and English Channel from Furness (2015).

12.15.14 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. Garthe and Hüppop (2004) developed a scoring system for such disturbance factors, whilst Furness and Wade (2012) developed a similar system with disturbance ratings to define the sensitivity of seabirds to disturbance and displacement.

12.15.15 Following the selection process an assessment of cumulative displacement has been carried out for three seabird species of interest identified as potentially at risk and of interest for this CEA. The three species are gannet, guillemot and razorbill.

Gannet

12.15.16 As determined in **paragraph 12.12.46**, gannets show a low level of sensitivity to maintenance activities from ship and helicopter traffic as well as to operational WTGs (Garthe and Hüppop, 2004; Furness and Wade, 2012; Krijgsveld *et al.*, 2011; Royal HaskoningDHV, 2013; APEM, 2014). For the purpose of this assessment the level of displacement considered across all bio seasons is between 60-80%.

12.15.17 A mortality rate of 1% was selected for this assessment based on expert judgement supported by additional evidence that 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 loss of habitat within the Rampion 2 array area.

12.15.18 For other projects, the data on seasonal population estimates have been collated where available. The subsequent bio-season and annual abundance estimates for gannet associated with each of the projects identified in **Table 12-43** are presented in **Table 12-45**. As it is difficult to split these project's data collated between the array area and 2km buffer a standardised approach has been taken for estimating displacement at the cumulative level. This approach considers gannet displacement within the array area plus 2km buffers.

Table 12-45 Gannet cumulative bio-season and total abundance estimates for displacement from all relevant projects

Project	Bio-season mean peak abundance (array area plus 2km buffer)				Tier
	Migration-free Breeding	Post-breeding migration	Return Migration	Annual Total	
Beatrice		0	0	0	1a
Blyth Demonstration Site				0	1a
Dudgeon		25	11	36	1a
East Anglia One	161	3,638	76	3875	1a
European Offshore Wind Development Centre (EOWDC)		5	0	5	1a
Galloper	360	907	276	1543	1a
Greater Gabbard	252	69	105	426	1a
Gunfleet Sands	0	12	9	21	1a
Hornsea Project One		694	250	944	1a
Humber Gateway				0	1a
Hywind 2 Demonstration		0	4	4	1a
Kentish Flats				0	1a

Project	Bio-season mean peak abundance (array area plus 2km buffer)				Tier
	Migration-free Breeding	Post-breeding migration	Return Migration	Annual Total	
Kentish Flats Extension	0	13	0	13	1a
Kincardine		0	0	0	1a
Lincs				0	1a
London Array				0	1a
Lynn and Inner Dowsing				0	1a
Methil		0	0	0	1a
Race Bank		32	29	61	1a
Rampion	0	590	0	590	1a
Scroby Sands				0	1a
Sheringham Shoal		31	2	33	1a
Teesside		0	0	0	1a
Thanet				0	1a
Westermost Rough				0	1a
Hornsea Project Two		1,140	124	1264	1b
Moray East		292	27	319	1b
Neart na Gaoithe		552	281	833	1b
Triton Knoll		15	24	39	1b
Seagreen Alpha		296	138	434	1b
Seagreen Bravo		368	194	562	1b
Dogger Bank A		916	176	1092	1c
Dogger Bank B		1,132	218	1350	1c
Dogger Bank C		379	226	605	1c

Project	Bio-season mean peak abundance (array area plus 2km buffer)				Tier
	Migration-free Breeding	Post-breeding migration	Return Migration	Annual Total	
East Anglia Three	412	1,269	524	2205	1c
Hornsea Three		984	524	1508	1c
Inch Cape		703	212	915	1c
Moray West		439	144	583	1c
Norfolk Vanguard		2,453	437	2890	1c
Norfolk Boreas		1,723	526	2249	1c
Sofia		508	238	746	1c
East Anglia ONE North	149	468	44	661	1c
East Anglia TWO	192	891	192	1275	1c
Total excluding Rampion 2	**1,526**	**20,544**	**5,011**	**27,081**	
Rampion 2	111	102	123	336	1d
Total Rampion 2 plus consented	**1,637**	**20,646**	**5,134**	**27,417**	
Hornsea Four	-	790	401	1,191	1d
Sheringham Shoal Extension	-	295	11	306	1d
Dudgeon Extension	-	343	47	390	1d
Berwick Bank	-	1,500	269	1,769	1d
Green Volt	-	16	49	65	1d
ForthWind Offshore Wind Demonstration Project - phase 1	-	26	44	70	1d
Five Estuaries	233	640	67	940	2
Total All Projects	**1,870**	**24,256**	**6,022**	**32,148**	

12.15.19 The magnitude of change is estimated by calculating the increase in mortality relative to the baseline mortality when compared against the largest UK North Sea and English Channel BDMPS population and then separately against the biogeographic population. The largest gannet BDMPS for the UK North Sea and English Channel is 456,298 (adults and immatures), whilst the wider bio-geographic population is 1,180,000 individuals (adults and immatures). Using the average mortality rate of 0.188, based on age specific demographic rates and age class proportions given in **Table 12-18**, the background mortality for these population scales are 85,784 and 221,840 individuals per annum, respectively.

12.15.20 The cumulative total of gannets at risk of displacement from all OWF projects (consented and proposed) is calculated to be 32,148 (**Table 12-45**). When applying the evidence led 60-80% displacement rate and a 1% mortality rate to estimate a cumulative total, between 193 and 257 individuals may be lost to the UK North Sea and English Channel BDMPS population and the wider biogeographic population.

12.15.21 A displacement rate of 60% and a mortality rate of 1% would lead to the cumulative loss of 193 gannets which would represent an increase of 0.22% relative to the baseline mortality rate at the BDMPS scale. At the biogeographic scale this additional mortality would increase the mortality relative to the baseline mortality by 0.09%. Alternatively, a displacement rate of 80% and a mortality rate of 1% would lead to the cumulative loss of 257 gannets which would increase the baseline mortality rate at the BDMPS scale and the biogeographic scale by 0.30% and 0.12%, respectively.

12.15.22 At both the BDMPS and the biogeographic scale, this level of potential change is considered to be of negligible magnitude on an annual cumulative basis, as it represents well under a 1% increase in mortality relative to the baseline mortality conditions. Therefore, irrespective of the sensitivity of the receptor, the effect is **Not Significant** at the BDMPS or biogeographic scales as defined in the assessment of significance matrix (**Table 12-24**) and is therefore not considered further.

Guillemot

12.15.23 As determined in **paragraph 12.12.46**, guillemots show a medium level of sensitivity to maintenance activities from ship and helicopter traffic as well as to operational WTGs (Garthe and Hüppop, 2004; Furness and Wade, 2012; Langston, 2010; Bradbury *et al.*, 2014).

12.15.24 As each individual OWF assessment considers the peak mean for each bio-season when these values are added together at a cumulative level, a highly unlikely total number of birds is estimated within these array areas and 2km buffers. The total abundance in **Table 12-46** represents almost 25% of the entire North Sea and English Channel BDMPS population, whilst the area covered by the combined array areas and 2km buffers of all OWFs within this cumulative displacement assessment would be well under 5% of the area. Therefore, by adding together seasonal mean peaks in this manner the overall assessment for cumulative displacement is considered to be highly precautionary.

12.15.25 It is also highly likely that guillemot and other auk species are displaced and / or habituate at different levels from areas within and outside active array areas. However, as it is difficult to split the data collated between the array area and 2 km buffer for the majority of the other projects within this CEA a standardised approach has been taken for estimating displacement. Accounting for this difficulty in separating data from array areas and the 2km buffers surrounding them for other projects considered in this CEA, a precautionary displacement rate of 50%, as described in **paragraph 12.13.36**, has been applied across both the array areas and 2km buffer for all projects.

12.15.26 Due to limitations in the data for other OWFs, seasonal population estimates have been collated for two separate bio-seasons covering the entire annual cycle, one for breeding and one for non-breeding. For some projects, data are also not available for their array area plus 2km buffer, so in these instances these data have been scaled up or down based on the available data. The subsequent bio-season and annual abundance estimates for guillemot associated with each of the projects identified in **Table 12-43** are presented in **Table 12-46**.

Table 12-46 Guillemot cumulative bio-season and total abundance estimates from all relevant projects

Project	Breeding Season	Non-breeding Season	Annual Total	Tier
Beatrice	-	2,755	2,755	1a
Blyth Demonstration Site	-	1,321	1,321	1a
Dudgeon	-	542	542	1a
East Anglia One	-	640	640	1a
EOWDC	-	225	225	1a
Galloper	-	593	593	1a
Greater Gabbard	-	548	548	1a
Gunfleet Sands	-	363	363	1a
Hornsea Project One	-	8,097	8,097	1a
Humber Gateway	-	138	138	1a
Hywind 2 Demonstration	-	2,136	2,136	1a
Kentish Flats Extension	-	4	4	1a
Kentish Flats	-	3	3	1a
Lincs, Lynn & Inner Dowsing	-	814	814	1a
Kincardine	-	0	0	1a
London Array	-	377	377	1a
Methil	-	0	0	1a
Race Bank	-	708	708	1a
Rampion	10,887	15,536	26,423	1a
Scroby Sands	-	-	-	1a

Project	Breeding Season	Non-breeding Season	Annual Total	Tier
Sheringham Shoal	-	715	715	1a
Teesside	-	901	901	1a
Thanet	-	124	124	1a
Westermost Rough	-	486	486	1a
Hornsea Project Two	-	13,164	13,164	1b
Moray East	-	547	547	1b
Neart na Gaoithe	-	3,761	3,761	1b
Triton Knoll	-	746	746	1b
Dogger Bank A	-	6,142	6,142	1c
Dogger Bank B	-	10,621	10,621	1c
Dogger Bank C	-	2,268	2,268	1c
East Anglia Three	-	2,859	2,859	1c
Hornsea Three	-	17,772	17,772	1c
Inch Cape	-	3,177	3,177	1c
Moray West	-	38,174	38,174	1c
Seagreen Alpha	-	4,688	4,688	1c
Norfolk Vanguard	-	4,776	4,776	1c
Seagreen Bravo	-	4,112	4,112	1c
Norfolk Boreas	-	13,777	13,777	1c
Sofia	-	3,701	3,701	1c
East Anglia ONE North	-	1,888	1,888	1c
East Anglia TWO	-	1,675	1,675	1c
Total excluding Rampion 2	**10,887**	**170,874**	**181,761**	

Project	Breeding Season	Non-breeding Season	Annual Total	Tier
Rampion 2	134	5,723	5,857	1d
Total Rampion 2 plus consented	**11,021**	**176,597**	**187,618**	
Hornsea Four	-	36,965	36,965	1d
Sheringham Shoal Extension	-	1,095	1,095	1d
Dudgeon Extension	-	14,887	14,887	1d
Berwick Bank	-	44,171	44,171	1d
Green Volt	-	16,105	16,105	1d
ForthWind Offshore Wind Demonstration Project - phase 1	-	401	401	1d
Five Estuaries		3,698	3,698	1d
All Projects Totals	**11,021**	**293,919**	**304,940**	

12.15.27 The magnitude of change is estimated by calculating the increase in mortality relative to the baseline mortality when compared against the largest UK North Sea and English Channel BDMPS population and then separately against the biogeographic population. The annual guillemot BDMPS for the UK North Sea and English Channel is 2,139,238 (adults and immatures), whilst the wider bio-geographic population is 4,125,000 individuals (adults and immatures). Using the average mortality rate of 0.143, based on age specific demographic rates and age class proportions given in **Table 12-18**, the background mortality for these population scales are 305,911 and 589,875 individuals per annum, respectively.

12.15.28 The cumulative total of guillemots at risk of displacement from all OWF projects is calculated to be 304,940 (**Table 12-46**). When applying the evidence led 50% displacement rate and a 1% mortality rate to cumulative total, 1,524 individuals may be lost to the UK North Sea and English Channel BDMPS population and the wider biogeographic population.

12.15.29 The potential cumulative loss of 1,524 guillemots would represent an increase of 0.50% relative to the baseline mortality rate at the BDMPS scale. At the biogeographic scale this would represent an increase of 0.26% in mortality relative to baseline mortality.

12.15.30 At the both the BDMPS and the biogeographic scale, this level of potential change is considered to be of negligible magnitude on an annual cumulative basis, as it represents under a 1% increase in mortality relative to the baseline mortality conditions. Therefore, irrespective of the sensitivity of the receptor, the significance of the effect is **Not Significant** at the BDMPS or biogeographic scales as defined in the assessment of significance matrix (**Table 12-24**) and is therefore not considered further in this assessment.

Razorbill

12.15.31 As determined in **paragraph 12.12.46**, razorbills show a medium level of sensitivity to maintenance activities from ship and helicopter traffic as well as to operational WTGs (Garthe and Hüppop, 2004; Furness and Wade, 2012; Langston, 2010; Bradbury *et al.*, 2014).

12.15.32 As each individual OWF assessment considers the peak mean for each bio-season when these values are added together at a cumulative level, a highly unlikely total number of birds is estimated within these array areas and 2km buffers. The total abundance in **Table 12-47** represents almost 20% of the entire North Sea and English Channel BDMPS population, whilst the area covered by the combined array areas and 2km buffers of all OWFs within this cumulative displacement assessment would be well under 5% of the area. Therefore, by adding together seasonal mean peaks in this manner the overall assessment for cumulative displacement is considered to be highly precautionary.

12.15.33 It is also highly likely that razorbills and other auk species are displaced and / or habituate at different levels from areas within and outside active array areas. However, as it is difficult to split the data collated between the array area and 2km buffer for the majority of the other projects within this CEA a standardised approach has been taken for estimating displacement. Accounting for this difficulty in separating data from array areas and the 2km buffers surrounding them for other projects considered in this CEA, a precautionary displacement rate of 50%, as described in **Section 12.13.36**, has been applied across both the array areas and 2km buffer for all projects.

12.15.34 Seasonal population estimates have been collated for four separate bio-seasons covering the entire annual cycle. For some projects, data are also not available for their array area plus 2km buffer, so in these instances these data have been scaled up or down based on the available data. The subsequent bio-season and annual abundance estimates for razorbill associated with each of the projects identified in **Table 12-43** are presented in **Table 12-47**.

Table 12-47 Razorbill cumulative bio-season and total abundance estimates for all relevant projects

Project	Migration-free breeding	Post-breeding migration	Migration-free winter	Return migration	Annual total	Tier
Beatrice	-	833	555	833	2,221	1a
Blyth Demonstration Site	-	91	61	91	243	1a
Dudgeon	-	346	745	346	1,437	1a
East Anglia One	-	26	155	336	517	1a
EOWDC	-	64	7	26	97	1a
Galloper	-	43	106	394	543	1a
Greater Gabbard	-	0	387	84	471	1a
Gunfleet Sands	-	0	30	0	30	1a
Hornsea Project One	-	4,812	1,518	1,803	8,133	1a
Humber Gateway	-	20	13	20	53	1a
Hywind 2 Demonstration	-	719	10	-	729	1a
Kentish Flats Extension	-	-	-	-	-	1a
Kentish Flats I	-	-	-	-	-	1a
Kincardine	-	0	0	0	0	1a
Lincs, Lynn & Inner Dowsing	-	34	22	34	90	1a
London Array	-	20	14	20	54	1a
Methil	-	0	0	0	0	1a
Race Bank	-	42	28	42	112	1a
Rampion	630	66	1,244	3,327	5,267	1a
Scroby Sands	-	-	-	-	-	1a

Project	Migration-free breeding	Post-breeding migration	Migration-free winter	Return migration	Annual total	Tier
Sheringham Shoal	-	1,343	211	30	1,584	1a
Teesside	-	61	2	20	83	1a
Thanet	-	0	14	21	35	1a
Westermost Rough	-	121	152	91	364	1a
Hornsea Project Two	-	4,221	720	1,668	6,609	1b
Moray East	-	1,103	30	168	1,301	1b
Neart na Gaoithe	-	5,492	508	-	6,000	1b
Triton Knoll	-	254	855	117	1,226	1b
Dogger Bank A	-	1,576	1,728	4,149	7,453	1c
Dogger Bank B	-	2,097	2,143	5,119	9,359	1c
Dogger Bank C	-	310	959	1,919	3,188	1c
East Anglia Three	-	1,122	1,499	1,524	4,145	1c
Hornsea Three	-	2,020	3,649	2,105	7,774	1c
Inch Cape	-	2,870	651	-	3,521	1c
Moray West	-	3,544	184	3,585	7,313	1c
Norfolk Vanguard	-	866	839	924	2,629	1c
Seagreen Alpha	-	0	1,103	0	1,103	1c
Seagreen Bravo	-	0	1,272	0	1,272	1c
Norfolk Boreas	-	263	1,065	345	1,673	1c
Sofia	-	592	1,426	2,953	4,971	1c
East Anglia ONE North	-	85	54	207	346	1c

Project	Migration-free breeding	Post-breeding migration	Migration-free winter	Return migration	Annual total	Tier
East Anglia TWO	-	44	136	230	410	1c
Total (consented) excluding Rampion 2	**630**	**35,100**	**24,095**	**32,531**	**92,356**	
Rampion 2	32	26	1193	6,303	7,554	1d
Total Rampion 2 plus consented	**662**	**35,126**	**25,288**	**38,834**	**99,910**	
Hornsea Four	-	4311	455	449	5,214	1d
Sheringham Shoal Extension	-	316	144	686	1,146	1d
Dudgeon Extension	-	923	320	845	2,088	1d
Berwick Bank	-	8849	1399	7480	17,728	1d
Green Volt	-	0	58	0	58	1d
ForthWind Offshore Wind Demonstration Project - phase 1	-	81	58	81	220	1d
Five Estuaries		284	1,046	756	2,086	2
All Projects Totals	**662**	**49,890**	**28,768**	**49,131**	**128,450**	

12.15.35 The magnitude of change is estimated by calculating the increase in mortality relative to the baseline mortality when compared against the largest UK North Sea and English Channel BDMPS population and then separately against the biogeographic population. The annual razorbill BDMPS for the UK North Sea and English Channel is 592,462 (adults and immatures), whilst the wider bio-geographic population is 1,707,000 individuals (adults and immatures). Using the average mortality rate of 0.193, based on age specific demographic rates and age class proportions given in **Table 12-18**, the background mortality for these population scales are 114,345 and 329,451 individuals per annum, respectively.

12.15.36 The cumulative total of razorbills at risk of displacement from all OWF projects is calculated to be 128,450 (**Table 12-47**). When applying the evidence led 50% displacement rate and a 1% mortality rate to cumulative total, 642 individuals may be lost to the UK North Sea and English Channel BDMPS population and the wider biogeographic population.

12.15.37 The potential cumulative loss of 631 razorbills would represent an increase in mortality of 0.56% relative to the baseline mortality rate at the BDMPS scale. At the biogeographic scale this would represent an increase in mortality of 0.19% relative to the baseline mortality.

12.15.38 At both the BDMPS and the biogeographic scale, this level of potential change is considered to be of negligible magnitude on an annual cumulative basis, as it represents under a 1% increase to the baseline mortality conditions. Therefore, irrespective of the sensitivity of the receptor, the significance of the effect is **Not Significant** at the biogeographic scale as defined in the assessment of significance matrix (**Table 12-24**) and is therefore not considered further in this assessment.

Operational Phase CEA: Potential Impact from Collision Risk

12.15.39 There is potential for cumulative collision risk to birds as a result of operational activities associated with Rampion 2 and other projects (**Table 12-43**). The risk to birds is through potential collision with WTGs and associated infrastructure from OWFs, resulting in injury or fatality. This may occur when birds fly through the OWFs whilst foraging for food, commuting between breeding sites and foraging areas, or during migration. The only projects identified for this CEA are those defined as being within Tier 1 (sub-tiers 1a to 1d) and Tier 2, as described in **Table 12-42**. The approach taken to assessing cumulative collision risk is a quantitative one, drawing upon the published information produced by the respective project developers. Such published, quantitative information on predicted collisions is not available at an early stage in the development of a project e.g. a project in Tier 3. The result is that the cumulative collision risk assessment addresses projects in Tiers 1 and 2 but not Tier 3 or below.

12.15.40 CRM has been carried out for Rampion 2 (**paragraph 12.13.73**) for six seabird species of interest identified as potentially at risk and of interest for impact assessment. Following a selection process for potential cumulative effects, those species predicted to have very low risk from Rampion 2 alone (deemed to be of no material contribution cumulatively) were not taken forward for further assessment. Seabird species considered to be of more than a material contribution to potential cumulative effects from collision risk were selected, which were: gannet, kittiwake, great black-backed gull, herring gull and lesser black-backed gull. The cumulative totals of collision risk from other projects have been amended and collated in order to be most representative of Band Option 1 (or 2 where that was presented) and standardised in accordance to the avoidance rates most appropriate to each species, as described in **Section 12.13.73** and in more detail within **Appendix 12.3: Collision risk modelling, Volume 4** of the ES (Document Reference 6.4.12.3).

12.15.41 It is noted that Natural England have published interim guidance on CRM (Natural England, 2022) which advises new avoidance rates (following Ozsanlev-Harris et

al. (2023)), and also advises applying a 70% macro-avoidance rate for gannet. Most projects identified in **Table 12-43** carried out their CRM prior to this guidance being released. As part of the DEP and SEP Examination, and following advice from Natural England, Equinor (2023) re-calculated previously published collision mortalities based to apply the new avoidance rates for all species, and incorporation of macro-avoidance for gannet. Natural England (2023) agreed with the cumulative values presented. Therefore, for projects with revised collision mortalities presented in Equinor (2023), the collision mortalities presented throughout this section are taken directly from Equinor (2023). For projects not considered in Equinor (2023), the same approach has been taken to adjust the avoidance rate i.e.

$$Revised\ collision\ mortality = Original\ collision\ mortality \times \frac{1 - New\ avoidance\ rate}{1 - Original\ avoidance\ rate}$$

12.15.42 The original avoidance rate was extracted directly from project documents where available, or else taken from the reported avoidance rate given in The Crown Estate (2017).

Gannet

12.15.43 During the non-breeding season, the BDMPS is defined as the UK North Sea and English Channel. During the breeding season, the ZOI consists of projects within mean-max foraging range (315.2 km; Woodward et al., 2019) of Rampion 2. **Table 12-48** shows the collision totals from all identified developments within the season-specific ZOI.

Table 12-48 Gannet cumulative bio-season and total collision mortality estimates from all relevant projects

Project	Migration-free breeding	Post-breeding migration	Return Migration	Total	Tier
Beatrice	-	10.6	2.1	12.7	1a
Blyth Demonstration Site	-	0.5	0.6	1.1	1a
Dudgeon	-	8.5	4.2	12.7	1a
East Anglia One	0.7	28.6	1.4	30.7	1a
EOWDC	-	1.1	0	1.1	1a
Galloper	3.9	6.7	2.7	13.3	1a
Greater Gabbard	3.1	1.9	1	6	1a
Gunfleet Sands	-	-	-	0	1a
Hornsea Project One	-	7	4.9	11.9	1a
Humber Gateway	-	0.2	0.3	0.5	1a
Hywind 2 Demonstration	-	0.2	0.2	0.4	1a
Kentish Flats	0.3	0.2	0.2	0.7	1a
Kentish Flats Extension	-	-	-	0	1a
Kincardine	-	0	0	0	1a
Lincs, Lynn & Inner Dowsing	-	0.3	0.5	0.8	1a
London Array	0.5	0.3	0.4	1.2	1a
Methil		0	0	0	1a
Race Bank	7.4	2.6	0.9	10.9	1a
Rampion	7.9	13.9	0.5	22.3	1a
Scroby Sands	-	-	-	0	1a

Project	Migration-free breeding	Post-breeding migration	Return Migration	Total	Tier
Sheringham Shoal	-	0.8	0	0.8	1a
Teesside	-	0.4	0	0.4	1a
Thanet	0.2	0	0	0.2	1a
Westermost Rough	-	0	0	0	1a
Hornsea Project Two	-	3.1	1.3	4.4	1b
Moray East	-	7.7	1.9	9.6	1b
Neart na Gaoithe	-	10.3	5	15.3	1b
Seagreen Alpha & Bravo	-	10.8	14.4	25.2	1b
Triton Knoll	-	14	6.6	20.6	1b
Dogger Bank A & B	-	18.2	11.9	30.1	1c
Dogger Bank C & Sofia	-	2.2	2.4	4.6	1c
East Anglia Three	1.3	7.3	2.1	10.7	1c
Hornsea Three	-	1.1	0.9	2	1c
Inch Cape	-	6.4	1.1	7.5	1c
Moray West	-	0.4	0.2	0.6	1c
Norfolk Vanguard	-	4.1	1.2	5.3	1c
Norfolk Boreas	-	2.8	0.9	3.7	1c
East Anglia ONE North	2.7	2.4	0.2	5.3	1c
East Anglia TWO	2.7	5	0.9	8.6	1c
Total excluding Rampion 2 (Consented Projects)	**30.7**	**179.6**	**70.9**	**281.2**	

Project	Migration-free breeding	Post-breeding migration	Return Migration	Total	Tier
Rampion 2	2.9	1.4	0.6	4.9	1d
Total (Rampion 2 & Consented Projects)	**33.6**	**181.0**	**71.5**	**286.1**	
Hornsea Four	-	1.1	0.3	1.4	1d
DEP and SEP	-	0.6	0.0	0.6	1d
Berwick Bank	-	3.9	0.7	4.6	1d
Green Volt	-	0.1	0.6	0.7	1d
ForthWind Offshore Wind Demonstration Project - phase 1	-	0.0	0.0	0.0	1d
Five Estuaries	2.0	2.3	0.2	4.5	2
Total (All Projects)	**35.6**	**189.1**	**73.2**	**297.8**	

Magnitude of Change

12.15.44 During the return migration bio-season, a total of 73 gannets may be subject to mortality. The BDMPS for the return migration bio-season is defined as 248,385 (Furness, 2015) and using the average baseline mortality rate of 0.188 (**Table 12-18**), the natural predicted mortality in the return migration bio-season is 46,696. The addition of 73 mortalities would represent an increase in mortality relative to the baseline mortality rate of 0.16%.

12.15.45 This level of potential change is considered to be of low magnitude during the return migration bio-season, as it represents only a slight increase to baseline mortality levels due to the small number of estimated collisions.

12.15.46 During the migration-free breeding bio-season, 36 gannets may be subject to mortality. During the migration-free breeding bio-season, the total regional baseline population of breeding adults and immature birds is predicted to be 400,326 gannets (**Table 12-17**). When the average baseline mortality rate of 0.188 (**Table 12-18**) is applied, the natural predicted mortality in the migration-free breeding bio-season is 75,261. The addition of 36 mortalities would represent a 0.05% increase in mortality relative to the baseline mortality rate.

12.15.47 This level of potential change is considered to be of negligible magnitude during the return migration bio-season, as it represents only a slight increase to baseline mortality levels due to the small number of estimated collisions.

12.15.48 During the post-breeding migration bio-season, 189 gannets may be subject to mortality. The BDMPS for the post-breeding migration bio-season is defined as 456,298 (Furness, 2015) and using the average baseline mortality rate of 0.188 (**Table 12-18**), the natural predicted mortality in the post-breeding migration bio-season is 85,784. The addition of 189 mortalities would represent a 0.22% increase in mortality relative to the baseline mortality rate.

12.15.49 This level of potential change is considered to be of low magnitude during the return migration bio-season, as it represents only a slight increase to baseline mortality levels due to the small number of estimated collisions.

12.15.50 The annual total of gannets subject to mortality due to collision is estimated to be 298. Using the largest BDMPS population of 456,298, as a proxy for the annual BDMPS population, with an average baseline mortality rate of 0.188 (**Table 12-18**), the natural predicted mortality is 85,784. The addition of 298 mortalities would represent an increase in mortality of 0.35% relative to the baseline mortality rate. When considering the annual potential level of change at the biogeographic scale, the natural predicted mortality for the biogeographic population of 1,180,000 across all seasons is 221,840. The addition of between 1,230 mortalities would represent an increase in mortality of 0.13% relative to the biogeographic baseline mortality rate.

This level of potential change is considered to be **negligible** on an annual basis at both the BDMPS and biogeographic scale, as it represents only a slight increase to baseline mortality levels due to the small number of estimated collisions. Therefore, irrespective of the sensitivity of the receptor, the significance of the effect is **Not Significant** at the biogeographic scale as defined in the assessment of significance matrix (**Table 12-24**) and is therefore not considered further in this assessment. Therefore, irrespective of the sensitivity of the receptor, the significance of the effect is **Not Significant** at the biogeographic scale as defined in the assessment of significance matrix (**Table 12-24**) and is therefore not considered further in this assessment.

Kittiwake

12.15.51 During the non-breeding season, the BDMPS is defined as the UK Western Waters and Channel (Furness, 2015). During the breeding season, ZOI is defined projects within the mean-max foraging of Rampion 2 (156.1 km; Woodward et al., 2019). **Table 12-49** shows the collision totals from all identified developments within the season-specific ZOI.

Table 12-49 Kittiwake cumulative bio-season and total collision mortality estimates from all relevant projects.

Project	Migration-free Breeding	Post-breeding migration	Return Migration	Annual Total	Tier
Barrow	-	-	-	-	1a
Burbo Bank	-	-	-	-	1a
Burbo Bank Extension	-	1.3	3.6	4.9	1a
Gwynt y Mor	-	-	-	-	1a
North Hoyle	-	-	-	-	1a
Ormonde	-	-	-	-	1a
Rampion	48.8	10.7	28.8	88.4	1a
Rhy Flats	-	-	-	-	1a
Robin Rigg	-	-	-	-	1a
Walney Phase 1	-	-	-	-	1a
Walney Phase 2	-	-	-	-	1a
Walney Extension	-	70.2	35.3	105.5	1a
West of Duddon Sands	-	-	-	-	1a
Thanet	0.1	-	-	-	1a
TwinHub	-	0	0	0.0	1c
Erebus	-	27.3	13.9	41.2	1c
Total excluding Rampion 2 (consented projects)	**49.0**	**109.6**	**81.6**	**240.0**	
Rampion 2	1.2	9.8	17.3	28.2	1d
Total (Rampion 2 + consented projects)	**50.2**	**119.4**	**98.9**	**268.3**	

Project	Migration-free Breeding	Post-breeding migration	Return Migration	Annual Total	Tier
Awel y Mor	-	9.5	20.7	30.2	1d
Mona	-	9.75	19.92	29.67	2
Morgan	-	21.63	15.69	37.32	2
Morecambe	-	14.72	7.54	22.26	2
All Projects Totals	**50.2**	**175.0**	**162.7**	**387.7**	

Magnitude of change

12.15.52 The annual total of kittiwakes subject to mortality due to collisions is estimated as 419. Using the largest BDMPS population of 911,586, as a proxy for the annual BDMPS population, with an average baseline mortality rate of 0.157 (**Table 12-18**), the natural predicted mortality is 143,119. The addition of 388 mortalities would represent an increase in mortality of 0.27% relative to the baseline mortality rate. When considering the annual potential level of change at the biogeographic scale, the natural predicted mortality for the biogeographic population of 5,100,000 across all seasons is 800,700. The addition of 388 mortalities would represent an increase in mortality of 0.05% relative to the biogeographic baseline mortality rate.

12.15.53 This level of potential change is considered to be negligible on an annual basis at both the BDMPS and bio-geographic scales, as it represents only a slight increase to baseline mortality levels due to the small number of estimated collisions.

12.15.54 Therefore, the magnitude of change resulting from collision risk in each bio-season alone and on an annual basis is considered to be negligible. Irrespective of the sensitivity of the receptor, the significance of the effect is **Not Significant** as defined in the assessment of significance matrix (**Table 12-24**) and is not considered further in this assessment.

Great black-backed gull

12.15.55 The non-breeding BDMPS for great black-backed gull is defined as the UK South West and Channel (Furness, 2015). For consistency with the data available from other projects, in this assessment two bio-seasons have been considered: breeding (April to August) and non-breeding (September to March) based on Furness (2015).

Table 12-50 Great black-backed gull cumulative bio-season and total collision mortality estimates from all Tier 1 and Tier 2 projects

Project	Breeding Season	Non-breeding Season	Annual Total	Tier
Barrow	-	-	0.0	1a
Burbo Bank	-	-	0.0	1a
Burbo Bank Extension	-	-	0.0	1a
Gwynt y Mor	-	-	0.0	1a
North Hoyle	-	-	0.0	1a
Ormonde	-	-	0.0	1a
Rampion	3.9	27.3	31.2	1a
Rhy Flats	-	-	0.0	1a
Robin Rigg	-	-	0.0	1a
Walney Phase 1	-	-	0.0	1a
Walney Phase 2	-	-	0.0	1a
Walney Extension	-	32.8	32.8	1a
West of Duddon Sands	-	-	0.0	1a
TwinHub	-	0	0.0	1c
Erebus	-	0.8	0.8	1c
Total excluding Rampion 2 (consented projects)	**3.90**	**60.90**	**64.8**	
Rampion 2	6.3	13.6	19.8	1d
Total (Rampion 2 plus consented projects)	**10.2**	**74.5**	**84.6**	
Awel y Mor	-	0.7	0.7	1d
Morgan	-	0.8	0.8	2
Mona	-	3.9	3.9	2
Morecambe	-	0.5	0.5	2

Project	Breeding Season	Non-breeding Season	Annual Total	Tier
Total (all projects)	**10.2**	**80.4**	**90.5**	

Magnitude of change

12.15.56 During the breeding bio-season, a total of 10.2 great black-backed gulls are estimated to be subject to mortality. The regional population during the breeding bio-season is defined as 44,753 (**Table 12-17**) and using the average baseline mortality rate of 0.093 (**Table 12-18**), the natural predicted mortality in the breeding bio-season is 4,162. The addition of 10.2 mortalities would represent a 0.24% increase in mortality relative to the baseline mortality rate.

12.15.57 This level of potential change is considered to be of negligible magnitude during the breeding bio-season, as it represents only a slight increase to baseline mortality levels due to the small number of collisions.

12.15.58 During the non-breeding bio-season, a total of 80.4 great black-backed gulls are estimated to be subject to mortality. The BDMPS for the non-breeding bio-season is defined as 17,742 (**Table 12-17**) and using the average baseline mortality rate of 0.093 (**Table 12-18**), the natural predicted mortality in the return migration bio-season is 1,650. The addition of 80.4 mortalities would represent a 4.87% increase in mortality relative to the baseline mortality rate.

12.15.59 This level of potential change is considered to be of medium magnitude during the non-breeding bio-season, as it represents a significant increase to baseline mortality levels.

12.15.60 The annual total of great black-backed gulls subject to mortality due to collision is estimated as 90.5. Using the largest BDMPS population of 48,832 as a proxy for the annual BDMPS population, with an average baseline mortality rate of 0.093 (**Table 12-18**), the natural predicted mortality is 4,541. The addition of 90.5 mortalities would be a 1.99% increase in mortality relative to the baseline mortality. When considering the annual potential level of change at the biogeographic scale, the natural predicted mortality for the biogeographic population of 235,000 across all seasons is 21,855. On a biogeographic scale, the addition of 90.5 mortalities would be a 0.41% increase in mortality relative to the baseline mortality.

12.15.61 This level of potential change is considered to be of medium magnitude on an annual basis at the BDMPS level, as it represents a significant increase to baseline mortality levels. However, the level of potential change for the biogeographic range is considered low as it only represents a slight increase to baseline mortality levels.

12.15.62 In order to fully assess the population-level impacts, Population Viability Analysis (PVA) has been conducted against the largest South-west and English Channel BDMPS population. PVA was conducted using the Natural England PVA Tool (Searle *et al.*, 2019). Full details of the methodology are presented in **Volume 4 Appendix 12.5: Population viability analysis, Volume 4** of the ES (Document Reference: 6.4.12.5)**.** The predicted annual mortality rate due to collisions

associated with wind turbine blades from Rampion 2 and consented OWFs is 90.5 individuals per annum. The closest increase in mortality rate assessed within the PVA for great black-backed gull was 100 mortalities per annum. When assessing this increase in mortality against the South-west and English Channel BDMPS population of 17,742 individuals (adults and immatures), the population growth rate is expected to decline by 0.68% compared to the counterfactual (no impact) growth rate, which after 30 years will have resulted in a reduction in population size by 19.03% compared to the counterfactual. Further details regarding the approach taken and the expected reductions in growth rates under differing levels of predicted impacts can be found in **Appendix 12.5: Population viability analysis, Volume 4** of the ES (Document Reference: 6.4.12.5).

Sensitivity of the receptor

12.15.63 As this species is not connected with a significant number of designated sites within the UK South-west and Channel BDMPS or wider bio-geographic population scales this species is afforded a conservation value level of low to reflect that. With respect to vulnerability to collision, it is considered to be high (**Table 12-33**). Whilst it may be of high vulnerability it is of low conservation value leading to an overall sensitivity of this receptor to collision risk of medium.

Significance of the effect

12.15.64 The magnitude of cumulative collision risk from operational OWFs within the UK South-west and Channel is defined as being a medium adverse change on an annual basis and the sensitivity of the species considered to be medium. The potential effect from cumulative collision risk to great black-backed gull from Rampion 2 and all other UK OWFs in the UK South-west and Channel is therefore assessed as moderate, which is potentially significant in EIA terms.

12.15.65 However, while the national population trend is declining, the population within the Isles of Scilly SPA has been increasing since 1999 (Heaney & St. Pierre, 2017). Therefore, the predicted level of impact is not considered to be of any significant consequence to the overall BDMPS population.

12.15.66 The results of the PVA analysis suggest that even the cumulative total impact is expected to have only a very slight impact on the overall population growth rate or populations size, with the population growth rate being only 0.68% lower than the counter-factual and the total population size after 30 years being only 19% smaller than the counter-factual.

12.15.67 The potential effect from cumulative collision risk to great black-backed gull from Rampion 2 and all other UK OWFs in the UK South-west and Channel is therefore assessed as moderate, which is potentially significant in EIA terms.

12.15.68 There is likely to be a significant amount of precaution in the numbers presented for other wind farms. For Rampion 1 in particular, the collision risk estimate is likely to be much higher than the actual collision risk based on the as-built design. The collision risk estimates for Rampion 1 were based on a maximum number of 175 WTGs, whereas the number of WTGs actually built was 116. Furthermore, the undeveloped area contained within the original Rampion 1 DCO now forms part of

the Rampion 2 proposed DCO Order Limits and therefore if Rampion 2 were to be consented, it would be impossible for Rampion 1 to also extend.

12.15.69 The contribution of Rampion 2 is also small, adding an estimated 19.8 collision mortalities annually to a cumulative total of 90.5.

12.15.70 On this basis, the overall conclusion is that the cumulative impact is **Not Significant** in EIA terms regardless of whether or not Rampion 2 is included, and the contribution of Rampion 2 is considered to have a minimal impact on the cumulative total.

Lesser black-backed gull

12.15.71 The non-breeding BDMPS for lesser black-backed gull is defined as the UK North Sea and Channel (Furness, 2015). **Table 12-51** summarises the bio-seasons and annual total collision risk from other developments within that region. These are mostly composed of data from the cumulative tables submitted at Deadline III for Sheringham and Dudgeon Extension Projects (Equinor, 2023), with the addition of new data not included in that report.

Table 12-51 Lesser black-backed gull cumulative bio-season and total collision mortality estimates from all Tier 1 and Tier 2 projects

Project	Breeding Season	Non-breeding Season	Annual Total	Tier
Beatrice		0	0	1a
Blyth Demonstration Site		0	0	1a
Dudgeon		36.7	36.7	1a
East Anglia One		40.6	40.6	1a
EOWDC		0	0	1a
Galloper		133.2	133.2	1a
Greater Gabbard		59.5	59.5	1a
Gunfleet Sands		0	0	1a
Hornsea Project One		20.9	20.9	1a
Humber Gateway		1.3	1.3	1a
Hywind 2 Demonstration		0	0	1a
Kentish Flats		-	0	1a

Project	Breeding Season	Non-breeding Season	Annual Total	Tier
Kentish Flats Extension		1.3	1.3	1a
Kincardine		0	0	1a
Lincs, Lynn & Inner Dowsing		8.2	8.2	1a
London Array		-	0	1a
Methil		0	0	1a
Race Bank		13	13	1a
Rampion		7.6	7.6	1a
Scroby Sands		-	0	1a
Sheringham Shoal		7.9	7.9	1a
Teesside		0	0	1a
Thanet		15.4	15.4	1a
Westermost Rough		0.4	0.4	1a
Hornsea Project Two		2.4	2.4	1b
Moray East		0	0	1b
Neart na Gaoithe		1.4	1.4	1b
Seagreen Alpha & Bravo		10.1	10.1	1b
Triton Knoll		35.5	35.5	1b
Dogger Bank A & B		12.5	12.5	1c
Dogger Bank C & Sofia		11.5	11.5	1c
East Anglia Three		9.8	9.8	1c
Hornsea Three		1.2	1.2	1c
Inch Cape		0	0	1c
Moray West		0	0	1c
Norfolk Vanguard		4.3	4.3	1c

Project	Breeding Season	Non-breeding Season	Annual Total	Tier
Norfolk Boreas		9.7	9.7	1c
East Anglia ONE North		0.7	0.7	1c
East Anglia TWO		0.6	0.6	1c
Total Excluding Rampion 2 (consented projects)	**0**	**445.7**	**445.7**	
Rampion 2	1.5	2.8	4.3	1d
Total (Rampion 2 plus consented)	**1.5**	**448.5**	**450.0**	
Hornsea Four		0.2	0.2	1d
DEP and SEP		0.3	0.3	1d
Berwick Bank		0.0	0.0	1d
Green Volt		0.0	0.0	1d
ForthWind Offshore Wind Demonstration Project - phase 1		0.0	0.0	1d
Five Estuaries		5.7	5.7	1d
Total (All projects)	**1.5**	**454.7**	**456.2**	

12.15.72 The estimated collision risk to lesser black-backed gull from Rampion 2 is an annual total of four birds (**Table 12-37**), which would increase the cumulative annual total by 0.94%.

12.15.73 The annual total of lesser black-backed gull subject to mortality due to collisions is estimated as 456. Using the largest BDMPS population of 209,007, as a proxy for the annual BDMPS population, with an average baseline mortality rate of 0.172 (**Table 12-18**), the natural predicted mortality is 25,917. The addition of 456 mortalities will represent an increase in mortality of 1.76% relative to the baseline mortality rate. When considering the annual potential level of change at the biogeographic scale, the natural predicted mortality for the biogeographic population of 864,000 across all seasons is 107,136. The addition of 456 mortalities will represent an increase in mortality of 0.43% relative to the biogeographic baseline mortality rate.

12.15.74 This level of potential change is considered to be of medium magnitude on an annual basis at the BDMPS level, as it represents a significant increase to baseline mortality levels. However, the level of potential change for the

biogeographic range is considered low as it only represents a slight increase to baseline mortality levels.

12.15.75 During the examination for East Anglia ONE North and East Anglia Two, the Applicant presented a cumulative total collision risk of 540 mortalities. In Natural England's conclusions (Natural England, 2021), Natural England refer to PVA carried out for lesser black-backed gull for Norfolk Boreas OWF (MacArthur Green 2019). Natural England conclude that even considering a cumulative annual mortality of 600 birds per year, the PVA carried out demonstrates that would lead to "*no significant adverse impact from cumulative collision to LBBG at an EIA scale*". As the cumulative total calculated for Rampion 2 on an EIA level is significantly lower (456 mortalities per year), it follows that this conclusion remains valid.

12.15.76 On this basis, it is concluded that the cumulative effect from collision risk to lesser black-backed gull from Rampion 2 and all other projects is assessed as **Not Significant**.

Herring gull

12.15.77 During the non-breeding season, the BDMPS is defined as the UK North Sea and English Channel. **Table 12-52** shows the collision totals from all Tier 1 developments within the season-specific ZOI.

Table 12-52 Herring gull cumulative bio-season and total collision mortality estimates for all Tier 1 and Tier 2 projects

Project	Breeding Season	Non-breeding Season	Annual Total	Tier
Beatrice	71.1	284.3	355.4	1a
Blyth Demonstration Site	0.7	3.2	3.9	1a
Dudgeon	-	-	0.0	1a
East Anglia One	0.0	27.4	27.4	1a
EOWDC	6.9	0.0	6.9	1a
Galloper	39.2	0.0	39.2	1a
Greater Gabbard	0.0	0.0	0.0	1a
Gunfleet Sands	-	-	0.0	1a

Project	Breeding Season	Non-breeding Season	Annual Total	Tier
Hornsea Project One	3.5	13.9	17.4	1a
Humber Gateway	0.5	1.3	1.8	1a
Hywind 2 Demonstration	0.7	9.4	10.1	1a
Kentish Flats	0.0	0.0	0.0	1a
Kentish Flats Extension	0.6	2.0	2.6	1a
Kincardine	1.2	0.0	1.2	1a
Lincs, Lynn & Inner Dowsing	0.0	0.0	0.0	1a
London Array	-	-	0.0	1a
Methil	7.0	4.4	11.4	1a
Race Bank	0.0	0.0	0.0	1a
Rampion	186.0	0.0	186.0	1a
Scroby Sands	-	-	0.0	1a
Sheringham Shoal	0.0	0.0	0.0	1a
Teesside	10.4	41.4	51.8	1a
Thanet	5.9	23.5	29.4	1a
Westermost Rough	0.1	0.0	0.1	1a
Hornsea Project Two	28.6	0.0	28.6	1b
Moray East	62.4	0.0	62.4	1b
Neart na Gaoithe	6.0	15.0	21.0	1b
Seagreen Alpha & Bravo	12.0	25.2	37.2	1b

Project	Breeding Season	Non-breeding Season	Annual Total	Tier
Triton Knoll	0.0	0.0	0.0	1b
Dogger Bank A & B	0.0	0.0	0.0	1c
Dogger Bank C & Sofia	0.0	0.0	0.0	1c
East Anglia Three	0.0	27.6	27.6	1c
Hornsea Three	1.2	4.8	6.0	1c
Inch Cape	0.0	16.2	16.2	1c
Moray West	14.4	1.2	15.6	1c
Norfolk Vanguard	0.5	8.5	9.0	1c
Norfolk Boreas	1.8	6.5	8.3	1c
East Anglia ONE North	0.0	0.0	0.0	1c
East Anglia TWO	0.0	0.6	0.6	1c
Total Excluding Rampion 2 (consented projects)	**460.6**	**516.3**	**977.0**	
Rampion 2	34.5	28.1	62.6	1d
Total (Rampion 2 plus consented)	**495.2**	**544.5**	**1,039.7**	
Hornsea Four	1.2	0.6	1.8	1d
Sheringham Shoal Extension	0.0	0.0	0.0	1d

Project	Breeding Season	Non-breeding Season	Annual Total	Tier
Dudgeon Extension	0.0	0.3	0.3	
Berwick Bank	51.6	8.4	60.0	1d
Green Volt	0.0	4.6	4.6	1d
ForthWind Offshore Wind Demonstration Project - phase 1	0.0	0.0	0.0	1d
Five Estuaries	0.7	1.5	2.2	2
Total (All projects)	**548.7**	**559.9**	**1,108.5**	

12.15.78 The annual total of herring gulls subject to mortality due to collisions is estimated as 1,108.5. Using the largest BDMPS population of 466,511, as a proxy for the annual BDMPS population, with an average baseline mortality rate of 0.172 (**Table 12-18**), the natural predicted mortality is 80,240. The addition of 1,108.5 mortalities will represent an increase in mortality of 1.38% relative to the baseline mortality rate. When considering the annual potential level of change at the biogeographic scale, the natural predicted mortality for the biogeographic population of 1,098,000 across all seasons is 188,856. The addition of 1,108.5 mortalities will represent an increase in mortality of 0.59% relative to the biogeographic baseline mortality rate.

12.15.79 This level of potential change is considered to be of medium magnitude on an annual basis at the BDMPS level, as it represents a significant increase to baseline mortality levels. However, the level of potential change for the biogeographic range is considered low as it only represents a slight increase to baseline mortality levels.

12.15.80 In order to fully assess the population-level impacts, Population Viability Analysis (PVA) has been conducted against the largest UK North Sea and English Channel BDMPS population. PVA was conducted using the Natural England PVA Tool (Searle *et al.*, 2019). Full details of the methodology are presented in **Appendix 12.5: Population viability analysis, Volume 4** of the ES (Document Reference: 6.4.12.5)**.** The predicted annual mortality rate due to collisions associated with wind turbine blades from Rampion 2 and all other OWFs is 1,108.5 individuals per annum. The closest higher increase in mortality rate assessed within the PVA for herring gull was 1,150 mortalities per annum. When assessing this increase in mortality against the UK North Sea and English Channel BDMPS population of 466,511 individuals (adults and immatures), the population growth rate is expected to decline by 0.30% compared to the counterfactual (no impact) growth rate, which after 30 years will have resulted in a reduction in population size by 8.81% compared to the counterfactual. Further details regarding the approach taken and

the expected reductions in growth rates under differing levels of predicted impacts can be found in **Appendix 12.5: Population viability analysis** (Document Reference: 6.4.12.5).

Sensitivity of the receptor

12.15.81 Herring gull is red listed on BoCC5 (Stanbury et al., 2021). However, it is classified as Least Concern on the IUCN Red List (BirdLife International, 2021) as a result of a wide distribution and large, albeit potentially declining, population. It is also noted that population estimates are primarily based on long term monitoring of natural nesting sites; however, there has been a significant movement inland and increase in roof-nesting, which has been poorly recorded and may balance or even reverse this trend (BirdLife International, 2021). This is further confirmed by an increase in breeding range of 36% from 1968–72 to 2008–11 (Balmer et al., 2013). Therefore, the conservation value of herring gull is assessed as medium. Herring gull are considered to be highly sensitive to collision risk (Garthe & Huppop, 2004; Furness & Wade, 2012; Wade et al., 2016). Overall, considering both factors, it is concluded that a sensitivity of high is appropriate.

Significance of the effect

12.15.82 Whilst the cumulative collision rates were initially considered to be of medium at the BDMPS level, subsequent PVA modelling suggests that the population-level impact is likely to be low, leading to an overall magnitude of change of minor. The sensitivity of the receptor has been assessed as medium. Therefore, following the matrix approach for the assessment of significance (**Table 12-24**) it is concluded that the overall effect can be considered to be a minor adverse effect, which is **Not Significant** in EIA terms.

Operational phase CEA- combined operational displacement and collision risk

12.15.83 Due to gannet being scoped for both collision risk and displacement assessments, it is possible that these two impacts could cumulatively adversely affect gannet populations when they are combined. Previous sections have concluded that cumulative displacement has an overall low magnitude of impact when compared when addressing the increase from baseline mortality. Similarly, assessing the cumulative collisions for bio-seasons concludes a low magnitude of impact. It has been concluded that when regarding the annual total, the cumulative collision for gannet is of medium magnitude in terms of impact to baseline mortality. Following these results, the combined impact of cumulative collision risk and cumulative displacement may be greater than either of these risks acting alone and so further consideration of how they act together is necessary. When considering both risks it is recognised that this means double counting of birds as birds estimated to be subject to collision risk mortality will not be able to be subjected to displacement consequent mortality as well. Similarly, birds that are subject to displacement will not be subject to collision risk as they are assumed to have not entered the survey area. A more refined method for considering both risks together along with the reduction of any double counting of impacts is not agreed with SNCBs the precautionary and highly unlikely approach is presented in this assessment.

Potential magnitude of impact

12.15.84 As detailed in **Table 12-45** and **Table 12-48**, the combined predicted mortality in the O&M phase (displacement and collision risk) equates to between between 491 (193 + 298) and 555 (257 + 298) individuals per year. On a BDMPS scale, the addition of 491 to 555 mortalities per year will increase the baseline mortality rate by 0.57 to 0.65%. On a biogeographic scale, the addition of 491 to 555 mortalities per year will increase the baseline mortality rate by 0.22 to 0.25%. Therefore, taking macro avoidance into consideration, the level of potential change can be considered to be minor.

Sensitivity of the receptor

12.15.85 Whilst the majority of the gannets within the BDMPS are likely to be from designated sites (including UK SPAs), there is no strong connection to any one UK SPA. Gannets are a far-ranging species, and therefore it is likely that any impacts will be distributed across a number of breeding colonies within and outside of UK SPAs. The majority of UK gannet colonies have experienced positive growth rates since records began, with the total UK population increasing by 41% in the period 2000 to 2018 (JNCC, 2020). The colony at Bempton Cliffs, which is likely to have the strongest connectivity with Rampion 2, has experienced an average annual growth rate of 9.9% between 2003 and 2017 (JNCC, 2020), a period in which numerous offshore windfarms became operational. Furthermore, there is evidence of density-dependence in gannets (Horwsill & Robinson, 2015) which suggests colony growth rates are limited by population size, possibly due to competition for nesting sites or for food. This suggests that even with a slight increase in mortality relative to counterfactual baseline mortality, the UK population is likely to continue to experience strong growth. To reflect that, this species is afforded a conservation value level of medium. With respect to vulnerability to collision and displacement combined, it is considered to be medium (**Table 12-33**). Given a medium conservation value and medium vulnerability, this leads to an overall sensitivity of this receptor to collision risk and displacement combined of medium.

Significance of the effect

12.15.86 The combined impact of collision risk and displacement on gannet has been found to lead to a minor level of change, and the sensitivity of the receptor assessed as medium. Therefore, following the matrix approach for the assessment of significance (**Table 12-24**), it is concluded that the overall effect can be considered to be a minor adverse effect, which is **Not Significant** in EIA terms.

12.16 Transboundary effects

12.16.1 Transboundary effects arise when impacts from a development within one European Economic Area (EEA) state affects the environment of other EEA states. A screening of transboundary effects has been carried out and is presented in Appendix B of the Scoping Report (RED, 2020).

12.16.2 Transboundary impacts upon avian receptors (seaward of the MHWS) are possible due to the wide foraging and migratory ranges of typical bird species in the English Channel. In addition, a number of bird species that have been

recorded during previous surveys include those that are listed as qualifying features of European Sites in other EEA States. The key bird species present in the Rampion 2 array area, offshore export cable corridor and cable landfall area, based on the results of the desk study and aerial digital survey data presented in **Appendix 12.1: Baseline technical report, Volume 4** of the ES (Document Reference: 6.4.12.1) include gannet, kittiwake, guillemot, razorbill, and large gulls.

12.16.3 The key direct potential impacts and effects for avian receptors are predicted to arise during the operation and maintenance phase as a result of potential collisions (with rotating WTG blades which may result in direct mortality of individuals), disturbance and barrier effects (caused by the physical presence of structures which may displace birds or prevent transit of birds between foraging and breeding sites, or on migration, respectively).

12.16.4 The assessment considers potential transboundary effects on protected areas in EEA states on the BDMPS scale and biogeographic scales relevant for each key species, that includes individuals from outside of the UK.

12.16.5 With regards to the potential for transboundary cumulative impacts, there is some limited potential for collisions and displacement at offshore wind farms outside UK territorial waters. However, the operational offshore wind farms in Belgium, the Netherlands, and Germany are comparatively small (collectively, these projects are of a similar size to no more than one to two of the more recent UK OWFs, such as East Anglia ONE). There are no operational offshore wind farms within French territorial waters in the English Channel.

12.16.6 Since the spatial scope for a transboundary assessment will be much larger than that considered for Rampion 2 alone or cumulatively with other UK projects then any assessment of potential impacts and effects will be against larger seabird population sizes accounting for a larger spatial scale. Therefore, it is apparent that the scale of offshore wind farm developments within such a wider context will be relatively much smaller with respect to any potential impacts considered at the UK BDMPS scale. Therefore, the inclusion of non-UK offshore wind farms is considered very unlikely to alter the conclusions of the existing cumulative assessment, and highly likely to reduce estimated impacts at population levels if calculated at larger spatial scales.

12.16.7 The assessment considers potential transboundary effects on neighbouring marine conservation zones (MCZs) in France, including all Natura 2000 sites along the English Channel/North Sea coastline. Special attention is paid to the Picardy estuaries and Opal marine nature reserve, which are geographically the nearest non-UK protected areas to the Rampion 2 project zone. This assessment, however, is limited to bird species that are listed as qualifying features of European Sites in other EEA States and which were identified as key bird species actually occurring in the Rampion 2 array area, offshore export cable corridor and cable landfall area, i.e., gannet, kittiwake, guillemot, razorbill, and large gull species (cf. **Appendix 12.1: Baseline technical report, Volume 4** of the ES (Document Reference: 6.4.12.1)).

12.16.8 The assessment of transboundary effects distinguishes between functional connectivity and spatial overlap in the probability of occurrence. Protected areas in countries beyond the UK are unlikely to have significant functional connectivity with the Rampion 2 project zone, i.e., the extent to which distinct sites are linked

by regular diurnal or seasonal movements of individuals is expected to be low. Although theoretical foraging zones of nesting birds (based on average foraging ranges given in Westwood *et al.* 2019) may overlap with the Rampion 2 project zone (e.g., black-legged kittiwake, lesser-black-backed gull), a statistical distance measure determined elsewhere is unsuitable for a site-specific risk assessment at the individual- and population-based level.

12.16.9 Since displacement and barrier effects appear negligible in terms of the spatial dimensions and distances from seabird breeding colonies outside the UK, there is no sufficient justification to assume potential bias in the sensitivity assessment of key seabird species arising from the geographic origin of individuals frequenting the wind farm. Consequently, a rescoring that omits the sub-scores related to national administrative responsibilities (i.e., score a and c in Bradbury *et al.* 2014) is formally possible but is not sufficiently motivated for effects of displacement and barriers to movement that are unlikely to carry over into neighbouring MCZs.

12.16.10 In conclusion, no significant transboundary effects are currently expected to arise from Rampion 2, despite a potential residual risk of collision for individuals that originate beyond UK borders and fly through the Rampion 2 project zone. At the individual level, this risk will correspond to that of the non-transboundary assessment.

12.17 Inter-related effects

12.17.1 The inter-related effects assessment considers likely significant effects from multiple impacts and activities from the construction, operation and maintenance and decommissioning phases of Rampion 2 on the same receptor, or group of receptors.

12.17.2 Inter-related effects could potentially arise in one of two ways. The first type of inter-related effect is a Proposed Development lifetime effect, where multiple phases of the Proposed Development interact to create a potentially more significant effect on a receptor than in one phase alone. The phases for Rampion 2 are construction, operation and maintenance, and decommissioning. All Proposed Development lifetime effects are assessed in **Chapter 30: Inter-related effects, Volume 2** of the ES (Document Reference: 6.2.30).

12.17.3 The second type of inter-related effect is receptor-led effects. Receptor-led effects are where effects from different environmental aspects combine spatially and temporally on a receptor. These effects may be short-term, temporary, transient, or longer-term.

12.17.4 Receptor-led effects have been considered, where relevant, in this chapter for potential interactions between offshore and intertidal ornithology and the following environmental aspects shown in **Table 12-53**.

Table 12-53 Chapter topic inter-relationships

Topic and description	Related Chapter	Where addressed in this Chapter
Indirect impacts through effects on habitats and prey during construction (offshore cable corridor)	**Volume 2, Chapter 8: Fish and shellfish ecology, Volume 2** of the ES (Document Reference: 6.2.8) and **Volume 2, Chapter 9: Benthic, subtidal and intertidal ecology, Volume 2** of the ES (Document Reference: 6.2.9)	**Section 12.12**
Indirect impacts through effects on habitats and prey during construction (array area)		**Section 12.12**
Indirect impacts through effects on habitats and prey during operation (array area)		**Section 12.13**
Indirect impacts through effects on habitats and prey during decommissioning (offshore cable corridor)		**Section 12.14**

12.17.5 As none of the offshore impacts on birds were assessed individually to have any greater than a minor adverse effect, it is considered highly unlikely that they would inter-relate to form an overall significant effect on offshore and intertidal ornithology receptors.

12.17.6 Full results of the receptor-led effects assessment can be found in **Chapter 30: Inter-related effects, Volume 2** of the ES (Document Reference: 6.2.30).

12.18 Summary of residual effects

12.18.1 **Table 12-54** presents a summary of the assessment of significant impacts, any relevant embedded environmental measures and residual effects on offshore and intertidal ornithology receptors.

Table 12-54 Summary of assessment of residual effects

Activity and impact	Receptor and sensitivity or value	Magnitude of impact	Embedded environmental measures	Assessment of residual effect (significance)
Construction				
Disturbance and displacement: intertidal cable corridor	Sanderling	Negligible	C – 4 Horizontal Directional Drill (HDD) technique will be used at the landfall location. C – 43 The subsea export cable ducts will be drilled underneath the beach using horizontal directional drilling (HDD) techniques.	Not significant
	Mediterranean gull	Negligible		Not significant
Disturbance and displacement: offshore cable corridor	All receptors	Negligible		Not significant
Disturbance and displacement: array area	Gannet	Negligible		Not significant
	Guillemot	Negligible		Not significant
	Razorbill	Negligible		Not significant
Indirect effects: offshore cable corridor	All receptors	Negligible		Not significant

Activity and impact	Receptor and sensitivity or value	Magnitude of impact	Embedded environmental measures	Assessment of residual effect (significance)
Indirect effects: array area	All receptors	Negligible		Not significant
Operation and maintenance				
Disturbance and displacement: array area	Gannet	Negligible		Not significant
	Guillemot	Negligible		Not significant
	Razorbill	Negligible		Not significant
Collision risk: array area	Gannet	Negligible	C - 89 There will be a minimum blade tip clearance of at least 22m above MHWS.	Not significant
	Kittiwake	Negligible		Not significant
	Common gull	Negligible		Not significant
	Lesser black-backed gull	Negligible		Not significant
	Herring gull	Negligible		Not significant
	Great black-backed gull	Negligible		Not significant
	Migratory species	Negligible		Not significant

Activity and impact	Receptor and sensitivity or value	Magnitude of impact	Embedded environmental measures	Assessment of residual effect (significance)
Indirect effects: array area	All receptors	Negligible		Not significant
Decommissioning				
Disturbance and displacement: offshore cable corridor	All receptors	Negligible		Not significant
Disturbance and displacement: array area	Gannet	Negligible		Not significant
	Guillemot	Negligible		Not significant
	Razorbill	Negligible		Not significant
Indirect effects: offshore cable corridor	All receptors	Negligible		Not significant

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12.19 Glossary of terms and abbreviations

Table 12-55 Glossary of terms and abbreviations – offshore and intertidal ornithology

Term (acronym)	Definition
Baseline	Refers to existing conditions as represented by latest available survey and other data which is used as a benchmark for making comparisons to assess the impact of development.
Baseline conditions	The environment as it appears (or would appear) immediately prior to the implementation of the Proposed Development together with any known or foreseeable future changes that will take place before completion of the Proposed Development.
BDMPS	*Biologically Defined Minimum Population Scale*
BoCC	*Birds of Conservation Concern*
BSI	*British Standard Institute*
BTO	*British Trust for Ornithology*
CEA	*Cumulative Effects Assessment*
CI	*Confidence Intervals*
Code of Construction Practice (COCP)	The code sets out the standards and procedures to which developers and contractors must adhere to when undertaking construction of major projects. This will assist with managing the environmental impacts and will identify the main responsibilities and requirements of developers and contractors in constructing their projects.
Construction effects	Used to describe both temporary effects that arise during the construction phases as well as permanent existence effects that arise from the physical existence of development (for example new buildings).
CRM	*Collision Risk Model*
Cumulative effects	Additional changes caused by a Proposed Development in conjunction with other similar developments or as a combined effect of a set of developments.
Cumulative Effects Assessment (CEA)	Assessment of impacts as a result of the incremental changes caused by other past, present and reasonably

Term (acronym)	Definition
	foreseeable human activities and natural processes together with the Proposed Development.
DCO Application	An application for consent to undertake a Nationally Significant Infrastructure Project made to the Planning Inspectorate who will consider the application and make a recommendation to the Secretary of State, who will decide on whether development consent should be granted for the Proposed Development.
DECC	*Department and Energy and Climate Change*
Decommissioning	The period during which a development and its associated processes are removed from active operation.
Development Consent Order (DCO)	This is the means of obtaining permission for developments categorised as Nationally Significant Infrastructure Projects, under the Planning Act 2008.
DEP	Dudgeon Extension Project
EEA	*European Economic Area*
Environmental Impact Assessment (EIA)	The process of evaluating the likely significant environmental effects of a proposed project or development over and above the existing circumstances (or 'baseline').
Environmental measures	Measures which are proposed to prevent, reduce and where possible offset any significant adverse effects (or to avoid, reduce and if possible, remedy identified effects.
Environmental Statement (ES)	The written output presenting the full findings of the Environmental Impact Assessment.
EOWDC	*European Offshore Wind Development Centre*
ETG	*Expert Topic Group*
EU	*European Union*
Evidence Plan Process (EPP)	A voluntary consultation process with specialist stakeholders to agree the approach and the information required to support the EIA and HRA for certain aspects.
ExA	*Examining Authority*
Future baseline	Refers to the situation in future years without the Proposed Development.

Term (acronym)	Definition
GGOWL	*Greater Gabbard Offshore Wind Farm*
HAT	Highest Astronomical Tide
HPAI	Highly Pathogenic Avian Influenza
HDD	*Horizontal Directional Drilling*
HRA	Habitats Regulations Assessment
Impact	The changes resulting from an action.
Indirect effects	Effects that result indirectly from the Proposed Development as a consequence of the direct effects, often occurring away from the site, or as a result of a sequence of interrelationships or a complex pathway. They may be separated by distance or in time from the source of the effects.
JNCC	*Joint Nature Conservation Committee*
LAT	*Lowest Astronomical Tide*
Likely Significant Effects	It is a requirement of Environmental Impact Assessment Regulations to determine the likely significant effects of the Proposed Development on the environment which should relate to the level of an effect and the type of effect.
Magnitude (of change)	A term that combines judgements about the size and scale of the effect, the extent of the area over which it occurs, whether it is reversible or irreversible and whether it is short term or long term in duration'. Also known as the 'degree' or 'nature' of change.
MDS	*Maximum Design Scenario*
MHWS	*Mean High Water Springs*
MLWS	*Mean Low Water Springs*
MMER	*Monitoring, Mitigation and Enhancement Register*
MSL	*Mean Sea Level*
Nationally Significant Infrastructure Project (NSIP)	Nationally Significant Infrastructure Projects are major infrastructure developments in England and Wales which are consented by DCO. These include proposals for renewable energy projects with an installed capacity greater than 100MW.

Term (acronym)	Definition
NEWS	*Non-Estuarine Waterbird Survey*
NPS	*National Policy Statement*
NSIP	*Nationally Significant Infrastructure Project*
Offshore part of the PEIR Assessment Boundary	An area that encompasses all planned offshore infrastructure.
ORJIP	*Offshore Renewables Joint Industry Programme*
OSS	*Offshore Substation*
OWF	*Offshore Wind Farm*
PCH	*Potential Collision Height*
PEIR Assessment Boundary	The PEIR Assessment Boundary combines the search areas for the offshore and onshore infrastructure associated with the Proposed Development. It is defined as the area within which the Proposed Development and associated infrastructure will be located, including the temporary and permanent construction and operational work areas.
Planning Inspectorate	The Planning Inspectorate deals with planning appeals, national infrastructure planning applications, examinations of local plans and other planning-related and specialist casework in England and Wales.
Preliminary Environmental Information Report (PEIR)	The written output of the Environmental Impact Assessment undertaken to date for the Proposed Development. It is developed to support formal consultation and presents the preliminary findings of the assessment to allow an informed view to be developed of the Proposed Development, the assessment approach that has been undertaken, and the preliminary conclusions on the likely significant effects of the Proposed Development and environmental measures proposed.
Proposed Development	The development that is subject to the application for development consent, as described in **Chapter 4: The Proposed Development, Volume 2**(Document Reference: 6.2.4).
PVA	*Population Viability Analysis*
Receptor	These are as defined in Regulation 5(2) of The Infrastructure Planning (Environmental Impact

Term (acronym)	Definition
	Assessment) Regulations 2017 and include population and human health, biodiversity, land, soil, water, air, climate, material assets, cultural heritage and landscape that may be at risk from exposure to pollutants which could potentially arise as a result of the Proposed Development.
RED	*Rampion Extension Development Ltd. (the Applicant)*
RIAA	*Report to Inform Appropriate Assessment*
RSPB	*Royal Society for the Protection of Birds*
SAC	*Special Area of Conservation*
Scoping Opinion	A Scoping Opinion is adopted by the Secretary of State for a Proposed Development.
Scoping Report	A report that presents the findings of an initial stage in the Environmental Impact Assessment process.
sCRM	*Stochastic Collision Risk Modelling*
SD	*Standard Deviation*
Secretary of State	The body who makes the decision to grant development consent.
Sensitivity	A term applied to specific receptors, combining judgements of the susceptibility of the receptor to the specific type of change or development proposed and the value associated to that receptor.
SEP	Sheringham Shoal Extension Project
Significance	A measure of the importance of the environmental effect, defined by criteria specific to the environmental aspect.
Significant effects	It is a requirement of the EIA Regulations to determine the likely significant effects of the development on the environment which should relate to the level of an effect and the type of effect. Where possible significant effects should be mitigated.
SNCB	*Statutory Nature Conservation Body*
SOS	*The Sussex Ornithological Society*
SoS	*Secretary of State*
SPA	*Special Protection Area*

Term (acronym)	Definition
SSSIs	*Sites of Special Scientific Interest*
Temporal Scope	The temporal scope covers the time period over which changes to the environment and the resultant effects are predicted to occur and are typically defined as either being temporary or permanent.
UK	*United Kingdom*
WeBS	*Wetland Bird Survey*
WTG	*Wind Turbine Generator*
WWT	*Wildfowl & Wetlands Trust*
Zone of Influence (ZOI)	The area surrounding the Proposed Development which could result in likely significant effects.

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