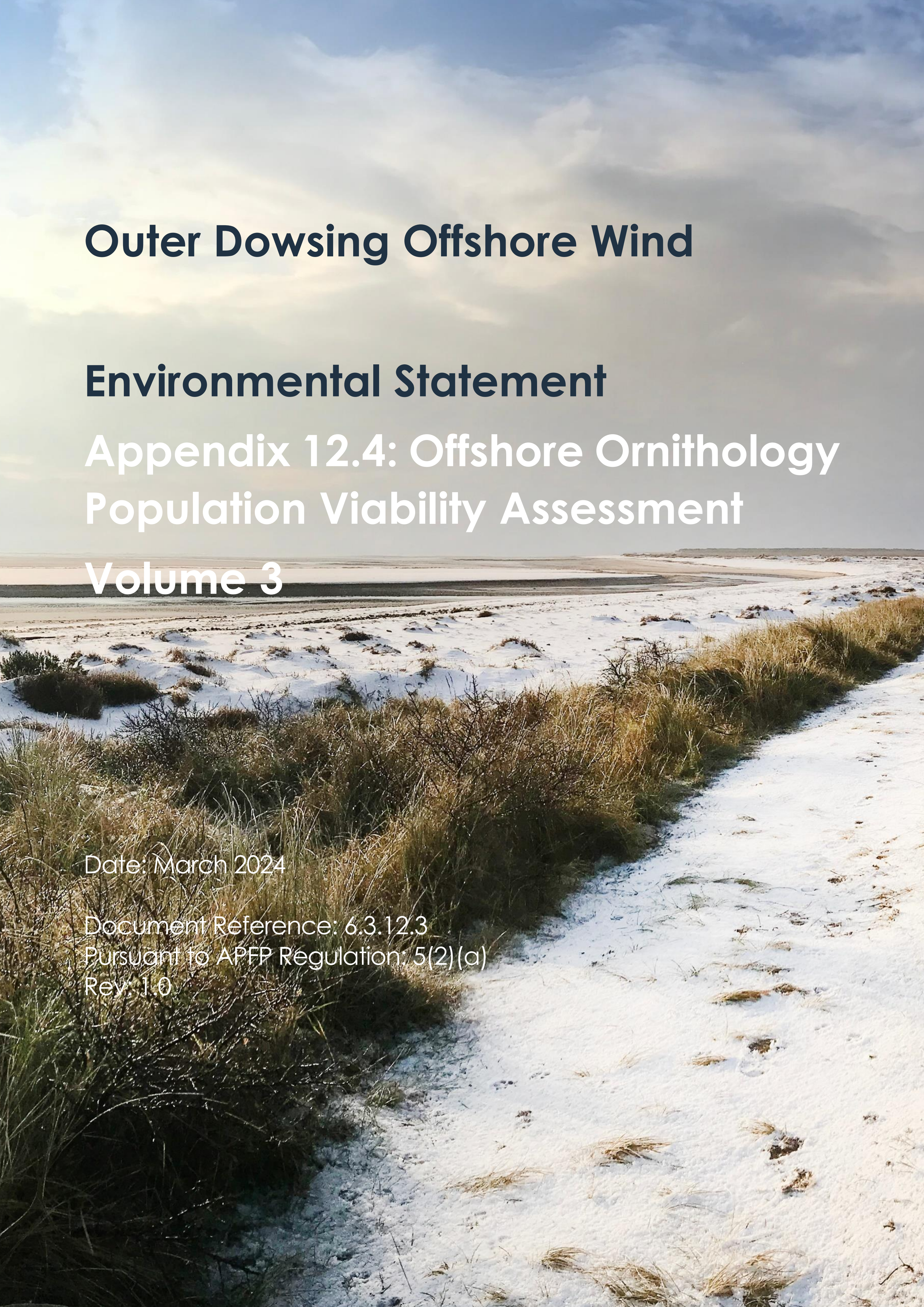

Outer Dowsing Offshore Wind

Environmental Statement

Appendix 12.4: Offshore Ornithology Population Viability Assessment

Volume 3

Date: March 2024

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Acronyms & Definitions

Abbreviations / Acronyms

Abbreviation / Acronym	Description
ANS	Artificial Nesting Structure
BDMPS	Biologically Defined Minimum Population Scale
BTO	British Trust for Ornithology
CGR	Counterfactual of Population Growth
CPS	Counterfactual Population Size
DCO	Development Consent Order
EIA	Environmental Impact Assessment
EPP	Evidence Plan Process
ES	Environmental Statement
GT R4 Ltd	The Applicant. The special project vehicle created in partnership between Corio Generation (a wholly owned Green Investment Group portfolio company), Gulf Energy Development and TotalEnergies.
GULF	Total Energies and Gulf Energy Development
HRA	Habitats Regulations Assessments
NSIP	Nationally Significant Infrastructure Project
ODOW	Outer Dowsing Offshore Wind (The Project)
OWF	Offshore wind farm
ORCP	Offshore Reactive Compensation Platforms
PVA	Population Viability Analysis
RSPB	Royal Society for the Protection of Birds
SD	Standard deviation
SNCB	Statutory Nature Conservation Body
SPA	Special Protected Area
WTGs	Wind turbine generators

Terminology

Term	Definition
Array area	The area offshore within which the generating station (including Wind Turbine Generators (WTG) and inter array cables), offshore accommodation platforms, offshore transformer substations and associated cabling will be positioned.
The Applicant	GT R4 Ltd. The Applicant making the application for a Development Consent Order (DCO). The Applicant is GT R4 Limited (a joint venture between Corio Generation, Total Energies and Gulf Energy Development (GULF)), trading as Outer Dowsing Offshore Wind. The Project is being developed by Corio Generation (a wholly owned Green Investment Group portfolio company), TotalEnergies and GULF.
Cumulative impact	Impacts that result from changes caused by other past, present or reasonably foreseeable actions together with the Project.
Development Consent Order (DCO)	An order made under the Planning Act 2008 granting development consent for a Nationally Significant Infrastructure Project (NSIP).

Term	Definition
Effect	Term used to express the consequence of an impact. The significance of an effect is determined by correlating the magnitude of an impact with the sensitivity of a receptor, in accordance with defined significance criteria.
EIA Directive	European Union 2011/92/EU (as amended by Directive 2014/52/EU).
EIA Regulations	Infrastructure Planning (Environmental Impact Assessment) Regulations 2017
Environmental Impact Assessment (EIA)	A statutory process by which certain planned projects must be assessed before a formal decision to proceed can be made. It involves the collection and consideration of environmental information, which fulfils the assessment requirements of the EIA Directive and EIA Regulations, including the publication of an Environmental Statement (ES).
Environmental Statement (ES)	The suite of documents that detail the processes and results of the EIA.
Evidence Plan	A voluntary process of stakeholder consultation with appropriate Expert Topic Groups (ETGs) that discusses and, where possible, agrees the detailed approach to the Environmental Impact Assessment (EIA) and information to support Habitats Regulations Assessment (HRA) for those relevant topics included in the process, undertaken during the pre-application period.
GT R4 Ltd	The Applicant making the application for a DCO. Refer to as GT R4 Ltd on first introduction, then "the Applicant" thereafter. The Applicant is GTR4 Limited (a joint venture between Corio Generation and Total Energies), trading as Outer Dowsing Offshore Wind. The project is being developed by Corio Generation (a wholly owned Green Investment Group portfolio company) and TotalEnergies.
Habitats Regulations Assessment (HRA)	A process which helps determine likely significant effects and (where appropriate) assesses adverse impacts on the integrity of European conservation sites and Ramsar sites. The process consists of up to four stages of assessment: screening, appropriate assessment, assessment of alternative solutions and assessment of imperative reasons of over-riding public interest (IROPI) and compensatory measures.
Impact	An impact to the receiving environment is defined as any change to its baseline condition, either adverse or beneficial.
Intertidal	The area between Mean High Water Springs (MHWS) and Mean Low Water Springs (MLWS)
NSIP Reform Action Plan	An Action Plan launched in February 2023 by Department for Levelling Up, Housing & Communities to reform the NSIP regime to ensure the effectiveness and resilience of the planning regime for the growing pipeline of critical infrastructure projects.
Offshore Export Cable Corridor (ECC)	The Offshore Export Cable Corridor (Offshore ECC) is the area within the Order Limits within which the export cable running from the array to landfall will be situated.
Offshore Reactive Compensation Platform (ORCP)	A structure attached to the seabed by means of a foundation, with one or more decks and a helicopter platform (including bird deterrents) housing electrical reactors and switchgear for the purpose of the efficient transfer of power in the course of HVAC transmission by providing reactive compensation.
Outer Dowsing Offshore Wind (ODOW)	The Project.

Term	Definition
Onshore Infrastructure	The combined name for all onshore infrastructure associated with the Project from landfall to grid connection.
Receptor	A distinct part of the environment on which effects could occur and can be the subject of specific assessments. Examples of receptors include species (or groups) of animals or plants, people (often categorised further such as 'residential' or those using areas for amenity or recreation), watercourses etc.
The Project	Outer Dowsing Offshore Wind including proposed onshore and offshore infrastructure.
Wind turbine generator (WTG)	All the components of a wind turbine, including the tower, nacelle, and rotor.

Reference Documentation

Document Number	Title
6.1.3	Project Description
6.1.12	Intertidal and Offshore Ornithology

12 Offshore Ornithology Population Viability Assessment

12.1 Introduction

12.1.1 Overview

12.1.1.1 Project Background

1. GTR4 Limited (trading as Outer Dowsing Offshore Wind) hereafter referred to as the 'Applicant', is proposing to develop Outer Dowsing Offshore Wind (hereafter 'The Project'). The Project array area will be located approximately 54km from the Lincolnshire coastline in the southern North Sea. The Project will include both offshore and onshore infrastructure including an offshore generating station (windfarm), export cables to landfall, Offshore Reactive Compensation Platforms (ORCPs), onshore cables, connection to the electricity transmission network, ancillary and associated development and areas for the delivery of up to two Artificial Nesting Structures (ANS) and the creation and recreation of a biogenic reef (if these compensation measures are deemed to be required by the Secretary of State) (see Volume 1, Chapter 3: Project Description (document reference 6.1.3) for full details).
2. This technical annex has been produced to support the assessment of potential project impacts on seabirds identified in Volume 1, Chapter 12: Intertidal and Offshore Ornithology (document reference 6.1.12).
3. The consideration of offshore and intertidal ornithology for The Project has been discussed with consultees (Natural England and the Royal Society for the Protection of Birds (RSPB)) through The Project Evidence Plan Process (EPP). The latest Natural England and Statutory Nature Conservation Bodies (SNCB) advice has been followed (Parker *et al.*, 2022c; MIG-Birds, 2022). Where there is deviation from this guidance, any agreements made with consultees during the EPP regarding the displacement methodology can be found within document 6.1.12, Section 12.3.

12.1.1.2 Population Viability Analysis

4. Renewable energy projects in the marine environment, such as Offshore Wind Farms (OWFs), have the potential to impact on seabirds through a number of processes such as collision with turbine blades resulting in mortality, or displacement from an area due to the presence of Wind Turbine Generators (WTGs). These processes affect individuals, but the cumulative effects (when the project alone effects are considered alongside any effects from other projects on the same receptor) have the potential to affect the productivity or elevate the baseline mortality of a population.
5. The Environmental Impact Assessment (EIA) and Habitats Regulations Assessments (HRA) processes provides the assessment of such potential effects as a consequence of OWFs at varying population scales, from a single Special Protection Area (SPA) colony to the wider biogeographic population.

6. One method to estimate the effect that developments alone or cumulatively may have on a population is through Population Viability Analysis (PVA). PVA provides a robust framework using demographic parameters to predict changes in the population, using statistical population models to forecast future changes over a set period. Comparisons are made between 'baseline' scenario whereby conditions remain unimpacted and under an 'impacted' scenario where an impact is applied to a population by the alteration of demographic parameters.
7. This report provides PVAs modelled population impacts to the North Sea and English Channel Biologically Defined Minimum Population Scale (BDMPS) and wider biogeographic population scales. The eight species selected for modelling were:
   - Black-legged kittiwake (hereafter 'kittiwake');
   - Northern gannet (hereafter 'gannet');
   - Common guillemot (hereafter 'guillemot');
   - Razorbill;
   - Atlantic Puffin (hereafter 'puffin');
   - Lesser black-backed gull;
   - Herring gull; and
   - Great black-backed gull.
8. These species were selected to further assess the predicted cumulative impacts only, due to the predicted impacts at a cumulative scale exceeding, or being close to exceeding, a 1% increase relative to baseline mortality relative to the BDMPS for that species. A 1% increase to baseline mortality is generally regarded as the threshold for undertaking further assessments such as PVA (Parker *et al.*, 2022c).
9. PVA was undertaken using the Seabird PVA Tool developed by Natural England (Searle *et al*. 2019). The Seabird PVA Tool was accessed via the 'Shiny App' interface, which is a user-friendly graphical user interface accessible via a standard web-browser that uses the nepva R package to perform the modelling and analysis. The advantages of using an online platform for modelling and analysis purposes are that the approach is consistent across projects, users are not required to use any R code, users are not required to install or maintain R, and updates to the model are made directly to the server. The tool is capable of assessing many different types of impact to a population. For example, it can model impacts as changes to demographic parameters (e.g. survival or productivity), or as a cull or harvest of a fixed size per year (Searle *et al*. 2019).

12.2 Methodology

12.2.1 Guidance and Models

10. The user guide for the Seabird PVA Tool provided by Natural England (Mobbs *et al.* 2020) has been followed for modelling and assessment of potential impacts. The demographic parameters used for the PVA are presented in Section 12.2.2, whilst the input log and outputs from the Shiny App are included in Annex A of this report.

11. The Seabird PVA Tool uses a Leslie matrix to construct a PVA model (Caswell, 2000) based on the parameters provided by the user. Two broad types of population models are available: (a) deterministic Leslie matrix models, and (b) stochastic Leslie matrix models. Users are able to specify whether the model is run using environmental stochasticity (as opposed to a deterministic model), demographic stochasticity, and whether it incorporates density dependence.
12. PVA for The Project was run using stochasticity, as this option incorporates uncertainty into inputs and outputs, and therefore provides more ecologically realistic values compared to deterministic models.
13. A stochastic model produces probabilistic outputs to account for the impact of environmental and demographic stochasticity. Environmental stochasticity describes the effects random variation in factors such as weather can have on a population and is modelled by the incorporation of randomly generated values for the probability of survival from one-time step to the next. Demographic stochasticity refers to the effect of random variation in population structure on demographic rates and is modelled by selecting the survival probability from a distribution. Demographic stochasticity can usually be ignored for populations greater than 100 individuals, however including demographic stochasticity will not cause any penalty when simulating larger populations (WWT Consulting 2012). Demographic stochasticity was therefore included in PVA models.
14. All PVA modelling in this report was undertaken with the Beta/Gamma model for environmental stochasticity and was run with no density dependence. To ensure robust results, all simulations were set to run 5,000 times. All models were run for a 35-year time span (2030 to 2065), representing the likely lifespan of The Project.
15. Modelling has been undertaken including ‘burn in’ within the model. The inclusion of ‘burn in’ allows for a stable age structure to be generated before the impacts are applied. A burn in period of five years was used as per Natural England guidance (Parker *et al.,* 2022c; Mobbs *et al.* 2020), with the exception of lesser black-backed gull for which no burn in was included.

16. Demographic processes, such as growth, survival, productivity and recruitment, change relative to the number of individuals in a population, and are therefore density dependent. Density dependence regulates population size by adjusting demographic rates to maintain a population around a carrying capacity. If impacts form OWFs decrease survival, reduced competition for resources could cause a subsequent increase in survival and/or productivity and consequently an increase in population growth rate. Density dependence is self-evident in the natural environment, as without density dependence, populations would grow exponentially. However, the mechanisms as to how this operates in seabird populations are largely uncertain. If density dependence is mis-specified in an assessment, the modelled predictions will be unreliable. Therefore, it is more typical to use more precautionary density independent models for seabird assessments, despite the ecological evidence suggesting that density dependence acts on large populations (Horswill *et al.* 2017). As such, density independent models lack any means by which a population can recover once it has been reduced beyond a certain point, they are therefore appropriate for impact assessment purposes as it represents a precautionary approach (Ridge *et al.* 2019).
17. The demographic rates used in the analyses are presented in Table 12.1, Table 12.2 and Table 12.3.

12.2.2 Species-specific input parameters

18. The Shiny App offers the users the choice of using pre-set demographic parameters or the ability to enter custom values. The pre-set demographic values are available for a total of 15 different species. The values are derived from previously reported national or colony specific demographic parameters sourced from the British Trust for Ornithology (BTO) Seabird Monitoring Program (BTO, 2023), divided into eight regional classifications for breeding success data (further information on the eight regional classifications can be found in Mobbs *et al.* (2020)) or Horswill and Robinson (2015) for survival rate.

12.2.2.1 Population size

19. The initial population size used in PVA was the relevant peak annual BDMPS population and biogeographic populations as defined in Volume 1, Chapter 12: Intertidal and Offshore Ornithology (document reference 6.1.12).

Table 12.1:Initial population sizes used in PVA.

Species	BDMPS population	Biogeographic population
Kittiwake	829,937	5,100,000
Gannet	456,298	1,180,000
Guillemot	2,045,078	4,125,000
Razorbill	591,874	1,707,000
Puffin	868,689	11,840,000
Lesser black-backed gull	209,007	864,000
Herring gull	466,511	1,098,000
Great black-backed gull	91,399	235,000

12.2.2.2 Breeding success data

20. The input value used for mean productivity and Standard Deviation (SD) was selected as the default values in the PVA tool for the Greater North Sea region.

Table 12.2: Breeding success parameters used in PVA.

Species	Productivity rate +/- SD
Kittiwake	0.70 (± 0.32)
Gannet	0.69 (± 0.07)
Guillemot	0.69 (± 0.12)
Razorbill	0.56 (± 0.16)
Puffin	1.40 (± 0.46)
Lesser black-backed gull	0.47 (± 0.58)
Herring gull	1.03 (± 0.66)
Great black-backed gull	1.40 (± 0.46)

12.2.2.3 Survival rate

21. Survival rates used were based on the “National” values in the PVA tool, which are based on Horswill and Robinson (2015).

Table 12.3 Survival rates used in PVA.

Species	Survival rate (+/- SD)						
	Adult	Immature 0 to 1	Immature 1 to 2	Immature 2 to 3	Immature 3 to 4	Immature 4 to 5	Immature 5 to 6
Kittiwake	0.85 (± 0.08)	0.79 (± 0.08)	0.85 (± 0.08)	0.85 (± 0.08)	0.85 (± 0.08)	0.85 (± 0.08)	-
Gannet	0.92 (± 0.04)	0.42 (± 0.05)	0.83 (± 0.03)	0.89 (± 0.02)	0.90 (± 0.02)	0.92 (± 0.04)	-
Guillemot	0.94 (± 0.03)	0.56 (± 0.06)	0.79 (± 0.15)	0.92 (± 0.10)	0.94 (± 0.11)	0.94 (± 0.03)	0.94 (±0.03)
Razorbill	0.90 (± 0.07)	0.63 (± 0.07)	0.63 (± 0.07)	0.90 (± 0.07)	0.90 (± 0.07)	0.90 (± 0.07)	-
Puffin	0.91 (± 0.08)	0.71 (± 0.11)	0.71 (± 0.11)	0.71 (± 0.11)	0.76 (± 0.09)	0.81 (± 0.08)	-
Lesser black-backed gull	0.89 (± 0.06)	0.82 (± 0.06)	0.89 (± 0.06)	0.89 (± 0.06)	0.89 (± 0.06)	0.89 (± 0.06)	-
Herring gull	0.83 (± 0.08)	0.80 (± 0.08)	0.83 (± 0.08)	0.80 (± 0.08)	0.80 (± 0.08)	0.80 (± 0.08)	-
Great black-backed gull	0.93 (± 0.00)	0.93 (± 0.00)	0.93 (± 0.00)	0.93 (± 0.00)	0.93 (± 0.00)	0.93 (± 0.00)	-

12.3 PVA Scenarios assessed

22. This section outlines the different PVA scenarios assessed for each species. Key scenarios include assessment of impacts from The Project alone, and cumulatively with other projects, though further scenarios (e.g., different displacement rates) are described on a species-by-species basis below. Table 12.4 to Table 12.11 present the relevant mortalities for each species scenario and the extent to which those mortalities reduce the population survival rates. It is these reduction in survival rates that are inputted into the model to inform the 'impacted' scenario.

12.3.1 Kittiwake

23. For kittiwake, two main scenarios are assessed (Project alone and cumulatively) against both BDMPS and biogeographic populations.

Table 12.4: PVA scenarios assessed for kittiwake.

Scenario	Mortalities per annum	Impact on survival rate (BDMPS)	Impact on survival rate (biogeographic)
Project alone	30.9	<0.001	<0.001
Cumulative	3,212.6	0.004	0.001

12.3.2 Gannet

24. As gannet is assessed for both collision and displacement impacts, the PVA analysis for this species considers the combined impacts only (i.e., collision impacts plus displacement impacts). Within this, there are therefore several scenarios based on the different displacement rates presented in 6.1.12 Offshore and Intertidal Ornithology (60% to 80% displacement). Based on this, six scenarios are assessed.

Table 12.5: PVA scenarios assessed for gannet.

Scenario	Mortalities per annum	Impact on survival rate (BDMPS)	Impact on survival rate (biogeographic)
Project alone			
60% displacement, 1% mortality	9.1	<0.001	<0.001
70% displacement, 1% mortality	10.0	<0.001	<0.001
80% displacement, 1% mortality	10.5	<0.001	<0.001
Cumulative			
60% displacement, 1% mortality	825.5	0.002	0.001
70% displacement, 1% mortality	883.4	0.002	0.001

Scenario	Mortalities per annum	Impact on survival rate (BDMPS)	Impact on survival rate (biogeographic)
80% displacement, 1% mortality	941.3	0.002	0.001

12.3.3 Guillemot

25. Guillemot scenarios assessed incorporate a range of different displacement and mortality results as presented in 6.1.12 Offshore and Intertidal Ornithology, ranging from 30% displacement and 1% mortality to 70% displacement and 10% mortality. Based on this, eight scenarios are assessed.

Table 12.6: PVA scenarios assessed for guillemot.

Scenario	Mortalities per annum	Impact on survival rate (BDMPS)	Impact on survival rate (biogeographic)
Project alone			
30% displacement, 1% mortality	83	<0.001	<0.001
50% displacement, 1% mortality	138.3	<0.001	<0.001
70% displacement, 2% mortality	387.1	<0.001	<0.001
70% displacement, 10% mortality	1,935.7	0.001	<0.001
Cumulative			
30% displacement, 1% mortality	1,772.2	0.001	<0.001
50% displacement, 1% mortality	2,870.3	0.001	0.001
70% displacement, 2% mortality	8,036.9	0.004	0.002
70% displacement, 10% mortality	40,184.4	0.020	0.020

12.3.4 Razorbill

26. Razorbill scenarios assessed incorporate a range of different displacement and mortality results as presented in 6.1.12 Offshore and Intertidal Ornithology, ranging from 30% displacement and 1% mortality to 70% displacement and 10% mortality. Based on this, eight scenarios are assessed.

Table 12.7: PVA scenarios assessed for razorbill.

Scenario	Mortalities per annum	Impact on survival rate (BDMPS)	Impact on survival rate (biogeographic)
Project alone			

Scenario	Mortalities per annum	Impact on survival rate (BDMPS)	Impact on survival rate (biogeographic)
30% displacement, 1% mortality	42.5	<0.001	<0.001
50% displacement, 1% mortality	80.8	<0.001	<0.001
70% displacement, 2% mortality	198.1	<0.001	<0.001
70% displacement, 10% mortality	990.7	0.002	0.001
Cumulative			
30% displacement, 1% mortality	506.2	0.001	<0.001
50% displacement, 1% mortality	843.7	0.001	<0.001
70% displacement, 2% mortality	2,362.32	0.004	0.001
70% displacement, 10% mortality	11,811.6	0.020	0.007

12.3.5 Puffin

27. Razorbill scenarios assessed incorporate a range of different displacement and mortality results as resented in 6.1.12 Offshore and Intertidal Ornithology, ranging from 30% displacement and 1% mortality to 70% displacement and 10% mortality. Based on this, six scenarios are assessed.

Table 12.8: PVA scenarios assessed for puffin.

Scenario	Mortalities per annum	Impact on survival rate (BDMPS)	Impact on survival rate (biogeographic)
Project alone			
30% displacement, 1% mortality	4.2	<0001	<0001
50% displacement, 1% mortality	7.0	<0001	<0001
70% displacement, 10% mortality	97.8	<0001	<0001
Cumulative			
30% displacement, 1% mortality	153.6	<0001	<0001
50% displacement, 1% mortality	255.9	<0001	<0001
70% displacement, 10% mortality	3582.7	0.004	<0001

12.3.6 Lesser black-backed gull

28. For lesser black-backed gull, two main scenarios are assessed (Project alone and cumulatively, both assessed against both BDMPS and biogeographic populations).

Table 12.9: PVA scenarios assessed for lesser black-backed gull.

Scenario	Mortalities per annum	Impact on survival rate (BDMPS)	Impact on survival rate (biogeographic)
Project alone	1.7	<0.001	<0.001
Cumulative	725.0	0.003	0.001

12.3.7 Herring gull

29. For herring gull, two main scenarios are assessed (Project alone and cumulatively, both assessed against both BDMPS and biogeographic populations).

Table 12.10: PVA scenarios assessed for herring gull.

Scenario	Mortalities per annum	Impact on survival rate (BDMPS)	Impact on survival rate (biogeographic)
Project alone	2.2	<0.001	<0.001
Cumulative	948.6	0.002	0.001

12.3.8 Great black-backed gull.

30. For great black-backed gull, two main scenarios are assessed (Project alone and Project cumulatively, both assessed against both BDMPS and biogeographic populations).

Table 12.11: PVA scenarios assessed for great black-backed gull.

Scenario	Mortalities per annum	Impact on survival rate (BDMPS)	Impact on survival rate (biogeographic)
Project alone	3.0	<0.001	<0.001
Cumulative	1371.4	0.015	0.006

12.4 PVA Results

31. For each scenario (Table 12.4), Counterfactual of Population Growth (CGR) and Counterfactual Population Size (CPS) have been presented from the model outputs, measuring the changes in annual growth rate and population size respectively at the end of the impacted period of 35 years relative to a baseline scenario. The impact on adult survival is also presented, calculated as the number of mortalities divided by the relevant population size used in the PVA analysis.

12.4.1 Kittiwake

Table 12.12: PVA results for kittiwake.

Scenario	Mortalities per annum	CGR (BDMPS)	CPS (BDMPS)	CGR (biogeographic)	CPS (biogeographic)
Project alone	30.9	1.000	0.999	1.000	1.000
Cumulative	3,212.6	0.995	0.891	0.999	0.973

12.4.2 Gannet

Table 12.13: PVA results for gannet.

Scenario	Mortalities per annum	CGR (BDMPS)	CPS (BDMPS)	CGR (biogeographic)	CPS (biogeographic)
Project alone					
60% displacement, 1% mortality	9.1	1.000	0.999	1.000	1.000
70% displacement, 1% mortality	10.0	1.000	0.999	1.000	1.000
80% displacement, 1% mortality	10.5	1.000	0.999	1.000	1.000
Cumulative					
60% displacement, 1% mortality	825.5	0.999	0.968	0.999	0.971
70% displacement, 1% mortality	883.4	0.999	0.963	0.999	0.969
80% displacement, 1% mortality	941.3	0.999	0.958	0.999	0.967

12.4.3 Guillemot

Table 12.14: PVA results for guillemot.

Scenario	Mortalities per annum	CGR (BDMPS)	CPS (BDMPS)	CGR (biogeographic)	CPS (biogeographic)
Project alone					
30% displacement, 1% mortality	83	1.000	0.998	1.000	0.999
50% displacement, 1% mortality	138.3	1.000	0.997	1.000	0.999
70% displacement, 2% mortality	387.1	1.000	0.992	1.000	0.996
70% displacement, 10% mortality	1,935.7	0.999	0.962	0.999	0.981
Cumulative					
30% displacement, 1% mortality	1,772.2	0.999	0.965	1.000	0.983
50% displacement, 1% mortality	2,870.3	0.998	0.945	0.999	0.972
70% displacement, 2% mortality	8,036.9	0.996	0.853	0.998	0.924
70% displacement, 10% mortality	40,184.4	0.978	0.447	0.989	0.674

12.4.4 Razorbill

Table 12.15: PVA results for razorbill.

Scenario	Mortalities per annum	CGR (BDMPS)	CPS (BDMPS)	CGR (biogeographic)	CPS (biogeographic)
Project alone					
30% displacement, 1% mortality	42.5	1.000	0.997	1.000	0.999
50% displacement, 1% mortality	80.8	1.000	0.994	1.000	0.998
70% displacement, 2% mortality	198.1	1.000	0.986	1.000	0.995
70% displacement, 10% mortality	990.7	0.998	0.931	0.999	0.976
Cumulative					
30% displacement, 1% mortality	506.2	0.999	0.964	1.000	0.987
50% displacement, 1% mortality	843.7	0.998	0.941	0.999	0.979
70% displacement, 2% mortality	2,362.32	0.995	0.844	0.998	0.943

Scenario	Mortalities per annum	CGR (BDMPS)	CPS (BDMPS)	CGR (biogeographic)	CPS (biogeographic)
70% displacement, 10% mortality	11,811.6	0.976	0.424	0.992	0.745

12.4.5 Puffin

Table 12.16: PVA results for puffin.

Scenario	Mortalities per annum	CGR (BDMPS)	CPS (BDMPS)	CGR (biogeographic)	CPS (biogeographic)
Project alone					
30% displacement, 1% mortality	4.2	1.000	1.000	1.000	1.000
50% displacement, 1% mortality	7.0	1.000	1.000	1.000	1.000
70% displacement, 10% mortality	97.8	1.000	0.995	1.000	1.000
Cumulative					
30% displacement, 1% mortality	153.6	1.000	0.993	1.000	0.999
50% displacement, 1% mortality	255.9	1.000	0.988	1.000	0.999
70% displacement, 10% mortality	3582.7	0.995	0.839	1.000	0.987

12.4.6 Lesser black-backed gull

Table 12.17: PVA results for lesser black-backed gull

Scenario	Mortalities per annum	CGR (BDMPS)	CPS (BDMPS)	CGR (biogeographic)	CPS (biogeographic)
Project alone	1.7	1.000	1.000	1.000	1.000
Cumulative	725.0	0.996	0.867	0.999	0.966

12.4.7 Herring gull

Table 12.18: PVA results for herring gull.

Scenario	Mortalities per annum	CGR (BDMPS)	CPS (BDMPS)	CGR (biogeographic)	CPS (biogeographic)
Project alone	2.2	1.000	1.000	1.000	1.000
Cumulative	948.6	0.998	0.915	0.999	0.963

12.4.8 Great black-backed gull

Table 12.19: PVA results for great black-backed gull.

Scenario	Mortalities per annum	CGR (BDMPS)	CPS (BDMPS)	CGR (biogeographic)	CPS (biogeographic)
Project alone	3.0	1.000	0.999	1.000	1.000
Cumulative	1371.4	0.984	0.557	0.994	0.797

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Annex A

Full log of model inputs and outputs available on request from the Applicant.