Environmental Impact Assessment Report
Volume 3, Appendix 33.4: Offshore and Intertidal Ornithology Cumulative Effects Assessment

MarramWind Offshore Wind Farm

December 2025

MarramWind

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1. Introduction

1.1.1.1 This Appendix presents the cumulative effects assessment (CEA) for offshore and intertidal ornithology undertaken for MarramWind Offshore Wind Farm (hereafter, referred to as 'the Project'). This Appendix should be read in conjunction with **Volume 1, Chapter 12: Offshore and Intertidal Ornithology** and **Chapter 33: Cumulative Effects Assessment**.

1.1.1.2 This CEA presents a review of all other developments considered to potentially impact in a cumulative manner on offshore and intertidal ornithology receptors with the Project. It also provides for consideration of all such other developments' potential impacts in a quantitative manner, where possible, that may coincide with the construction, operation and maintenance (O&M) and decommissioning of the offshore Project seaward of Mean High Water Springs (MHWS). The aim of this CEA is to determine if any receptors may be subject to a likely significant adverse effect as a result of the Project with other developments.

2. Cumulative Effects

2.1 Overview

2.1.1.1 Cumulative effects are the result of the predicted impact of the Project acting in tandem with the predicted impacts of other proposed and reasonably foreseeable developments on receptors. This includes other developments that are not inherently considered as part of the current baseline.

2.2 Screening for cumulative effects

2.2.1.1 The first step of the CEA identifies which effect pathways for the Project alone, as assessed within **Volume 1, Chapter 12: Offshore and Intertidal Ornithology**, have the potential to interact with other developments to give rise to cumulative effects. All potential cumulative effects to be taken forward in the CEA are detailed in **Table 2.1**. To ensure a proportionate approach to CEA, a screening exercise (**Table 2.1**) has been completed to identify which potential effect pathways will tangibly contribute to any cumulative effect, therefore requiring CEA.

Table 2.1 Offshore and intertidal ornithology potential cumulative effects

Impact	Receptor	Potential for cumulative effect	Rationale
Construction stage			
Impact C1: Direct temporary habitat loss / disturbance (Option Agreement Area (OAA) and offshore export cable corridor)	All Receptors	No	Effect pathway is both spatially and temporally limited, significantly limiting the potential for a cumulative effect to occur. The Project has also committed to installation using horizontal directional drilling (HDD) further reducing the potential for a cumulative effect to occur.
Impact C2: Direct temporary habitat loss / disturbance (export cable corridor landfall)	All Receptors	No	Effect pathway is both spatially and temporally limited, significantly limiting the potential for a cumulative effect to occur.
Impact C3: Indirect impacts due to effects on prey species and habitats (OAA and offshore export cable corridor)	All Receptors	No	Effect pathway is both spatially and temporally limited, significantly limiting the potential for a cumulative effect to occur.
O&M stage			
Impact O1: Indirect impacts due to effects on prey species and habitats (OAA)	All Receptors	No	Magnitude of impact concluded as very low for the Project alone. Any potential impact on prey and supporting habitat within the operation and maintenance stage relates to any required ad hoc maintenance or

Impact	Receptor	Potential for cumulative effect	Rationale
			repairs. Such works would be highly localised and short term in nature, therefore no potential for a tangible cumulative effect to occur.
Impact O2: Distributional responses (OAA)	Kittiwake	Yes	Multiple developments within species foraging range identified which may cause increased levels of disturbance.
	Guillemot	Yes	Multiple developments within species foraging range identified which may cause increased levels of disturbance.
	Razorbill	Yes	Multiple developments within species foraging range identified which may cause increased levels of disturbance.
	Puffin	Yes	Multiple developments within species foraging range identified which may cause increased levels of disturbance.
	Gannet	Yes	Multiple developments within species foraging range identified which may cause increased levels of disturbance.
	Fulmar	No	Project alone concluded potential for effect as negligible. Such a level of predicted effect would not tangibly contribute to any cumulative effect.
	Migratory birds (see Section 12.10.3 of **Volume 1, Chapter 12: Offshore and Intertidal Ornithology** for full list of receptors)	No	As summarised within Section 12.10.3 of **Volume 1, Chapter 12: Offshore and Intertidal Ornithology** there is limited evidence to suggest the potential for barrier effects will lead to a significant effect for the Project alone or cumulatively given their migratory flight behaviour and limited interaction (bi-annual at most).
Impact O3: Collision risk (OAA)	Great skua	No	The Project alone impact annually was predicted to be significantly less than a single individual (0.68) per annum. Such a level of predicted effect would not tangibly contribute to any cumulative effect.
	Great-black-backed gull	Yes	Multiple developments within species foraging range identified which may cause increased levels of collision.
	Herring gull	Yes	Multiple developments within species foraging range identified which may cause increased levels of collision.

Impact	Receptor	Potential for cumulative effect	Rationale
	Lesser black-backed gull	No	The Project alone impact annually was predicted to be significantly less than a single individual (0.27) per annum. Such a level of predicted effect would not tangibly contribute to any cumulative effect.
	Kittiwake	Yes	Multiple developments within species foraging range identified which may cause increased levels of collision.
	Gannet	Yes	Multiple developments within species foraging range identified which may cause increased levels of collision.
	Migratory birds (as assessed within Section 12.10.4 of **Volume 1, Chapter 12: Offshore and Intertidal Ornithology** for full list of receptors)	No	Potential for a significant cumulative effect can confidently be excluded given the minimal impacts predicted for Project alone and other nearby developments which have quantitatively assessed migratory risk (Ossian Offshore Wind Farm Limited (OOWFL), 2024; ERM, 2024a; GoBe 2024a). Further, previous regional assessments have concluded that the potential risk of collision cumulatively was non-significant despite being based on more precautionary biometric parameters and turbine designs (Wildfowl and Wetlands Trust (WWT) & MacArthur Green, 2014), although noting that the cumulative risk was estimated in a context that did not include any ScotWind developments.
Impact O4: Entanglement with mooring lines (OAA)	All Receptors	No	Limited evidence to support the effect pathway leading to an impact for the Project alone or cumulatively.
Decommissioning stage			
Impact D1: Direct temporary habitat loss / disturbance (OAA and offshore export cable corridor)	All Receptors	No	Effect pathway is both spatially and temporally limited, significantly limiting the potential for a cumulative effect to occur.
Impact D2: Direct temporary habitat loss / disturbance (offshore export cable corridor landfall)	All Receptors	No	Effect pathway is both spatially and temporally limited, significantly limiting the potential for a cumulative effect to occur.

2.3 Screening for other developments

2.3.1.1 The second step of the CEA process involves the creation of a shortlist of other developments with the potential to interact with the Project and consequently give rise to cumulative effects. A comprehensive list of all other offshore developments considered is provided in **Appendix 33.1: Identification of Offshore 'Other Developments' for Cumulative Effects Assessment**. This list has been compiled based on available information on each plan or project as of June 2025.

2.3.1.2 To account for potential uncertainty around the other developments considered within the cumulative assessment, a tiering process has been used whereby developments are assigned a tier that reflects their current stage in the planning and development process. Tiers used are presented in **Table 2.2** below.

Table 2.2 Tiers used for screening and assessment of 'other developments' (offshore)

Tier	Sub-Tier	Criteria
Tier 1	Tier 1a	'Other developments' in operation (as per MD-LOT's guidance see Table 33.1 of **Volume 1, Chapter 33 Cumulative Effects Assessment**, Stakeholder Issue ID: 749).
	Tier 1b	'Other developments' under construction.
	Tier 1c	Permitted applications, whether under the Electricity Act 1989; Marine and Coastal Access Act 2009 (between 12 and 200nm) and the Marine (Scotland) Act 2010 (between 0 and 12nm); Town and Country Planning (Scotland) Act 1997; or other regimes, but not yet implemented.
	Tier 1d	Submitted applications, whether under the Electricity Act 1989; Marine and Coastal Access Act 2009 (between 12 and 200nm) and the Marine (Scotland) Act 2010 (between 0 and 12nm); Town and Country Planning (Scotland) Act 1997; or other regimes, but not yet determined.
	Tier 1e	All refusals subject to appeal procedures but not yet determined.
Tier 2	N/A	'Other developments' where a Scoping Report has been submitted.
Tier 3	Tier 3a	'Other developments' where a Scoping Report has not been submitted.
	Tier 3b	'Other developments' 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 developments (as appropriate) that set the framework for future development consents / approvals, where such development is reasonably likely to come forward.

2.3.1.3 Only Tier one and two developments have been included in the CEA shortlist, as Tier three currently have no quantitative data available. However, this process is still considered highly precautionary. Most projects are evaluated based on their consented design rather than the actual as-built turbines and layout. Previous headroom and sensitivity assessments (e.g., MacArthur Green, 2020, GoBe, 2025a; APEM, 2024; APEM, 2022a) have found that this approach can substantially overestimate collision risk impacts. Furthermore, it is assumed that all developments currently awaiting consent will be developed to the maximum extent outlined in their proposed designs. This represents a precautionary approach, as some developments may ultimately not receive consent, may scale back their design before consent is granted, or may reduce the project boundary.

2.3.1.4 The shortlisting of developments also takes into account the Zone of Influence (ZOI), with the shortlist determined based on the largest ZOI for offshore and intertidal ornithology. The CEA accounts for the ZOI being species specific and also the potential for the ZOI to vary depending on the season. The approach to defining ZOIs to inform cumulative assessments was consulted on with NatureScot (see Section 12.3 of **Volume 1, Chapter 12: : Offshore and Intertidal Ornithology**) and agreed as the following approach:

- For breeding season assessments, the ZOI is based on all developments within Mean Maximum Foraging Range (MMFR) plus one standard deviation (SD) of the Project, based on the recommended MMFR plus one SD values within NatureScot Guidance Note 3 (NatureScot, 2023a).
- For the non-breeding season assessments, the ZOI is based on all developments within the species-specific North Sea (and English Channel) Biologically Defined Minimum Population Scale (BDMPS) region as defined in Furness (2015). An exception to this approach has been applied to herring gull and guillemot, whereby a regional approach has also been assessed in the non-breeding season, as advised by NatureScot (see Section 12.3 of **Volume 1, Chapter 12: Offshore and Intertidal Ornithology**).

2.3.1.5 The offshore and intertidal ornithology breeding season ZOI (using gannet's foraging range of 509.4km, Woodward *et al*., 2019) is shown in **Volume 2, Figure 33.12a: 'Other developments' screened into the CEA for offshore and intertidal ornithology**.

2.3.1.6 The offshore and intertidal ornithology non-breeding season ZOI (using the species-specific North Sea (and English Channel) BDMPS region as defined in Furness (2015) is shown in **Volume 2, Figure 33.12b: 'Other developments' screened into the CEA for offshore and intertidal ornithology**.

2.3.1.7 Based on the effect pathways concluded as requiring CEA and the effect pathways posed by other developments identified, the resulting shortlist for the offshore ornithology CEA is presented in **Table 2.3**. Additionally, though developments within tiers one and two may be included in the short list, they are only included within the CEA if quantitative data are available for the species and impact in question.

2.3.1.8 In relation to intertidal ornithology receptors, the potential for a CEA was confidently ruled out for all potential effect pathways as summarised within **Table 2.1** and is therefore, not considered further within this Appendix.

Table 2.3 Other developments shortlisted for the CEA for Offshore and Intertidal Ornithology

'Other development' ID	Project	Tier	Distance from OAA (km)
OWF-001	2B Energy Methil Demonstration (Methil)	1a	264.9
OWF-002	Aberdeen (EOWDC)	1a	108.9
OWF-005	Beatrice Offshore Wind Farm (Beatrice)	1a	112.2
OWF-010	Blyth Demo Phase 1 (Blyth Demonstration Project)	1a	320.7
OWF-020	Dogger Bank A	1a	382.3
OWF-025	Dudgeon Offshore Wind Farm	1a	534.4
OWF-026	East Anglia ONE	1a	653.7
OWF-030	Galloper Offshore Wind Farm	1a	687.2
OWF-031	Greater Gabbard Offshore Wind Farm	1a	689.5
OWF-033	Gunfleet Sands	1a	784.9
OWF-036	Hornsea Project ONE	1a	475
OWF-038	Hornsea Project TWO	1a	467.4
OWF-039	Humber Gateway	1a	484.5
OWF-040	Hywind Scotland Pilot Park (Hywind)	1a	66.8
OWF-044	Kentish Flats	1a	856
OWF-045	Kincardine – Phase 1 & Phase 2	1a	126
OWF-046	Lincs Offshore Wind Farm	1a	618.3
OWF-047	London Array	1a	796.3
OWF-048	Lynn and Inner Dowsing Wind Farms	1a	592.9
OWF-049	Moray East	1a	101.3
OWF-050	Moray West	1a	116.5
OWF-053	Neart na Gaoithe (NNG) Offshore Wind Farm	1a	207.9

'Other development' ID	Project	Tier	Distance from OAA (km)
OWF-058	Race Bank	1a	524.7
OWF-061	Seagreen Offshore Wind Farm (Seagreen alpha and bravo)	1a	158.7
OWF-063	Sheringham Shoal Offshore Wind Farm	1a	547.6
OWF-067	Teeside	1a	374.8
OWF-069	Triton Knoll	1a	503.7
OWF-070	Westermost Rough	1a	464.1
OWF-136	Levenmouth Demonstration	1a	245.0
OWF-137	Scroby Sands	1a	611.8
OWF-138	Rampion	1a	813.4
OWF-139	Thanet	1a	740.8
OWF-021	Dogger Bank B	1b	356.3
OWF-022	Dogger Bank C	1b	380.8
OWF-037	Hornsea Project THREE	1b	455.9
OWF-041	Inch Cape Offshore Wind Farm	1b	179.7
OWF-065	Sofia	1b	367.7
OWF-140	East Anglia THREE	1b	619.5
OWF-009	Berwick Bank Offshore Wind Farm	1c	176.1
OWF-011	Blyth Demo Phase 2	1c	311.3
OWF-027	East Anglia ONE North	1c	645.9
OWF-028	East Anglia TWO	1c	665.7
OWF-032	Green Volt – Floating Offshore Wind Farm (INTOG 6)	1c	9.2
OWF-054	Norfolk Boreas	1c	578.6
OWF-055	Norfolk Vanguard	1c	584.9

'Other development' ID	Project	Tier	Distance from OAA (km)
OWF-059	Salamander (INTOG 3)	1c	47.8
OWF-061	Seagreen 1A Offshore Wind Farm	1c	171.8
OWF-062	Sheringham and Dudgeon Extension Offshore Wind Farm Extension	1c	535.2
OWF-068	Culzean (INTOG 12)	1c	168.3
OWF-072	West of Orkney Offshore Wind Farm (ScotWind Plan Option Area N1)	1c	195.7
OWF-073	Pentland Floating Offshore Wind Farm	1c	186.9
OWF-083	Pentland Floating Offshore Wind Demonstration	1c	187.9
OWF-133	Berwick Bank Offshore Wind Farm (Cambois connection)	1c	174.9
OWF-141	Rampion 2	1c	815.7
OWF-142	Hornsea Project FOUR	1c	432.2
OWF-014	Buchan Offshore Wind Floating Energy Allyance NE8 (ScotWind Plan Option Area NE8)	1d	22.1
OWF-015	Caledonia Offshore Wind Farm (ScotWind Plan Option Area NE4)	1d	83.4
OWF-017	Cenos Floating Offshore Wind Farm (INTOG 11)	1d	140.8
OWF-023	Dogger Bank South East	1d	399.1
OWF-029	Five Estuaries Offshore Wind Farm	1d	690
OWF-052	Muir Mhòr Floating Wind Farm (ScotWind Plan Option Area E2)	1d	59
OWF-056	Ossian Floating Offshore Wind Farm (ScotWind Plan Option Area E1)	1d	126.2
OWF-057	Outer Dowsing Offshore Wind Farm	1d	500.5
OWF-135	Dogger Bank South West	1d	385.1
OWF-143	North Falls	1d	708.3
OWF-003	Aspen (INTOG 7)	2	25

'Other development' ID	Project	Tier	Distance from OAA (km)
OWF-008	Bellrock (Plan Option Area E1)	2	122.8
OWF-013	Broadshore (ScotWind Plan Option Area NE6)	2	46.6
OWF-016	CampionWind (ScotWind Plan Option Area E2)	2	62.3
OWF-018	Bowdun (ScotWind Plan Option Area E3)	2	113
OWF-019	Ayre Offshore Wind Farm (ScotWind Plan Option Area NE2 Cluaran Ear-Thuath)	2	92.8
OWF-043	Talisk (Scotwind Plan Option Area N3)	2	330.8
OWF-051	Morven (ScotWind Plan Option Area E1)	2	126.7
OWF-060	Scaraben (INTOG 2)	2	42.6
OWF-064	Sinclair (INTOG 1)	2	50.7
OWF-066	Stromar (ScotWind Plan Option Area NE3)	2	73.4
OWF-074	Arven Offshore Wind Farm (ScotWind Plan Option Area NE1)	2	200.9
OWF-085	Dogger Bank D	2	390.7

2.4 Cumulative effects methodology

2.4.1.1 In the absence of the cumulative effects framework (CEF), the Project has individually compiled quantitative impact predictions for other developments (**Table 2.3**) required to be included within cumulative assessments. Reference sources for each development impact prediction are provided within each species and effect pathway cumulative tables. For assessment of distributional response effects (Impact O2) (**Section 3**), the primary reference source for impact predictions was the North East and East Ornithology Group for ScotWind Projects (NEEOG) in-combination and cumulative totals (Royal HaskoningDHV, 2024).

2.4.1.2 For assessment of collision risk (Impact O3) (see **Section 4**), the primary reference source for impact predictions was the Sheringham Shoal and Dudgeon Offshore Wind Farm Extension Projects collision risk modelling (CRM) updates, as this dataset provided the greatest transparency to implement necessary impact adjustments to account for recent guidance updates relating to avoidance rate changes and consideration of macro avoidance for gannet (SNCBs, 2024; NatureScot, 2025). Where necessary, updates were provided to the primary data sources above to account for other development design refinements or inclusion of new developments where quantitative data has become available. Where such

updates were needed, reference sources are provided within each cumulative assessment table.

2.4.1.3 Assessments have been undertaken seasonally (using the seasonal definitions recommended within NatureScot's Guidance Note 9 (NatureScot, 2020)) against the regional populations defined within Table 12.9 of **Volume 1, Chapter 12: Offshore and Intertidal Ornithology**. Annual impact assessments are also provided against the largest seasonal population size. Summing the breeding and non-breeding season impacts assessed will not necessarily result in the total annual impact assessed. This is due to the regional breeding season approach typically resulting in a reduced number of developments considered, and a smaller regional population assessed against than the annual impact assessment, meaning additional breeding season impacts are required to be included for the annual assessment. A colour coding system has been applied within the cumulative tables with breeding season impacts highlighted in green considered for both the regional breeding season and annual assessment, and breeding season impacts not highlighted considered within the annual assessment only.

3. Impact O2: Distributional Responses (Option Agreement Area)

3.1 Overview

3.1.1.1 There is potential for cumulative distributional responses to ornithological receptors as a result of operational and maintenance activities associated with the Project and other developments. Developments in addition to the Project identified for this CEA are categorised in appropriate Tiers, as described in **Table 2.2**. Note that some of the other developments screened into assessment have been in operation for a number of years and, therefore, may be decommissioned within the Project's operational lifespan or even prior to the Project's construction. It is, therefore, precautionary to carry out this CEA on the basis of all other developments having temporal overlap within the operational phase.

3.1.1.2 The presence of offshore wind turbines has the potential to directly disturb and displace seabirds that would normally reside within and around the area of sea where such infrastructure are located. This potentially reduces the area available to those seabirds that may be susceptible to such effects to forage, loaf and/ or moult within and around offshore wind farms. Distributional responses may contribute to individual birds experiencing fitness consequences, affecting productivity and survival, which at an extreme level could lead to the mortality of individuals. Distributional responses may also contribute to individual birds being more productive during the breeding season, if they are deterred from foraging further than they may need to, therefore allowing for more efficient chick rearing. Cumulative distributional responses, therefore, have the potential to lead to effects on a wider scale when considering multiple developments within a given area on a single receptor.

3.1.1.3 Estimated mortality arising from distributional responses is presented separately for each species assessed. For each species assessment, the source of seasonal mean peak abundance estimates for the relevant developments is identified where available, ensuring a consistent methodology for estimating potential predicted mortality from distributional responses. Annual predicted abundance is also provided for each development by summing the seasonal predicted abundance.

3.1.1.4 As each individual development included within assessments considers the mean peak abundance for each season, the total predicted cumulative abundance for any season is likely to include some degree of double counting of the same seabirds, especially developments within close proximity of each other. This therefore has the potential to lead to double counting of effects as an individual can't be subject to displacement consequential mortality for multiple developments.

3.1.1.5 Therefore, by adding together seasonal mean peaks in this manner the overall assessment for cumulative displacement is considered to be highly precautionary.

3.1.1.6 For each of the five species screened in for CEA distributional response assessment, a review was undertaken of evidence from the literature on potential disturbance levels and distributional response effects from offshore wind farms. The conclusions of these reviews are presented within Section 12.10.3 of **Volume 1, Chapter 12: Offshore and Intertidal Ornithology** and have been used to inform the 'Developers' approach. A 'Guidance' approach to assessment is also presented based on the recommendations within NatureScot's Guidance Note 8 (NatureScot, 2023b).

3.1.1.7 To note, minor rounding discrepancies may be apparent for the abundances / impact mortality predictions presented due to limited available information for some developments. However, this should not materially affect the overall assessment outcomes.

3.2 Kittiwake

3.2.1 Sensitivity or value of receptor

3.2.1.1 As concluded within **Volume 1, Chapter 12: Offshore and Intertidal Ornithology**, the overall sensitivity of kittiwake to distributional response effects is considered to be **low**.

3.2.2 Magnitude of impact

3.2.2.1 The level of predicted cumulative impact in relation to distributional responses during the operation and maintenance stage is provided in **Table 3.1** based on the cumulative seasonal predicted abundance presented within **Table 3.3**. To note, English offshore wind farm developments are excluded from consideration of CEA in relation to distributional response effects, as Natural England do not advise that such an effect pathway is required to be assessed for kittiwake, and quantitative data are therefore not available.

3.2.2.2 The impact predictions presented in **Table 3.1** are based on the Guidance approach only as the Applicant considers there is insufficient evidence suggesting that kittiwake are displaced by offshore wind farms to justify a requirement to assess kittiwake for distributional response effects (see Section 12.10.3 of **Volume 1, Chapter 12: Offshore and Intertidal Ornithology** for further detail).

3.2.2.3 As agreed with NatureScot during consultation (see Section 12.3 of **Volume 1, Chapter 12: Offshore and Intertidal Ornithology**), the breeding season CEA is based on those developments (highlighted in green within **Table 3.3**) which are within MMFR plus one SD due to assessments being undertaken against a regional population as defined in Section 12.6 of **Volume 1, Chapter 12: Offshore and Intertidal Ornithology**.

Table 3.1 Summary of seasonal cumulative distributional response impacts predicted for kittiwake during the operation and maintenance stage, following the Guidance approach

Season	Cumulative Total Abundance (OAA plus 2km)	Regional baseline populations (individuals)	Predicted Impact	
			30% Disp; 1% to 3% Mort (individuals per annum)	Reduction in survival rate (%)
Breeding	51,392	283,312	154.2 to 462.5	0.054 to 0.163
Non-breeding	43,646	829,937	130.9 to 392.8	0.016 to 0.047
Annual	100,907	829,937	302.7 to 908.2	0.036 to 0.109

3.2.2.4 As concluded within **Table 3.1**, the level of impact predicted annually or seasonally exceeds the 0.02% change in the regional baseline population survival rate when considering the Guidance approach. In accordance with NatureScot Guidance Note 11 (NatureScot, 2023c), further consideration of the potential impact is required in the form of Population Viability Analysis (PVA).

3.2.2.5 PVA has been undertaken for the 35-year operational lifetime of the Project. Outputs are presented in **Table 3.2** below, including the predicted median reduction in annual growth rate (counterfactual growth rate (CGR) and median reduction in final population size

(counterfactual population size (CPS)). PVA modelling was undertaken using density independent modelling and therefore, the CGR value is considered a more reliable metric than CPS values for interpreting impacts (Cook and Robinson, 2016). For full details on PVA methodology, see **Appendix 12.4: Offshore EIA Population Viability Analysis Report**.

Table 3.2 PVA results for annual cumulative distributional response impacts predicted for kittiwake, following the Guidance approach

Scenario modelled	Increase in mortality	Density independent counterfactual metric (35yrs)		Reduction in annual growth rate (%)	Reduction in final population size after 35yrs (%)
		Median CGR	Median CPS		
Annual cumulative total, 30% Disp; 1% Mort	302.7	1.000	0.978	0.04	2.19
Annual cumulative total, 30% Disp; 3% Mort	908.2	0.999	0.936	0.13	6.40

3.2.2.6 As kittiwake is assessed for both distributional responses and collision, full consideration of the combined impact in the context of the regional population is presented within that assessment (**Section 5.2**).

3.2.2.7 In relation to cumulative effects from distributional responses in isolation, even considering the upper displacement/mortality rates used in the Guidance Approach, the predicted impact is sufficiently small (0.1% reduction in annual population growth rate) that regardless of population trends, the impact from distributional responses alone would have no measurable effect against natural fluctuations in population. Therefore, the magnitude is assessed as **low**.

3.2.3 Significance of residual effect

3.2.3.1 With a predicted sensitivity of **low** and a magnitude of impact of **low**, the effect significance is therefore, **Minor** (**Not Significant**) in environmental impact assessment (EIA) terms.

Table 3.3 Kittiwake cumulative seasonal abundance estimates

'Other development' ID	Distance from OAA (km)	Name of 'other development'	Breeding season	Post breeding migration	Return migration	Total non-breeding	Annual total	Reference source
Tier 1a								
OWF-001	265	2B Energy Methil Demonstration (Methil)	44	24	36	60	104	HiDef (2022a)
OWF-002	109	Aberdeen (EOWDC)	663	14	23	37	700	Royal HaskoningDHV (2024)
OWF-005	112	Beatrice	1,430	1,112	1,112	2,224	3,654	Royal HaskoningDHV (2024)
OWF-010	321	Blyth Demonstration Project	591	740	740	1,480	2,071	Royal HaskoningDHV (2024)
OWF-020	382	Dogger Bank A	N/A	N/A	N/A	N/A	N/A	Royal HaskoningDHV (2024)
OWF-025	534	Dudgeon	N/A	N/A	N/A	N/A	N/A	Royal HaskoningDHV (2024)
OWF-027	654	East Anglia ONE	N/A	N/A	N/A	N/A	N/A	Royal HaskoningDHV (2024)
OWF-030	687	Galloper	N/A	N/A	N/A	N/A	N/A	Royal HaskoningDHV (2024)
OWF-031	690	Greater Gabbard	N/A	N/A	N/A	N/A	N/A	Royal HaskoningDHV (2024)
OWF-033	785	Gunfleet Sands	N/A	N/A	N/A	N/A	N/A	Royal HaskoningDHV (2024)
OWF-036	475	Hornsea Project One	N/A	N/A	N/A	N/A	N/A	Royal HaskoningDHV (2024)
OWF-038	467	Hornsea Project Two	N/A	N/A	N/A	N/A	N/A	Royal HaskoningDHV (2024)

'Other development' ID	Distance from OAA (km)	Name of 'other development'	Breeding season	Post breeding migration	Return migration	Total non-breeding	Annual total	Reference source
OWF-039	485	Humber Gateway	N/A	N/A	N/A	N/A	N/A	Royal HaskoningDHV (2024)
OWF-040	67	Hywind	122	-	-	-	122	Royal HaskoningDHV (2024)
OWF-044	856	Kentish Flats and Extension	N/A	N/A	N/A	N/A	N/A	Royal HaskoningDHV (2024)
OWF-045	126	Kincardine	229	-	-	-	229	Royal HaskoningDHV (2024)
OWF-046	593	Lincs & LID	N/A	N/A	N/A	N/A	N/A	Royal HaskoningDHV (2024)
OWF-047	796	London Array	N/A	N/A	N/A	N/A	N/A	Royal HaskoningDHV (2024)
OWF-049	101	Moray East	1,963	-	-	-	1,963	Royal HaskoningDHV (2024)
OWF-050	117	Moray West	6,902	1,470	1,074	2,544	9,446	Royal HaskoningDHV (2024)
OWF-053	208	Neart na Gaoithe	2,164	2,016	139	2,155	4,319	Royal HaskoningDHV (2024)
OWF-058	525	Race Bank	N/A	N/A	N/A	N/A	N/A	Royal HaskoningDHV (2024)
OWF-061	159	Seagreen (Alpha & Bravo)	3,235	2,286	2,286	4,572	7,807	Royal HaskoningDHV (2024)
OWF-063	548	Sheringham Shoal	N/A	N/A	N/A	N/A	N/A	Royal HaskoningDHV (2024)
OWF-067	375	Teesside	N/A	N/A	N/A	N/A	N/A	Royal HaskoningDHV (2024)
OWF-069	504	Triton Knoll	N/A	N/A	N/A	N/A	N/A	Royal HaskoningDHV (2024)
OWF-070	464	Westermost Rough	N/A	N/A	N/A	N/A	N/A	Royal HaskoningDHV (2024)

'Other development' ID	Distance from OAA (km)	Name of 'other development'	Breeding season	Post breeding migration	Return migration	Total non-breeding	Annual total	Reference source
OWF-136	245	Levenmouth Demonstration	184	-	-	-	184	Royal HaskoningDHV (2024)
OWF-137	612	Scroby Sands	N/A	N/A	N/A	N/A	N/A	Royal HaskoningDHV (2024)
OWF-138	813	Rampion	N/A	N/A	N/A	N/A	N/A	Royal HaskoningDHV (2024)
OWF-139	741	Thanet	N/A	N/A	N/A	N/A	N/A	Royal HaskoningDHV (2024)
Tier 1b								
OWF-021	356	Dogger Bank B	N/A	N/A	N/A	N/A	N/A	Royal HaskoningDHV (2024)
OWF-037	455	Hornsea Project Three	N/A	N/A	N/A	N/A	N/A	Royal HaskoningDHV (2024)
OWF-065	368	Sofia	N/A	N/A	N/A	N/A	N/A	Royal HaskoningDHV (2024)
OWF-140	619	East Anglia THREE	N/A	N/A	N/A	N/A	N/A	Royal HaskoningDHV (2024)
Tier 1c								
OWF-009	176	Berwick Bank	21,141	11,190	13,766	24,956	46,097	Royal HaskoningDHV (2024)
OWF-022	381	Dogger Bank C	N/A	N/A	N/A	N/A	N/A	Royal HaskoningDHV (2024)
OWF-025	535	Dudgeon	N/A	N/A	N/A	N/A	N/A	Royal HaskoningDHV (2024)
OWF-027	646	East Anglia ONE North	N/A	N/A	N/A	N/A	N/A	Royal HaskoningDHV (2024)
OWF-028	666	East Anglia TWO	N/A	N/A	N/A	N/A	N/A	Royal HaskoningDHV (2024)

'Other development' ID	Distance from OAA (km)	Name of 'other development'	Breeding season	Post breeding migration	Return migration	Total non-breeding	Annual total	Reference source
OWF-032	9	Green Volt	183	149	83	232	415	APEM (2022b)
OWF-041	180	Inch Cape	3,866	1,069	1,069	2,138	6,004	Royal HaskoningDHV (2024)
OWF-054	579	Norfolk Boreas	N/A	N/A	N/A	N/A	N/A	Royal HaskoningDHV (2024)
OWF-055	585	Norfolk Vanguard	N/A	N/A	N/A	N/A	N/A	Royal HaskoningDHV (2024)
OWF-059	48	Salamander	3,718	-	-	220	3,938	ERM (2024b)
OWF-063	535	SEP	N/A	N/A	N/A	N/A	N/A	Royal HaskoningDHV (2024)
OWF-068	168	Culzean	3	-	-	2	5	Atlantic Ecology (2024)
OWF-072	196	West of Orkney	1,113	-	-	1,217	2,330	MacArthur Green (2024a)
OWF-073	187	Pentland Floating	546	118	41	159	705	Royal HaskoningDHV (2024)
OWF-141	816	Rampion 2	N/A	N/A	N/A	N/A	N/A	Royal HaskoningDHV (2024)
OWF-142	432	Hornsea Project Four	N/A	N/A	N/A	N/A	N/A	Royal HaskoningDHV (2024)
Tier 1d								
OWF-014	22	Buchan	183	105	345	450	633	Natural Power Ltd (2025a)
OWF-015	83	Caledonia	2,039	-	-	483	2,522	GoBe (2024a)
OWF-017	141	Cenos	208	-	-	97	305	HiDef (2024a)

'Other development' ID	Distance from OAA (km)	Name of 'other development'	Breeding season	Post breeding migration	Return migration	Total non-breeding	Annual total	Reference source
OWF-023, OWF-135	385	Dogger Bank South (East and West)	N/A	N/A	N/A	N/A	N/A	RWE (2025)
OWF-029	690	Five Estuaries	N/A	N/A	N/A	N/A	N/A	MacArthur Green (2024b)
OWF-052	59	Muir Mhor	3,252	-	-	809	4,061	Natural Power Ltd (2024a)
OWF-056	126	Ossian	3,183	566	581	1,147	4,330	Royal HaskoningDHV (2024)
OWF-057	501	Outer Dowsing	N/A	N/A	N/A	N/A	N/A	GoBe (2025b)
OWF-143	708	North Falls	N/A	N/A	N/A	N/A	N/A	Royal HaskoningDHV (2024)
Tier 2								
OWF-085	391	Dogger Bank D	N/A	N/A	N/A	N/A	N/A	APEM (2025a)
MarramWind			890	-	-	144	1,034	-
Total			51,392 / 57,261	20,119	20,555	43,646	100,907	-

Table note: Developments presented in green are those with breeding season connectivity to the Project based on a MMFR plus one SD foraging range of 300.6km (NatureScot, 2023a). Non-highlighted developments in the breeding season are presented to provide context for how the annual total was derived. N/A refers to where impacts are not applicable as kittiwake is not assessed for distributional responses in England as explained in Section 12.10.3 of **Volume 1, Chapter 12: Offshore and Intertidal Ornithology**.

3.3 Guillemot

3.3.1 Sensitivity or value of receptor

3.3.1.1 As concluded within **Volume 1, Chapter 12: Offshore and Intertidal Ornithology**, the overall sensitivity of the receptor to distributional response effects is considered to be **medium**.

3.3.2 Magnitude of impact

3.3.2.1 The level of predicted cumulative impact in relation to distributional responses during the operation and maintenance stage is provided in **Table 3.4** and **Table 3.5** based on the cumulative seasonal predicted abundance presented within **Table 3.7**. As per NatureScot advice (see Section 12.3 of **Volume 1, Chapter 12: Offshore and Intertidal Ornithology**), the non-breeding population is considered to be the same as the breeding season, drawn from colonies within MMFR plus one SD of the Project only. Consequently, the cumulative assessment only considers developments within this range also.

3.3.2.2 The impact predictions presented in **Table 3.4** are based on the Developers preferred approach, whilst impact predictions in **Table 3.5** are based on displacement and mortality rates recommended within NatureScot's Guidance Note 8 (NatureScot, 2023b) forming the Guidance approach.

Table 3.4 Summary of seasonal cumulative distributional response impacts predicted for guillemot during the operation and maintenance stage, following the Developers approach

Season	Cumulative Total Abundance (OAA plus 2km)	Regional baseline populations (individuals)	Predicted Impact	
			50% Disp; 0% to 1% Mort (individuals per annum)	Reduction in survival rate (%)
Breeding	62,430	189,381	0.0 to 312.2	0.000 to 0.165
Non-breeding	61,762	189,381	0.0 to 308.8	0.000 to 0.163
Annual	124,192	189,381	0.0 to 621.0	0.000 to 0.328

Table 3.5 Summary of seasonal cumulative distributional response impacts predicted for guillemot during the operation and maintenance stage, following the Guidance approach

Season	Cumulative Total Abundance (OAA plus 2km)	Regional baseline populations (individuals)	Predicted Impact	
			60% Disp; 1% to 5% Mort (individuals per annum)	Reduction in survival rate (%)
Breeding	62,430	189,381	1,123.7 to 1,872.9	0.593 to 0.989
Non-breeding	61,762	189,381	370.6 to 1,111.7	0.196 to 0.587
Annual	124,192	189,381	1,494.3 to 2,984.6	0.789 to 1.576

3.3.2.3 As concluded within **Table 3.4** and **Table 3.5**, the level of impact predicted annually or seasonally exceeds the 0.02% change in the regional baseline population survival rate when considering either approach. In accordance with NatureScot Guidance Note 11 (NatureScot, 2023c), further consideration of the potential impact is required in the form of PVA.

3.3.2.4 PVA has been undertaken for both the Developer and Guidance approaches over the 35-year operational lifetime of the Project. Outputs are presented in **Table 3.6** below, including the CGR and CPS values. PVA modelling was undertaken using density independent modelling and therefore, the CGR value is considered a more reliable metric than CPS for interpreting impacts (Cook and Robinson, 2016). For full details on PVA methodology, see **Appendix 12.4**.

Table 3.6 PVA results for annual cumulative distributional response impacts predicted for guillemot

Scenario modelled	Increase in mortality	Density independent counterfactual metric (35yrs)		Reduction in annual growth rate (%)	Reduction in final population size after 35yrs (%)
		Median CGR	Median CPS		
Annual cumulative total, 50% Disp; 1% Mort (Developers approach)	621.0	0.996	0.828	0.37	17.18
Annual cumulative total, 60% Disp; 1 to 3% Mort (Guidance approach)	1,494.3	0.991	0.635	0.89	36.53
Annual cumulative total, 60% Disp; 3 - 5% Mort (Guidance approach)	2,984.62	0.982	0.402	1.77	59.84

3.3.2.5 The Scottish breeding guillemot population has declined by 31% between the Seabirds 2000 Census, and Seabirds Count (2015 to 2021) (Burnell *et al*., 2023), though notably the largest declines were observed in the north in Orkney and Shetland, which do not form part of the regional population assessed against for guillemot. Key Special Protection Areas (SPAs) forming the regional population for guillemot include the Buchan Ness to Collieston Coast SPA (which declined by 0.0% per annum across this period), and the Troup, Pennan and Lion's Head SPA (which declined by 4.3% per annum). The cause for these declines observed in Scotland is thought to be linked to reductions in prey availability during the breeding season resulting in reduced productivity, or starvation in winter months (Burnell *et al.,* 2023). However, remedial actions have been taken to reduce the risk of reduced prey availability impacting guillemot via The Sandeel (Prohibition of Fishing) (Scotland) Order 2024.

3.3.2.6 A review of pre and post Highly Pathogenic Avian Influenza (HPAI) outbreak colony trends was conducted by Tremlett *et al*. (2024) for various seabird species. Guillemot individuals were shown to have decreased by 6% when comparing pre-HPAI records to counts conducted in 2023 post the outbreak. It must be noted that colony specific trends do differ in terms of colony count change. A further, less significant outbreak of HPAI occurred at seabird colonies in 2023, although the virus was not noted to affect guillemots until June, July and August, after colony counts were completed, suggesting impacts may be worse that reported in Tremlett *et al.* (2024).

3.3.2.7 When considering the Developers approach, a reduction in growth rate of up to 0.37% per annum, would further contribute to the declining population trend of Scottish guillemots.

3.3.2.8 Under the Guidance approach, the predicted impact could result in up to a 1.77% reduction in population growth rate annually, which if true would likely lead to an adverse impact on the regional population when considering the Scottish guillemot population trend. Though this predicted impact is considered to be highly precautionary for the following reasons:

- Peak abundance assumption. Mean peak abundance estimates assume that the highest monthly abundance represents the entire season, likely overestimating exposure. This precautionary assumption is applied consistently across all developments in the cumulative assessment.
- High displacement and mortality rates. The approach assumes displacement of 60% and mortality of 3%/5% for all developments, despite limited to no evidence supporting these values.
- No habituation considered. The assessment does not account for potential habituation or adaptation of birds over the operational lifetime of developments.
- No density dependence or environmental co variates considered within PVA. Modelling assumes a closed population and excludes compensatory mechanisms such as reduced competition for resources when numbers decline. If density dependence were incorporated, the predicted reduction in annual growth rate would likely be smaller, further reducing the estimated impact. Additionally, PVA does not consider other environmental factors likely to have a significantly greater effect on the receptor and likely overshadow any potential effects from developments. Such environmental factors would include reduction in prey availability linked to changes in environmental conditions (climate change).

3.3.2.9 Despite the above points, when considering the outputs from the Developer's approach, the predicted cumulative impact is assessed as **medium** at most. For the Guidance approach, a magnitude of **medium** to **high** is concluded.

3.3.3 Significance of residual effect

3.3.3.1 With a predicted sensitivity of **medium** and a magnitude of impact of **high** at most, the effect significance is therefore, up to **Major Adverse** (**Significant**) in EIA terms.

3.3.3.2 As the effect significance has been concluded as significant in EIA terms, the Project has considered the feasibility of mitigation to reduce the residual effect significance. However, the reason for the significant effect conclusion is due to the pre-existing scale of predicted impact, rather than due to the Projects contribution to the CEA. There are no feasible mitigation measures that could sufficiently reduce the CEA adverse effects to a level that is not significant in EIA terms or avoid a potential Adverse Effect on Site Integrity (AEoSI) (please refer to **Derogation Case**).

3.3.3.3 To note, the Project has provided potential options for compensation with respect to guillemot, as presented within the **Derogation Case**. Although such compensation options are focussed on offsetting the predicted impacts apportioned to selected qualifying features of designated sites, such potential measures if implemented are expected to significantly offset the Project's contribution to regional scale impacts.

Table 3.7 Guillemot cumulative seasonal abundance estimates

'Other development' ID	Distance to OAA (km)	Project	Breeding season	Non-breeding	Annual total	Reference Source
Tier 1a						
OWF-001	265	2B Energy Methil Demonstration (Methil)	-	-	-	HiDef (2022a)
OWF-002	109	Aberdeen (EOWDC)	-	-	-	Royal HaskoningDHV (2024)
OWF-005	112	Beatrice	-	-	-	Royal HaskoningDHV (2024)
OWF-010	321	Blyth Demonstration Site	-	-	-	Royal HaskoningDHV (2024)
OWF-020	382	Dogger Bank A	-	-	-	Royal HaskoningDHV (2024)
OWF-025	534	Dudgeon	-	-	-	Royal HaskoningDHV (2024)
OWF-027	654	East Anglia One	-	-	-	Royal HaskoningDHV (2024)
OWF-030	687	Galloper	-	-	-	Royal HaskoningDHV (2024)
OWF-031	690	Greater Gabbard	-	-	-	Royal HaskoningDHV (2024)

'Other development' ID	Distance to OAA (km)	Project	Breeding season	Non-breeding	Annual total	Reference Source
OWF-033	785	Gunfleet Sands	-	-	-	Royal HaskoningDHV (2024)
OWF-036	475	Hornsea Project One	-	-	-	Royal HaskoningDHV (2024)
OWF-038	467	Hornsea Project Two	-	-	-	Royal HaskoningDHV (2024)
OWF-039	485	Humber Gateway	-	-	-	Royal HaskoningDHV (2024)
OWF-040	67	Hywind 2 Demonstration	249	2,136	2,385	Royal HaskoningDHV (2024)
OWF-044	856	Kentish Flats and Extension	-	-	-	Royal HaskoningDHV (2024)
OWF-045	126	Kincardine	-	-	-	Royal HaskoningDHV (2024)
OWF-046	593	Lincs, Lynn and Inner Dowsing	-	-	-	Royal HaskoningDHV (2024)
OWF-047	796	London Array	-	-	-	Royal HaskoningDHV (2024)
OWF-049	101	Moray East	-	-	-	Royal HaskoningDHV (2024)
OWF-050	117	Moray West	-	-	-	Royal HaskoningDHV (2024)
OWF-053	208	Neart na Gaoithe	-	-	-	Royal HaskoningDHV (2024)

'Other development' ID	Distance to OAA (km)	Project	Breeding season	Non-breeding	Annual total	Reference Source
OWF-058	525	Race Bank	-	-	-	Royal HaskoningDHV (2024)
OWF-061	159	Seagreen Alpha	-	-	-	Royal HaskoningDHV (2024)
OWF-061	159	Seagreen Bravo	-	-	-	Royal HaskoningDHV (2024)
OWF-063	548	Sheringham Shoal	-	-	-	Royal HaskoningDHV (2024)
OWF-067	375	Teesside	-	-	-	Royal HaskoningDHV (2024)
OWF-069	504	Triton Knoll	-	-	-	Royal HaskoningDHV (2024)
OWF-070	464	Westermost Rough	-	-	-	Royal HaskoningDHV (2024)
OWF-136	245	Levenmouth Demonstration	-	-	-	Royal HaskoningDHV (2024)
OWF-137	612	Scroby Sands	-	-	-	Royal HaskoningDHV (2024)
OWF-138	813	Rampion	-	-	-	Royal HaskoningDHV (2024)
OWF-139	741	Thanet	-	-	-	Royal HaskoningDHV (2024)

'Other development' ID	Distance to OAA (km)	Project	Breeding season	Non-breeding	Annual total	Reference Source
Tier 1b						
OWF-021	356	Dogger Bank B	-	-	-	Royal HaskoningDHV (2024)
OWF-037	455	Hornsea Project Three	-	-	-	Royal HaskoningDHV (2024)
OWF-065	368	Sofia	-	-	-	Royal HaskoningDHV (2024)
OWF-140	619	East Anglia Three	-	-	-	Royal HaskoningDHV (2024)
Tier 1c						
OWF-009	176	Berwick Bank	-	-	-	Royal HaskoningDHV (2024)
OWF-022	381	Dogger Bank C	-	-	-	Royal HaskoningDHV (2024)
OWF-025	535	Dudgeon	-	-	-	Royal HaskoningDHV (2024)
OWF-027	646	East Anglia One North	-	-	-	Royal HaskoningDHV (2024)
OWF-028	666	East Anglia Two	-	-	-	Royal HaskoningDHV (2024)
OWF-032	9	Green Volt	4,429	16,105	20,534	APEM (2022b)

'Other development' ID	Distance to OAA (km)	Project	Breeding season	Non-breeding	Annual total	Reference Source
OWF-041	180	Inch Cape	-	-	-	Royal HaskoningDHV (2024)
OWF-054	579	Norfolk Boreas	-	-	-	Royal HaskoningDHV (2024)
OWF-055	585	Norfolk Vanguard	-	-	-	Royal HaskoningDHV (2024)
OWF-059	48	Salamander	3,616	11,779	15,395	ERM (2024b)
OWF-063	535	SEP	-	-	-	Royal HaskoningDHV (2024)
OWF-068	168	Culzean	-	-	-	Royal HaskoningDHV (2024)
OWF-072	196	West of Orkney	-	-	-	MacArthur Green (2024a)
OWF-073	187	Pentland Floating	-	-	-	Royal HaskoningDHV (2024)
OWF-141	816	Rampion 2	-	-	-	Royal HaskoningDHV (2024)
OWF-142	432	Hornsea Project Four	-	-	-	Royal HaskoningDHV (2024)
Tier 1d						
OWF-014	22	Buchan	7,932	7,932	15,864	Natural Power Ltd (2025a)

'Other development' ID	Distance to OAA (km)	Project	Breeding season	Non-breeding	Annual total	Reference Source
OWF-015	83	Caledonia	16,092	6,710	22,802	GoBe (2024a)
OWF-017	141	Cenos	-	-	-	HiDef (2024a)
OWF-023, OWF-135	385	Dogger Bank South (East and West)	-	-	-	RWE (2025)
OWF-029	690	Five Estuaries	-	-	-	MacArthur Green (2024b)
OWF-052	59	Muir Mhor	13,123	11,863	24,986	Natural Power Ltd (2024a)
OWF-056	126	Ossian	-	-	-	Royal HaskoningDHV (2024)
OWF-057	501	Outer Dowsing	-	-	-	GoBe (2025b)
OWF-143	708	North Falls	-	-	-	Royal HaskoningDHV (2024)
Tier 2						
OWF-085	391	Dogger Bank D	-	-	-	APEM (2025a)
MarramWind			16,989	5,237	22,226	-
Totals			62,430	61,762	124,192	-

Table note: Developments presented in green are those with breeding season connectivity to the Project based on a MMFR plus one SD foraging range of 95.2km and 153.7km for developments south and north of the Pentland Firth, respectively (NatureScot, 2023a). For guillemot, the same approach is also relevant for the non-breeding season.

3.4 Razorbill

3.4.1 Sensitivity or value of receptor

3.4.1.1 As concluded within **Volume 1, Chapter 12: Offshore and Intertidal Ornithology**, the overall sensitivity of the receptor to distributional response effects is considered to be **medium**.

3.4.2 Magnitude of impact

3.4.2.1 The level of predicted cumulative impact in relation to distributional responses during the operation and maintenance stage is provided in **Table 3.8** and **Table 3.9** based on the cumulative seasonal predicted abundance presented within **Table 3.11**.

3.4.2.2 The impact predictions presented in **Table 3.8** are based on the Developers preferred approach, whilst impact predictions in **Table 3.9** are based on displacement and mortality rates recommended within NatureScot's Guidance Note 8 (NatureScot, 2023b) forming the Guidance approach.

3.4.2.3 As agreed with NatureScot during consultation (see Section 12.3 of **Volume 1, Chapter 12: Offshore and Intertidal Ornithology**), the breeding season CEA is based on those developments (highlighted in green within **Table 3.11**) which are within MMFR plus one SD due to assessments being undertaken against a regional population as defined in Section 12.6 of **Volume 1, Chapter 12: Offshore and Intertidal Ornithology**.

Table 3.8 Summary of seasonal cumulative distributional response impacts predicted for razorbill during the operation and maintenance stage, following the Developers approach

Season	Cumulative Total Abundance (OAA plus 2km)	Regional baseline populations (individuals)	Predicted impact	
			50% Disp; 0% to 1% Mort (individuals per annum)	Reduction in survival rate (%)
Breeding	10,657	30,895	0.0 to 53.3	0.000 to 0.172
Non-breeding	179,624	591,874	0.0 to 898.1	0.000 to 0.152
Annual	232,042	591,874	0.0 to 1,160.2	0.000 to 0.196

Table 3.9 Summary of seasonal cumulative distributional response impacts predicted for razorbill during the operation and maintenance stage, following the Guidance approach

Season	Cumulative Total Abundance (OAA plus 2km)	Regional baseline populations (individuals)	Predicted impact	
			60% Disp; 1% to 5% Mort (individuals per annum)	Reduction in survival rate (%)
Breeding	10,657	30,895	191.8 to 319.7	0.621 to 1.035
Non-breeding	179,624	591,874	1,077.7 to 3,233.2	0.182 to 0.546
Annual	232,042	591,874	1,269.6 to 3,552.9	0.214 to 0.600

3.4.2.4 As concluded within **Table 3.8** and **Table 3.9**, the level of impact predicted annually or seasonally exceeds the 0.02% change in the regional baseline population survival rate when considering either approach. In accordance with NatureScot Guidance Note 11 (NatureScot, 2023c), further consideration of the potential impact is required in the form of PVA.

3.4.2.5 PVA has been undertaken for both the Developer and Guidance approaches over the 35-year operational lifetime of the Project. Outputs are presented in **Table 3.10** below, including the CGR and CPS values. PVA modelling was undertaken using density independent modelling, and therefore the CGR value is considered a more reliable metric than CPS for interpreting impacts (Cook and Robinson, 2016). For full details on PVA methodology, see **Appendix 12.4**.

Table 3.10 PVA results for annual cumulative distributional response impacts predicted for razorbill

Scenario modelled	Increase in mortality	Density independent counterfactual metric (35yrs)		Reduction in annual growth rate (%)	Reduction in final population size after 35yrs (%)
		Median CGR	Median CPS		
Annual cumulative total, 50% Displacement and 1% Mortality (Developers approach)	1,160.2	0.998	0.888	0.23	11.16
Annual cumulative total, 60% Displacement and 1% to 3% Mortality (Guidance approach)	1,269.6	0.997	0.879	0.25	12.14

Scenario modelled	Increase in mortality	Density independent counterfactual metric (35yrs)		Reduction in annual growth rate (%)	Reduction in final population size after 35yrs (%)
		Median CGR	Median CPS		
Annual cumulative total, 60% Displacement and 3% to 5% Mortality (Guidance approach)	3,552.9	0.993	0.696	0.71	30.45

3.4.2.6 The Scottish breeding razorbill population has remained stable between the Seabirds 2000 Census, and Seabirds Count (2015 to 2021) (Burnell *et al*., 2023), declining by only 2%. Notably these trends have been highly variable across Scottish SPAs, ranging from an 89% decline (Foula SPA) to a 92% increase (Fowlsheugh SPA) over this period. The reason for declines reported at some colonies is likely due to a reduction in key prey abundance and adverse weather events leading to a significant auk wreck within the early 2000's (Burnell et al., 2023). However, remedial actions have been taken to reduce the risk of reduced prey availability impacting razorbill via The Sandeel (Prohibition of Fishing) (Scotland) Order 2024.

3.4.2.7 Tremlett *et al*. (2024) conducted a review of pre- and post-HPAI outbreak colony counts for key seabird species. Upon review, the mortality levels of razorbill due to HPAI were assessed as low due to the minimal numbers of mortalities due to the virus.

3.4.2.8 When considering the Developers approach, the predicted reduction in population growth rate based on these parameters is unlikely to be distinguishable from natural fluctuations in the population. Given the stability of the Scottish razorbill population as a whole and the increasing population trends of the populations within closest proximity to the Project, a reduction in annual growth rate of up to 0.23% is not expected to significantly impact the population.

3.4.2.9 Under the Guidance approach, the predicted impact could result in up to 0.71% reduction in population growth rate which may have the potential to adversely impact the population. Though this predicted impact estimate is considered to be highly precautionary for the following reasons:

- Peak abundance assumption. Mean peak abundance estimates assume that the highest monthly abundance represents the entire season, likely overestimating exposure. This precautionary assumption is applied consistently across all developments in the cumulative assessment.
- High displacement and mortality rates. The approach assumes displacement of 60% and mortality of 3%/5% for all developments, despite limited to no evidence supporting these values.
- No habituation considered. The assessment does not account for potential habituation or adaptation of birds over the operational lifetime of developments.
- No density dependence or environmental co variates considered within PVA. Modelling assumes a closed population and excludes compensatory mechanisms such as reduced competition for resources when numbers decline. If density dependence were incorporated, the predicted reduction in annual growth rate would likely be smaller, further reducing the estimated impact. Additionally, PVA does not consider other

environmental factors likely to have a significantly greater effect on the receptor and likely overshadow any potential effects from developments. Such environmental factors would include reduction in prey availability linked to changes in environmental conditions (climate change).

3.4.2.10 When considering outputs from the Developer's approach, the predicted cumulative impact is sufficiently small that the magnitude would be assessed as **low**. For the Guidance approach, a magnitude of **low** to **medium** is concluded.

3.4.3 Significance of residual effect

3.4.3.1 With a predicted sensitivity of **medium** and a magnitude of impact of **medium at most**, the effect significance is therefore, **Moderate Adverse** (**Significant**) in EIA terms.

3.4.3.2 As the effect significance has been concluded as significant in EIA terms, the Project has considered the feasibility of mitigation to reduce the residual effect significance. However, the reason for the significant effect conclusion is due to the pre-existing scale of predicted impact, rather than due to the Project's contribution to the CEA. There are no feasible mitigation measures that could sufficiently reduce the CEA adverse effects to a level that is not significant in EIA terms or avoid a potential AEoSI (please refer to **Derogation Case**). For context, the Project alone predicted effect was concluded as minor adverse significance at most, which is not significant.

3.4.3.3 To note, the Project has provided potential options for compensation with respect to razorbill, as presented within the **Derogation Case.** Although such compensation options are focussed on offsetting the predicted impacts apportioned to selected qualifying features of designated sites, such potential measures if implemented are expected to significantly offset the Project's contribution to regional scale impacts.

Table 3.11 Razorbill cumulative seasonal abundance estimates

'Other development' ID	Distance to OAA (km)	Project	Breeding season	Post breeding migration	Migration-free winter	Return migration	Total non-breeding	Annual total	Reference source
Tier 1a									
OWF-001	265	2B Energy Methil Demonstration (Methil)	57	81	58	81	220	277	HiDef (2022a)
OWF-002	109	Aberdeen (EOWDC)	161	64	7	26	97	258	Royal HaskoningDHV (2024)
OWF-005	112	Beatrice	873	833	555	833	2,221	3,094	Royal HaskoningDHV (2024)
OWF-010	321	Blyth Demonstration Project	121	91	61	91	243	364	Royal HaskoningDHV (2024)
OWF-020	382	Dogger Bank A	1,250	1,576	1,728	4,149	7,453	8,703	Royal HaskoningDHV (2024)
OWF-025	534	Dudgeon	256	346	745	346	1,437	1,693	Royal HaskoningDHV (2024)
OWF-027	654	East Anglia ONE	16	26	155	336	517	533	Royal HaskoningDHV (2024)

'Other development' ID	Distance to OAA (km)	Project	Breeding season	Post breeding migration	Migration-free winter	Return migration	Total non-breeding	Annual total	Reference source
OWF-030	687	Galloper	44	43	106	394	543	587	Royal HaskoningDHV (2024)
OWF-031	690	Greater Gabbard	-	-	387	84	471	471	Royal HaskoningDHV (2024)
OWF-033	785	Gunfleet Sands	-	-	30	-	30	30	Royal HaskoningDHV (2024)
OWF-036	475	Hornsea Project One	1,109	4,812	1,518	1,803	8,133	9,242	Royal HaskoningDHV (2024)
OWF-038	467	Hornsea Project Two	2,511	4,221	720	1,668	6,609	9,120	Royal HaskoningDHV (2024)
OWF-039	485	Humber Gateway	27	20	13	20	53	80	Royal HaskoningDHV (2024)
OWF-040	67	Hywind	30	719	10	-	729	759	Royal HaskoningDHV (2024)
OWF-044	856	Kentish Flats and Extension	-	-	-	-	-	-	Royal HaskoningDHV (2024)

'Other development' ID	Distance to OAA (km)	Project	Breeding season	Post breeding migration	Migration-free winter	Return migration	Total non-breeding	Annual total	Reference source
OWF-045	126	Kincardine	22	-	-	-	-	22	Royal HaskoningDHV (2024)
OWF-046	593	Lincs & LID	45	34	22	34	90	135	Royal HaskoningDHV (2024)
OWF-047	796	London Array	14	20	14	20	54	68	Royal HaskoningDHV (2024)
OWF-049	101	Moray East	2,423	1,103	30	168	1,301	3,724	Royal HaskoningDHV (2024)
OWF-050	117	Moray West	2,808	3,544	184	3,585	7,313	10,121	Royal HaskoningDHV (2024)
OWF-053	208	Neart na Gaoithe	331	5,492	508	-	6,000	6,331	Royal HaskoningDHV (2024)
OWF-058	525	Race Bank	28	42	28	42	112	140	Royal HaskoningDHV (2024)
OWF-061	159	Seagreen Alpha	5,876	-	1,103	-	1,103	6,979	Royal HaskoningDHV (2024)

'Other development' ID	Distance to OAA (km)	Project	Breeding season	Post breeding migration	Migration-free winter	Return migration	Total non-breeding	Annual total	Reference source
OWF-061	159	Seagreen Bravo	3,698	-	1,272	-	1,272	4,970	Royal HaskoningDHV (2024)
OWF-063	548	Sheringham Shoal	106	1,343	211	30	1,584	1,690	Royal HaskoningDHV (2024)
OWF-067	375	Teesside	16	61	2	20	83	99	Royal HaskoningDHV (2024)
OWF-069	504	Triton Knoll	40	254	855	117	1,226	1,266	Royal HaskoningDHV (2024)
OWF-070	464	Westermost Rough	91	121	152	91	364	455	Royal HaskoningDHV (2024)
OWF-136	245	Levenmouth Demonstration	4	-	-	-	-	4	Royal HaskoningDHV (2024)
OWF-137	612	Scroby Sands	-	-	-	-	-	-	Royal HaskoningDHV (2024)
OWF-138	813	Rampion	630	66	1,244	3,327	4,637	5,267	Royal HaskoningDHV (2024)

'Other development' ID	Distance to OAA (km)	Project	Breeding season	Post breeding migration	Migration-free winter	Return migration	Total non-breeding	Annual total	Reference source
OWF-139	741	Thanet	3	-	14	21	35	38	Royal HaskoningDHV (2024)
Tier 1b									
OWF-021	356	Dogger Bank B	1,538	2,097	2,143	5,119	9,359	10,897	Royal HaskoningDHV (2024)
OWF-037	455	Hornsea Project Three	630	2,020	3,649	2,105	7,774	8,404	Royal HaskoningDHV (2024)
OWF-065	368	Sofia	1,153	592	1,426	2,953	4,971	6,124	Royal HaskoningDHV (2024)
OWF-140	619	East Anglia THREE	1,807	1,122	1,499	1,524	4,145	5,952	Royal HaskoningDHV (2024)
Tier 1c									
OWF-009	176	Berwick Bank	4,040	8,849	1,399	7,480	17,728	21,768	Royal HaskoningDHV (2024)
OWF-022	381	Dogger Bank C	834	310	959	1,919	3,188	4,022	Royal HaskoningDHV (2024)

'Other development' ID	Distance to OAA (km)	Project	Breeding season	Post breeding migration	Migration-free winter	Return migration	Total non-breeding	Annual total	Reference source
OWF-025	535	DEP	316	759	686	144	1,589	1,905	Royal HaskoningDHV (2024)
OWF-027	646	East Anglia ONE North	403	85	54	207	346	749	Royal HaskoningDHV (2024)
OWF-028	666	East Anglia TWO	281	44	136	230	410	691	Royal HaskoningDHV (2024)
OWF-032	9	Green Volt	457	-	58	-	58	515	APEM (2022b)
OWF-041	180	Inch Cape	1,436	2,870	651	-	3,521	4,957	Royal HaskoningDHV (2024)
OWF-054	579	Norfolk Boreas	630	263	1,065	345	1,673	2,303	Royal HaskoningDHV (2024)
OWF-055	585	Norfolk Vanguard	879	866	839	924	2,629	3,508	Royal HaskoningDHV (2024)
OWF-059	48	Salamander	334	-	484	-	484	818	ERM (2024b)
OWF-063	535	SEP	923	3,741	845	320	4,906	5,829	Royal HaskoningDHV (2024)

'Other development' ID	Distance to OAA (km)	Project	Breeding season	Post breeding migration	Migration-free winter	Return migration	Total non-breeding	Annual total	Reference source
OWF-068	168	Culzean	1	-	14	-	14	15	Atlantic Ecology (2024)
OWF-072	196	West of Orkney	141	-	132	-	132	273	MacArthur Green (2024a)
OWF-073	187	Pentland Floating	134	17	16	14	47	181	Royal HaskoningDHV (2024)
OWF-141	816	Rampion 2	32	26	1,193	6,303	7,522	7,554	Royal HaskoningDHV (2024)
OWF-142	432	Hornsea Project Four	386	4,311	455	449	5,215	5,601	Royal HaskoningDHV (2024)
Tier 1d									
OWF-014	22	Buchan	260	72	127	20	219	479	Natural Power Ltd (2025a)
OWF-015	83	Caledonia	1,762	-	1,930	-	1,930	3,692	GoBe (2024a)
OWF-017	141	Cenos	-	-	-	-	-	-	HiDef (2024a)
OWF-023, OWF-135	385	Dogger Bank South (East and West)	2,836	9,573	8,443	8,034	26,050	28,886	RWE (2025)
OWF-029	690	Five Estuaries	90	284	1,046	756	2,086	2,176	MacArthur Green (2024b)

'Other development' ID	Distance to OAA (km)	Project	Breeding season	Post breeding migration	Migration-free winter	Return migration	Total non-breeding	Annual total	Reference source
OWF-052	59	Muir Mhor	1,549	-	1,430	-	1,430	2,979	Natural Power Ltd (2024a)
OWF-056	126	Ossian	2,608	1,493	138	224	1,855	4,463	Royal HaskoningDHV (2024)
OWF-057	501	Outer Dowsing	3,159	2,185	1,779	5,134	9,098	12,257	GoBe (2025b)
OWF-143	708	North Falls	104	248	1,781	1,741	3,770	3,874	Royal HaskoningDHV (2024)
Tier 2									
OWF-085	391	Dogger Bank D	749	282	588	1,461	2,331	3,080	APEM (2025a)
MarramWind			356	-	1,214	-	1,214	1,570	-
Total			10,657 / 52,418	67,021	47,911	64,692	179,624	232,042	-

Table note: Developments presented in green are those with breeding season connectivity to the Project based on a MMFR plus one SD foraging range of 122.2km and 164.6km for developments south and north of the Pentland Firth, respectively (NatureScot, 2023a). Non-highlighted developments in the breeding season are presented to provide context for how the annual total was derived.

3.5 Puffin

3.5.1 Sensitivity or value of receptor

3.5.1.1 As concluded within **Volume 1, Chapter 12: Offshore and Intertidal Ornithology**, the overall sensitivity of the receptor to distributional response effects is considered to be **medium**.

3.5.2 Magnitude of impact

3.5.2.1 The level of predicted cumulative impact in relation to distributional responses during the operation and maintenance stage is provided in **Table 3.12** and **Table 3.13** based on the cumulative seasonal predicted abundance presented within **Table 3.15**.

3.5.2.2 The impact predictions presented in **Table 3.12** are based on the Developers preferred approach, whilst impact predictions in **Table 3.13** are based on displacement and mortality rates recommended within NatureScot's Guidance Note 8 (NatureScot, 2023b) forming the Guidance approach.

3.5.2.3 As agreed with NatureScot during consultation (see Section 12.3 of **Volume 1, Chapter 12: Offshore and Intertidal Ornithology**), the breeding season CEA is based on those developments (highlighted in green within **Table 3.15**) which are within MMFR plus one SD due to assessments being undertaken against a regional population as defined in Section 12.6 of **Volume 1, Chapter 12: Offshore and Intertidal Ornithology**.

Table 3.12 Summary of seasonal cumulative distributional response impacts predicted for puffin during the operation and maintenance stage, following the Developers approach

Season	Cumulative Total Abundance (OAA plus 2km)	Regional baseline populations (individuals)	Predicted Impact	
			50% Disp; 0% to 1% Mort (individuals per annum)	Reduction in survival rate (%)
Breeding	42,569	248,313	0.00 to 212.85	0.000 to 0.086
Non-breeding	42,431	231,957	0.00 to 212.16	0.000 to 0.091
Annual	89,415	248,313	0.00 to 447.07	0.000 to 0.180

Table 3.13 Summary of seasonal cumulative distributional response impacts predicted for puffin during the operation and maintenance stage, following the Guidance approach

Season	Cumulative Total Abundance (OAA plus 2km)	Regional baseline populations (individuals)	Predicted impact	
			60% Disp; 1% to 5% Mort (individuals per annum)	Reduction in survival rate (%)
Breeding	42,569	248,313	766.24 to 1277.07	0.309 to 0.514
Non-breeding	42,431	231,957	254.59 to 763.76	0.110 to 0.329
Annual	89,415	248,313	1,020.83 to 2,040.83	0.411 to 0.822

3.5.2.4 As concluded within **Table 3.12** and **Table 3.13**, the level of impact predicted annually or seasonally exceeds the 0.02% change in the regional baseline population survival rate when considering either approach. In accordance with NatureScot Guidance Note 11 (NatureScot, 2023c), further consideration of the potential impact is required in the form of PVA.

3.5.2.5 PVA has been undertaken for both the Developer and Guidance approaches over the 35-year operational lifetime of the Project. Outputs are presented in **Table 3.14** below, including the CGR and CPS values. PVA modelling was undertaken using density independent modelling, and therefore the CGR value is considered a more reliable metric than CPS for interpreting impacts (Cook and Robinson, 2016). For full details on PVA methodology, see **Appendix 12.4**.

Table 3.14 PVA results for annual cumulative distributional response impacts predicted for puffin

Scenario modelled	Increase in mortality	Density independent counterfactual metric (35yrs)		Reduction in annual growth rate (%)	Reduction in final population size after 35yrs (%)
		Median CGR	Median CPS		
Annual cumulative total, 50% Displacement and 1% Mortality (Developers approach)	447.1	0.998	0.926	0.22	7.36
Annual cumulative total, 60% Displacement and 1% to 3% Mortality (Guidance approach)	1,020.8	0.995	0.839	0.49	16.10
Annual cumulative total, 60% Displacement and 3% to 5% Mortality (Guidance approach)	2,040.8	0.990	0.704	1.08	29.62

3.5.2.6 The Scottish breeding puffin population has declined by 32% between the Seabirds 2000 Census, and Seabirds Count (2015 to 2021) (Burnell *et al*., 2023), though trends have been highly variable across Scottish SPAs, ranging from an 81% decline (Foula SPA) to a 425% increase (Canna and Sanday SPA) over this period. The main driver of reported declines likely relates to climate change impacts leading to increased frequency and severity of winter storm events (Burnell *et al.,* 2023). These adverse weather conditions are linked to reductions in prey availability impacting adult survival (Burnell *et al.,* 2023). However, remedial actions have been taken to reduce the risk of reduced prey availability impacting puffin via The Sandeel (Prohibition of Fishing) (Scotland) Order 2024.

3.5.2.7 Tremlett *et al*. (2024) conducted a review of pre and post HPAI outbreak colony counts for key seabird species. Upon review, the mortality levels of puffin due to HPAI were assessed as low due to the minimal numbers of mortalities due to the virus.

3.5.2.8 As outlined in **Volume 1, Chapter 12: Offshore and Intertidal Ornithology**, the most appropriate displacement rate for puffin is up to 50%, with up to 1% mortality, based on available evidence. The predicted reduction in population growth rate based on these parameters is sufficiently small such that it would be indistinguishable from natural fluctuations in the population.

3.5.2.9 Under the Guidance approach, the predicted impact could result in up to 0.71% reduction in population growth rate. This may have the potential to adversely impact the population. Though this predicted impact estimate is considered to be highly precautionary for the following reasons:

- Peak abundance assumption: Mean peak abundance estimates assume that the highest monthly abundance represents the entire season, likely overestimating exposure. This precautionary assumption is applied consistently across all developments in the cumulative assessment.
- High displacement and mortality rates: The approach assumes displacement of 60% and mortality of 3%/5% for all developments, despite limited evidence supporting these values.
- No habituation considered: The assessment does not account for potential habituation or adaptation of birds over the operational lifetime of projects.
- No density dependence in PVA: PVA modelling assumes a closed population and excludes compensatory mechanisms such as reduced competition for resources when numbers decline. If density dependence were incorporated, the predicted reduction in annual growth rate would likely be smaller, further reducing the estimated impact.

3.5.2.10 When considering outputs from the Developer's approach, the predicted cumulative impact is sufficiently small that the magnitude would be assessed as **low**. For the Guidance approach, a magnitude of **low** to **medium** is concluded.

3.5.3 Significance of residual effect

3.5.3.1 With a predicted sensitivity of **medium** and a magnitude of impact of **medium at most**, the effect significance is therefore, **Moderate Adverse** (**Significant**) in EIA terms.

3.5.3.2 As the effect significance has been concluded as significant in EIA terms, the Project has considered the feasibility of mitigation to reduce the residual effect significance. However, the reason for the significant effect conclusion is due to the pre-existing scale of predicted impact, rather than due to the Project 's contribution to the CEA. There are no feasible mitigation measures that could sufficiently reduce the CEA adverse effects to a level that is not significant in EIA terms or avoid a potential AEoSI (please refer to **Derogation Case**).

For context, the Project alone predicted effect was concluded as minor adverse significance at most, which is not significant.

3.5.3.3 To note, the Project has provided potential options for compensation with respect to puffin, as presented within the **Derogation Case**. Although such compensation options are focussed on offsetting the predicted impacts apportioned to selected qualifying features of designated sites, such potential measures if implemented are expected to significantly offset the Project's contribution to regional scale impacts.

Table 3.15 Puffin cumulative seasonal abundance estimates

'Other development' ID	Distance to OAA (km)	Project	Breeding season	Total non-breeding	Annual total	Reference source
Tier 1a						
OWF-001	265	2B Energy Methil Demonstration (Methil)	68	24	92	HiDef (2022a)
OWF-002	109	Aberdeen (EOWDC)	42	82	124	Royal HaskoningDHV (2024)
OWF-005	112	Beatrice	2,858	2,435	5,293	Royal HaskoningDHV (2024)
OWF-010	321	Blyth Demonstration Site	235	123	358	Royal HaskoningDHV (2024)
OWF-020	382	Dogger Bank A	37	295	332	Royal HaskoningDHV (2024)
OWF-025	534	Dudgeon	1	3	4	Royal HaskoningDHV (2024)
OWF-027	654	East Anglia One	16	32	48	Royal HaskoningDHV (2024)
OWF-030	687	Galloper	-	1	1	Royal HaskoningDHV (2024)
OWF-031	690	Greater Gabbard	-	1	1	Royal HaskoningDHV (2024)
OWF-033	785	Gunfleet Sands	-	-	-	Royal HaskoningDHV (2024)
OWF-036	475	Hornsea Project One	1,070	1,257	2,327	Royal HaskoningDHV (2024)
OWF-038	467	Hornsea Project Two	468	2,039	2,507	Royal HaskoningDHV (2024)

'Other development' ID	Distance to OAA (km)	Project	Breeding season	Total non-breeding	Annual total	Reference source
OWF-039	485	Humber Gateway	15	10	25	Royal HaskoningDHV (2024)
OWF-040	67	Hywind 2 Demonstration	119	85	204	Royal HaskoningDHV (2024)
OWF-044	856	Kentish Flats and Extension	3	6	9	Royal HaskoningDHV (2024)
OWF-045	126	Kincardine	19	-	19	Royal HaskoningDHV (2024)
OWF-046	593	Lincs, Lynn and Inner Dowsing	3	6	9	Royal HaskoningDHV (2024)
OWF-047	796	London Array	-	1	1	Royal HaskoningDHV (2024)
OWF-049	101	Moray East	2,795	656	3,451	Royal HaskoningDHV (2024)
OWF-050	117	Moray West	1,115	3,966	5,081	Royal HaskoningDHV (2024)
OWF-053	208	Neart na Gaoithe	2,562	2,103	4,665	Royal HaskoningDHV (2024)
OWF-058	525	Race Bank	1	10	11	Royal HaskoningDHV (2024)
OWF-061	159	Seagreen Alpha	2,572	1,526	4,098	Royal HaskoningDHV (2024)
OWF-061	159	Seagreen Bravo	3,582	3,863	7,445	Royal HaskoningDHV (2024)
OWF-063	548	Sheringham Shoal	4	26	30	Royal HaskoningDHV (2024)
OWF-067	375	Teesside	35	18	53	Royal HaskoningDHV (2024)
OWF-069	504	Triton Knoll	23	71	94	Royal HaskoningDHV (2024)

'Other development' ID	Distance to OAA (km)	Project	Breeding season	Total non-breeding	Annual total	Reference source
OWF-070	464	Westermost Rough	61	35	96	Royal HaskoningDHV (2024)
OWF-136	265	Levenmouth Demonstration	8	-	8	Royal HaskoningDHV (2024)
OWF-137	612	Scroby Sands	-	-	-	Royal HaskoningDHV (2024)
OWF-138	813	Rampion	7	-	7	Royal HaskoningDHV (2024)
OWF-139	741	Thanet	-	-	-	Royal HaskoningDHV (2024)
Tier 1b						
OWF-021	356	Dogger Bank B	102	743	845	Royal HaskoningDHV (2024)
OWF-037	455	Hornsea Project Three	253	67	320	Royal HaskoningDHV (2024)
OWF-065	368	Sofia	35	329	364	Royal HaskoningDHV (2024)
OWF-140	619	East Anglia Three	181	307	488	Royal HaskoningDHV (2024)
Tier 1c						
OWF-009	176	Berwick Bank	4,513	8,892	13,405	Royal HaskoningDHV (2024)
OWF-022	381	Dogger Bank C	34	273	307	Royal HaskoningDHV (2024)
OWF-025	535	DEP	24	46	70	Royal HaskoningDHV (2024)
OWF-027	646	East Anglia One North	-	-	-	Royal HaskoningDHV (2024)

'Other development' ID	Distance to OAA (km)	Project	Breeding season	Total non-breeding	Annual total	Reference source
OWF-028	666	East Anglia Two	15	-	15	Royal HaskoningDHV (2024)
OWF-032	9	Green Volt	250	41	291	APEM (2022b)
OWF-041	180	Inch Cape	2,956	2,688	5,644	Royal HaskoningDHV (2024)
OWF-054	579	Norfolk Boreas	-	23	23	Royal HaskoningDHV (2024)
OWF-055	585	Norfolk Vanguard	67	112	179	Royal HaskoningDHV (2024)
OWF-059	48	Salamander	357	1,852	2,209	ERM (2024b)
OWF-063	535	SEP	10	18	28	Royal HaskoningDHV (2024)
OWF-068	168	Culzean	-	-	-	Atlantic Ecology (2024)
OWF-072	196	West of Orkney	5,272	2,136	7,408	MacArthur Green (2024a)
OWF-073	187	Pentland Floating	6,521	6	6,527	Royal HaskoningDHV (2024)
OWF-141	816	Rampion 2	6	-	6	Royal HaskoningDHV (2024)
OWF-142	432	Hornsea Project Four	203	442	645	Royal HaskoningDHV (2024)
Tier 1d						
OWF-014	22	Buchan	938	524	1,462	Natural Power Ltd (2025a)
OWF-015	83	Caledonia	2,061	1,336	3,397	GoBe (2024a)

'Other development' ID	Distance to OAA (km)	Project	Breeding season	Total non-breeding	Annual total	Reference source
OWF-017	141	Cenos	221	67	288	HiDef (2024a)
OWF-023, OWF-135	385	Dogger Bank South (East and West)	172	377	549	RWE (2025)
OWF-029	690	Five Estuaries	-	-	-	MacArthur Green (2024b)
OWF-052	59	Muir Mhor	1,812	1,812	3,624	Natural Power Ltd (2024a)
OWF-056	126	Ossian	1,928	1,178	3,106	Royal HaskoningDHV (2024)
OWF-057	501	Outer Dowsing	666	414	1,080	GoBe (2025b)
OWF-143	708	North Falls	3	1	3	Royal HaskoningDHV (2024)
Tier 2						
OWF-085	391	Dogger Bank D	111	24	135	APEM (2025A)
MarramWind			554	50	604	-
Totals			42,569 / 46,984	42,431	89,415	-

Table note: Developments presented in green are those with breeding season connectivity to the Project based on a MMFR plus one SD foraging range of 265.4km (NatureScot, 2023a). Non-highlighted developments in the breeding season are presented to provide context for how the annual total was derived.

3.6 Gannet

3.6.1 Sensitivity or value of receptor

3.6.1.1 As concluded within **Volume 1, Chapter 12: Offshore and Intertidal Ornithology**, the overall sensitivity of the receptor to distributional response effects is considered to be **medium**.

3.6.2 Magnitude of impact

3.6.2.1 The level of predicted cumulative impact in relation to distributional responses during the operation and maintenance stage is provided in **Table 3.16** and **Table 3.17** based on the cumulative seasonal predicted abundance presented within **Table 3.19**.

3.6.2.2 The impact predictions presented in **Table 3.16** are based on the Developers preferred approach, whilst impact predictions in **Table 3.17** are based on displacement and mortality rates recommended within NatureScot's Guidance Note 8 (NatureScot, 2023b) forming the Guidance approach.

3.6.2.3 As agreed with NatureScot during consultation (see Section 12.3 of **Volume 1, Chapter 12: Offshore and Intertidal Ornithology**), the breeding season CEA is based on those developments (highlighted in green within **Table 3.19**) which are within MMFR plus one SD due to assessments being undertaken against a regional population as defined in Section 12.6 of **Volume 1, Chapter 12: Offshore and Intertidal Ornithology**.

Table 3.16 Summary of seasonal cumulative distributional response impacts predicted for gannet during the operation and maintenance stage, following the Developers approach

Season	Cumulative Total Abundance (OAA plus 2km)	Regional baseline populations (individuals)	Predicted impact	
			60% to 80% Disp; 1% Mort (individuals per annum)	Reduction in survival rate (%)
Breeding	30,263	404,306	181.6 to 242.1	0.045 to 0.060
Non-breeding	38,151	456,298	228.9 to 305.2	0.050 to 0.067
Annual	73,127	456,298	438.8 to 585.0	0.096 to 0.128

Table 3.17 Summary of seasonal cumulative distributional response impacts predicted for gannet during the operation and maintenance stage, following the Guidance approach

Season	Cumulative Total Abundance (OAA plus 2km)	Regional baseline populations (individuals)	Predicted Impact	
			70% Disp; 1% to 3% Mort (individuals per annum)	Reduction in survival rate (%)
Breeding	30,263	404,306	211.8 to 635.5	0.052 to 0.157
Non-breeding	38,151	456,298	267.1 to 801.2	0.059 to 0.176
Annual	73,127	456,298	511.9 to 1,535.7	0.112 to 0.337

3.6.2.4 As concluded within **Table 3.16** and **Table 3.17**, the level of impact predicted annually or seasonally exceeds the 0.02% change in the regional baseline population survival rate when considering either approach. In accordance with NatureScot Guidance Note 11 (NatureScot, 2023c), further consideration of the potential impact is required in the form of PVA.

3.6.2.5 PVA has been undertaken for both the Developer and Guidance approaches over the 35-year operational lifetime of the Project. Outputs are presented in **Table 3.18** below, including the CGR and CPS values. PVA modelling was undertaken using density independent modelling, and therefore the CGR value is considered a more reliable metric than CPS for interpreting impacts (Cook and Robinson, 2016). For full details on PVA methodology, see **Appendix 12.4**.

Table 3.18 PVA results for annual cumulative distributional response impacts predicted for gannet

Scenario modelled	Increase in mortality	Density independent counterfactual metric (35yrs)		Reduction in annual growth rate (%)	Reduction in final population size after 35yrs (%)
		Median CGR	Median CPS		
Annual cumulative total, 60% Displacement and 1% Mortality (Developers approach)	438.8	0.999	0.944	0.11	5.64
Annual cumulative total, 80% Displacement and 1% Mortality (Developers approach)	585.0	0.998	0.925	0.15	7.45

Scenario modelled	Increase in mortality	Density independent counterfactual metric (35yrs)		Reduction in annual growth rate (%)	Reduction in final population size after 35yrs (%)
		Median CGR	Median CPS		
Annual cumulative total, 70% Displacement and 1% Mortality (Guidance approach)	511.89	0.999	0.934	0.13	6.55
Annual cumulative total, 70% Displacement and 3% Mortality (Guidance approach)	1,535.67	0.996	0.816	0.40	18.42

3.6.2.6 The Scottish breeding gannet population has increased by 40% between the Seabirds 2000 Census, and Seabirds Count (2015 to 2021), with all eight Scottish SPAs for gannet showing an increase over this period (Burnell *et al*., 2023). The largest gannet colony on the east coast of Scotland, Forth Islands SPA, increased by 57% over this period, though it is acknowledged that this population has more recently seen declines as a result of HPAI.

3.6.2.7 As gannet is assessed for both distributional responses and collision, full consideration of the combined impact in the context of the regional population is presented within that assessment (**Section 5.3**).

3.6.2.8 When considering the persistent stable growth trend of the UK gannet population, the predicted reduction in growth rate for either the Developer or Guidance approach is not expected to significantly impact the population (<0.4% reduction in annual population growth rate), even when considering recent effects of HPAI. Therefore, the magnitude is assessed as **low** at most for all approaches.

3.6.3 Significance of residual effect

3.6.3.1 With a predicted sensitivity of **medium** and a magnitude of impact of **low,** the effect significance is therefore, **Minor Adverse** (**Not Significant**) in EIA terms.

Table 3.19 Gannet cumulative seasonal abundance estimates

'Other development' ID	Distance to OAA (km)	Project	Breeding season	Post-breeding migration	Return migration	Total non-breeding	Annual total	Reference Source
Tier 1a								
OWF-001	265	2B Energy Methil Demonstration (Methil)	64	-	-	24	88	HiDef (2022a)
OWF-002	109	Aberdeen (EOWDC)	35	5	-	5	40	Royal HaskoningDHV (2024)
OWF-005	112	Beatrice	151	-	-	-	151	Royal HaskoningDHV (2024)
OWF-010	321	Blyth Demonstration Project	-	-	-	-	-	Royal HaskoningDHV (2024)
OWF-020	356	Dogger Bank A & B	1,155	2,048	394	2,442	3,597	Royal HaskoningDHV (2024)
OWF-025	534	Dudgeon	53	25	11	36	89	Royal HaskoningDHV (2024)
OWF-027	654	East Anglia ONE	161	3,638	76	3,714	3,875	Royal HaskoningDHV (2024)

'Other development' ID	Distance to OAA (km)	Project	Breeding season	Post-breeding migration	Return migration	Total non-breeding	Annual total	Reference Source
OWF-030	687	Galloper	360	907	276	1,183	1,543	Royal HaskoningDHV (2024)
OWF-031	690	Greater Gabbard	252	69	105	174	426	Royal HaskoningDHV (2024)
OWF-033	785	Gunfleet Sands	-	12	9	21	21	Royal HaskoningDHV (2024)
OWF-036	475	Hornsea Project One	671	694	250	944	1,615	Royal HaskoningDHV (2024)
OWF-038	467	Hornsea Project Two	457	1,140	124	1,264	1,721	Royal HaskoningDHV (2024)
OWF-039	485	Humber Gateway	-	-	-	-	-	Royal HaskoningDHV (2024)
OWF-040	67	Hywind	10	-	4	4	14	Royal HaskoningDHV (2024)
OWF-044	856	Kentish Flats and Extension	-	13	-	13	13	Royal HaskoningDHV (2024)

'Other development' ID	Distance to OAA (km)	Project	Breeding season	Post-breeding migration	Return migration	Total non-breeding	Annual total	Reference Source
OWF-045	126	Kincardine	120	-	-	-	120	Royal HaskoningDHV (2024)
OWF-046	593	Lincs & LID	-	-	-	-	-	Royal HaskoningDHV (2024)
OWF-047	796	London Array	-	-	-	-	-	Royal HaskoningDHV (2024)
OWF-049	101	Moray East	564	292	27	319	883	Royal HaskoningDHV (2024)
OWF-050	117	Moray West	2,827	439	144	583	3,410	Royal HaskoningDHV (2024)
OWF-053	208	Neart na Gaoithe	1,987	552	281	833	2,820	Royal HaskoningDHV (2024)
OWF-058	525	Race Bank	92	32	29	61	153	Royal HaskoningDHV (2024)
OWF-061	159	Seagreen (Alpha & Bravo)	2,956	664	332	996	3,952	Royal HaskoningDHV (2024)

'Other development' ID	Distance to OAA (km)	Project	Breeding season	Post-breeding migration	Return migration	Total non-breeding	Annual total	Reference Source
OWF-063	548	Sheringham Shoal	47	31	2	33	80	Royal HaskoningDHV (2024)
OWF-067	375	Teesside	1	-	-	-	1	Royal HaskoningDHV (2024)
OWF-069	504	Triton Knoll	211	15	24	39	250	Royal HaskoningDHV (2024)
OWF-070	464	Westermost Rough	-	-	-	-	-	Royal HaskoningDHV (2024)
OWF-136	265	Levenmouth Demonstration	23	-	-	-	23	Royal HaskoningDHV (2024)
OWF-137	612	Scroby Sands	-	-	-	-	-	Royal HaskoningDHV (2024)
OWF-138	813	Rampion	-	590	-	590	590	Royal HaskoningDHV (2024)
OWF-139	741	Thanet	-	-	-	-	-	Royal HaskoningDHV (2024)

'Other development' ID	Distance to OAA (km)	Project	Breeding season	Post-breeding migration	Return migration	Total non-breeding	Annual total	Reference Source
Tier 1b								
OWF-037	455	Hornsea Project Three	1,333	984	524	1,508	2,841	Royal HaskoningDHV (2024)
OWF-140	619	East Anglia THREE	412	1,269	524	1,793	2,205	Royal HaskoningDHV (2024)
Tier 1c								
OWF-009	176	Berwick Bank	4,735	1,500	269	1,769	6,504	Royal HaskoningDHV (2024)
OWF-022	358	Dogger Bank C and Sofia	2,250	887	464	1,351	3,601	Royal HaskoningDHV (2024)
OWF-025, OWF-063	535	Dudgeon and Sheringham Shoals	440	638	57	695	1,135	Royal HaskoningDHV (2024)
OWF-027	646	East Anglia ONE North	149	468	44	512	661	Royal HaskoningDHV (2024)
OWF-028	666	East Anglia TWO	192	891	192	1,083	1,275	Royal HaskoningDHV (2024)
OWF-032	9	Green Volt	198	24	102	126	324	APEM (2022b)

'Other development' ID	Distance to OAA (km)	Project	Breeding season	Post-breeding migration	Return migration	Total non-breeding	Annual total	Reference Source
OWF-041	180	Inch Cape	2,398	703	212	915	3,313	Royal HaskoningDHV (2024)
OWF-054	579	Norfolk Boreas	1,229	1,723	526	2,249	3,478	Royal HaskoningDHV (2024)
OWF-055	585	Norfolk Vanguard	271	2,453	437	2,890	3,161	Royal HaskoningDHV (2024)
OWF-059	48	Salamander	442	-	-	369	811	ERM (2024b)
OWF-068	168	Culzean	-	-	-	-	-	Atlantic Ecology (2024)
OWF-072	196	West of Orkney	852	-	-	1,171	2,023	MacArthur Green (2024a)
OWF-073	187	Pentland Floating	166	24	8	32	198	Royal HaskoningDHV (2024)
OWF-141	816	Rampion 2	111	102	123	225	336	Royal HaskoningDHV (2024)
OWF-142	432	Hornsea Project Four	976	790	401	1,191	2,167	Royal HaskoningDHV (2024)
Tier 1d								

'Other development' ID	Distance to OAA (km)	Project	Breeding season	Post-breeding migration	Return migration	Total non-breeding	Annual total	Reference Source
OWF-014	22	Buchan	235	187	53	240	475	Natural Power Ltd (2025a)
OWF-015	83	Caledonia	909	-	-	315	1,224	GoBe (2024a)
OWF-017	141	Cenos	216	-	-	263	479	HiDef (2024a)
OWF-023, OWF-135	385	Dogger Bank South (East and West)	1,560	1,574	161	1,735	3,295	RWE (2025)
OWF-029	690	Five Estuaries	233	640	67	707	940	MacArthur Green (2024b)
OWF-052	59	Muir Mhor	597	-	-	667	1,264	Natural Power Ltd (2024a)
OWF-056	126	Ossian	1,393	775	42	817	2,210	Royal HaskoningDHV (2024)
OWF-057	501	Outer Dowsing	554	496	69	565	1,119	GoBe (2025b)
OWF-143	708	North Falls	69	287	196	483	552	Royal HaskoningDHV (2024)
Tier 2								
OWF-085	391	Dogger Bank D	217	813	85	898	2	APEM (2025a)

'Other development' ID	Distance to OAA (km)	Project	Breeding season	Post-breeding migration	Return migration	Total non-breeding	Annual total	Reference Source
MarramWind			642	-	-	304	946	-
Totals			30,263 / 34,976	28,394	6,644	38,151	73,127	-

Table note: Developments presented in green are those with breeding season connectivity to the Project based on a MMFR plus one SD of 509.4km (NatureScot, 2023a). Non-highlighted developments in the breeding season are presented to provide context for how the annual total was derived.

4. Impact O3: Collision Risk (Option Agreement Area)

4.1.1.1 There is potential for cumulative collision risk to birds as a result of operational activities associated with the Project and other developments. The risk to birds is through potential collision with wind turbines and associated infrastructure from offshore wind farms, resulting in injury or fatality. This may occur when birds fly through the offshore wind farms whilst foraging for food, commuting between breeding sites and foraging areas, or during migration. The only developments identified for this CEA are those defined as being within Tier 1 and Tier 2, as described in **Table 2.2**. The approach taken to assessing cumulative collision risk is a quantitative one, drawing upon the published information produced by the respective project developers. As such, the input parameters to CRM may vary from those put forward for the Project.

4.1.1.2 During the O&M phase of the Project, there is potential for cumulative collision risk on scoped in species from other relevant developments. Species sensitive to collision risk remain vulnerable to collisions from other developments. Predicted cumulative collision mortalities are presented in this section.

4.1.1.3 As the total predicted collisions for each individual development included within assessments are summed for each season, the total predicted cumulative impact for any season is likely to include some degree of double counting of the same seabirds, especially developments within close proximity of each other. This therefore has the potential to lead to double counting of effects as an individual can't be subject to collision consequential mortality for multiple developments. It is also important to consider the uncertainty highlighted in Section 12.10.4 of **Volume 1, Chapter 12: Offshore and Intertidal Ornithology** around the approach to collision risk modelling and how this may affect the impact predictions presented, particularly within a cumulative context.

4.1.1.4 To note, minor rounding discrepancies may be apparent for the impact mortality predictions presented due to limited available information for some developments. However, this should not materially affect the overall assessment outcomes.

4.2 Kittiwake

4.2.1 Sensitivity or value of receptor

4.2.1.1 As concluded within **Volume 1, Chapter 12: Offshore and Intertidal Ornithology**, the overall sensitivity of the receptor to collision risk is considered to be **medium**.

4.2.2 Magnitude of impact

4.2.2.1 The level of predicted cumulative impact in relation to collision risk during the operation and maintenance stage is provided in **Table 4.1**, with the predicted collision risk mortality values for each wind farm presented in **Table 4.3**. As summarised in **Table 4.3**, many of the project impacts included within the CEA were published prior to recent NatureScot guidance on Collision Risk Modelling (CRM) parameters (NatureScot, 2025). Therefore, where relevant, project impacts have been updated to reflect current advised avoidance rates based on the approach provided by Royal HaskoningDHV (2023a).

4.2.2.2 As agreed with NatureScot during consultation (see Section 12.3 of **Volume 1, Chapter 12: Offshore and Intertidal Ornithology**), the breeding season CEA is based on those

developments (highlighted in green within **Table 4.3**) which are within MMFR plus one SD due to assessments being undertaken against a regional population as defined in Section 12.6 of **Volume 1, Chapter 12: Offshore and Intertidal Ornithology**.

Table 4.1 Summary of seasonal cumulative collision risk impacts predicted for kittiwake during the operation and maintenance stage

Season	Regional baseline populations (individuals)	Predicted impact	
		Estimated number of kittiwake subject to mortality (individuals per annum)	Reduction in survival rate (%)
Breeding	283,312	924.3	0.326
Non-breeding	829,937	2,066.0	0.249
Annual	829,937	4,010.6	0.483

4.2.2.3 As concluded within **Table 4.1**, the level of impact predicted annually or seasonally exceeds the 0.02% change in the regional baseline population survival rate when considering either approach. In accordance with NatureScot Guidance Note 11 (NatureScot, 2023c), further consideration of the potential impact is required in the form of PVA.

4.2.2.4 PVA outputs are presented in **Table 4.2** below, including the CGR and CPS values. PVA modelling was undertaken using density independent modelling, and therefore the CGR value is considered a more reliable metric than CPS for interpreting impacts (Cook and Robinson, 2016). For full details on PVA methodology, see **Appendix 12.4**.

Table 4.2 PVA results for annual cumulative collision risk impact predicted for kittiwake

Scenario modelled	Increase in mortality	Density independent counterfactual metric (35yrs)		Reduction in annual growth rate (%)	Reduction in final population size after 35yrs (%)
		Median CGR	Median CPS		
Annual cumulative total CRM impact	4,010.6	0.994	0.746	0.57	25.35

4.2.2.5 The Scottish breeding kittiwake population has declined by 57% between the Seabirds 2000 Census, and Seabirds Count (2015 to 2021) (Burnell *et al.,* 2023). This trend is consistent across Scottish SPAs, with 27 out of 29 Scottish SPAs declining over this period. Declines during the 2000s are attributed to decreases in availability of primary food resources such as sandeel, specifically through impacts of climate change and sandeel fisheries (Burnell *et al.,* 2023). However, remedial actions have been taken to reduce the risk of reduced prey availability impacting kittiwake via The Sandeel (Prohibition of Fishing) (Scotland) Order 2024. Additionally, HPAI may provide an indirect benefit to kittiwake via a reduction in

predation pressure from great skua and large gull species, when considering the degree of impact on such species (Burnell *et al.,* 2023).

4.2.2.6 A review of pre and post HPAI outbreak colony trends was conducted by Tremlett *et al*. (2024) for various seabird species. Kittiwake apparently occupied nests (AON) were shown to have increased by 8% when comparing pre-HPAI records to counts conducted in 2023 post the outbreak. It must be noted that colony specific trends do differ in terms of colony count change. A further, less significant outbreak of HPAI occurred at seabird colonies in 2023, although the virus was not noted to affect kittiwakes until June, July and August, after colony counts were completed, suggesting impacts may be worse that reported in Tremlett *et al.* (2024).

4.2.2.7 As previously outlined in Section 12.10.4 of **Volume 1, Chapter 12: Offshore and Intertidal Ornithology**, there are significant uncertainties in the input parameters recommended which have the potential to result in highly conservative assumptions. This is then further compounded when developments are assessed cumulatively, introducing multiple layers of conservatism into the predicted impact.

4.2.2.8 When considering the predicted impact and the ongoing declines in the Scottish kittiwake population, it cannot be ruled out that a 0.57% reduction in growth rate has the potential to impact the regional population. Consequently, the magnitude is assessed as **medium**.

4.2.3 Significance of residual effect

4.2.3.1 With a predicted sensitivity of **medium** and a magnitude of impact of **medium,** the effect significance is therefore, **Moderate Adverse** (**Significant**) in EIA terms.

4.2.3.2 As the effect significance has been concluded as significant in EIA terms, the Project has considered the feasibility of mitigation to reduce the residual effect significance. However, the reason for the significant effect conclusion is due to the pre-existing scale of predicted impact, rather than due to the Project's contribution to the CEA. There are no feasible mitigation measures that could sufficiently reduce the CEA adverse effects to a level that is not significant in EIA terms or avoid a potential AEoSI (please refer to **Derogation Case**). For context, the Project alone predicted effect was concluded as minor adverse significance at most, which is not significant.

4.2.3.3 To note, the Project has provided potential options for compensation with respect to kittiwake, as presented within the **Derogation Case**. Although such compensation options are focussed on offsetting the predicted impacts apportioned to selected qualifying features of designated sites, such potential measures if implemented are expected to significantly offset the Project's contribution to regional scale impacts.

Table 4.3 Kittiwake cumulative seasonal estimates of collision risk mortality

'Other development' ID	Distance	Project	Breeding season	Post-breeding migration	Return migration	Total non-breeding	Annual total	Original avoidance rate	Original modelling approach*	Reference Source
Tier 1a										
OWF-001	265	2B Energy Methil Demonstration (Methil)	-	-	-	-	-	0.989	Deterministic	HiDef (2022b)
OWF-002	109	Aberdeen (EOWDC)	8.3	4.1	0.8	4.8	13.1	0.989	Deterministic	Royal HaskoningDHV (2023a)
OWF-005	112	Beatrice	66.3	7.5	27.9	35.4	101.6	0.989	Deterministic	Royal HaskoningDHV (2023a)
OWF-010	321	Blyth Demonstration Project	1.2	1.6	1.0	2.6	3.8	0.989	Deterministic	Royal HaskoningDHV (2023a)
OWF-025	534	Dudgeon	-	-	-	-	-	0.989	Deterministic	Royal HaskoningDHV (2023a)
OWF-027	654	East Anglia ONE	1.3	112.3	32.8	145.0	146.3	0.989	Deterministic	Royal HaskoningDHV (2023a)
OWF-030	687	Galloper	4.4	19.5	22.3	41.7	46.1	0.989	Deterministic	Royal HaskoningDHV (2023a)

'Other development' ID	Distance	Project	Breeding season	Post-breeding migration	Return migration	Total non-breeding	Annual total	Original avoidance rate	Original modelling approach*	Reference Source
OWF-031	690	Greater Gabbard	0.8	10.5	8.0	18.5	19.3	0.989	Deterministic	Royal HaskoningDHV (2023a)
OWF-033	785	Gunfleet Sands	-	-	-	-	-	0.989	Deterministic	Royal HaskoningDHV (2023a)
OWF-036	475	Hornsea Project One	30.8	39.1	14.6	53.8	84.6	0.989	Deterministic	Royal HaskoningDHV (2023a)
OWF-038	467	Hornsea Project Two	11.2	6.3	2.1	8.4	19.6	0.989	Deterministic	Royal HaskoningDHV (2023a)
OWF-039	485	Humber Gateway	1.3	2.2	1.3	3.6	4.9	0.989	Deterministic	Royal HaskoningDHV (2023a)
OWF-040	67	Hywind	11.6	0.6	0.6	1.3	12.9	0.989	Deterministic	Royal HaskoningDHV (2023a)
OWF-044	856	Kentish Flats	-	0.6	0.5	1.1	1.1	0.989	Deterministic	Royal HaskoningDHV (2023a)
OWF-044	856	Kentish Flats Extension	-	-	1.9	1.9	1.9	0.989	Deterministic	Royal HaskoningDHV (2023a)

'Other development' ID	Distance	Project	Breeding season	Post-breeding migration	Return migration	Total non-breeding	Annual total	Original avoidance rate	Original modelling approach*	Reference Source
OWF-045	126	Kincardine	15.4	6.3	0.7	7.0	22.4	0.989	Deterministic	Royal HaskoningDHV (2023a)
OWF-046	593	Lincs & LID	0.5	0.8	0.5	1.3	1.8	0.989	Deterministic	Royal HaskoningDHV (2023a)
OWF-047	796	London Array	1.0	1.6	1.3	2.9	3.9	0.989	Deterministic	Royal HaskoningDHV (2023a)
OWF-049	101	Moray East	30.5	1.4	13.5	14.9	45.4	0.989	Deterministic	Royal HaskoningDHV (2023a)
OWF-050	117	Moray West	55.3	16.8	4.9	21.7	77.0	0.989	Deterministic	Royal HaskoningDHV (2023a)
OWF-053	208	Neart na Gaoithe	5.6	11.9	1.4	13.3	18.9	0.989	Deterministic	Royal HaskoningDHV (2023b)
OWF-058	525	Race Bank	1.3	16.7	3.9	20.7	22.0	0.989	Deterministic	Royal HaskoningDHV (2023a)
OWF-061	159	Seagreen (Alpha & Bravo)	119.8	99.6	23.5	123.1	242.9	0.989	Deterministic	Royal HaskoningDHV (2023b)

'Other development' ID	Distance	Project	Breeding season	Post-breeding migration	Return migration	Total non-breeding	Annual total	Original avoidance rate	Original modelling approach*	Reference Source
OWF-063	548	Sheringham Shoal	-	-	-	-	-	0.989	Deterministic	Royal HaskoningDHV (2023a)
OWF-067	375	Teesside	26.9	16.8	1.8	18.6	45.4	0.989	Deterministic	Royal HaskoningDHV (2023a)
OWF-067, OWF-021	356	Dogger Bank A & B	202.0	94.5	206.8	301.3	503.3	0.989	Deterministic	Royal HaskoningDHV (2023a)
OWF-069	504	Triton Knoll	17.2	97.3	31.8	129.1	146.3	0.989	Deterministic	Royal HaskoningDHV (2023a)
OWF-070	464	Westermost Rough	0.1	0.1	0.1	0.2	0.3	0.989	Deterministic	Royal HaskoningDHV (2023a)
OWF-136	265	Levenmouth Demonstration	0.3	-	-	-	0.3	0.989	Deterministic	Royal HaskoningDHV (2023a)
OWF-137	612	Scroby Sands	-	-	-	-	-	0.989	Deterministic	Royal HaskoningDHV (2023a)
OWF-138	813	Rampion	38.1	26.2	20.8	47.0	85.1	0.989	Deterministic	Royal HaskoningDHV (2023a)

'Other development' ID	Distance	Project	Breeding season	Post-breeding migration	Return migration	Total non-breeding	Annual total	Original avoidance rate	Original modelling approach*	Reference Source
OWF-139	741	Thanet	0.1	0.4	0.3	0.6	0.8	0.989	Deterministic	Royal HaskoningDHV (2023a)
Tier 1b										
OWF-037	455	Hornsea Project Three	53.9	26.6	5.6	32.2	86.1	0.989	Deterministic	Royal HaskoningDHV (2023a)
OWF-140	619	East Anglia THREE	4.3	48.3	26.3	74.6	78.9	0.989	Deterministic	Royal HaskoningDHV (2023a)
Tier 1c										
OWF-009	176	Berwick Bank	431.9	133.0	125.3	258.3	690.2	0.989	Deterministic	Pelagica and Cork Ecology (2022)
OWF-022	381	Dogger Bank C & Sofia	95.8	63.5	151.8	215.3	311.2	0.989	Deterministic	Royal HaskoningDHV (2023a)
OWF-025, OWF-063	535	Dudgeon and Sheringham Shoal	5.0	3.0	0.6	3.6	8.7	0.992	Deterministic	Royal HaskoningDHV (2023a)
OWF-027	646	East Anglia ONE North	28.3	5.7	2.5	8.1	36.4	0.989	Deterministic	Royal HaskoningDHV (2023a)

'Other development' ID	Distance	Project	Breeding season	Post-breeding migration	Return migration	Total non-breeding	Annual total	Original avoidance rate	Original modelling approach*	Reference Source
OWF-028	666	East Anglia TWO	20.7	3.8	5.2	9.0	29.6	0.989	Deterministic	Royal HaskoningDHV (2023a)
OWF-032	9	Green Volt	5.2	5.4	3.3	8.7	13.9	0.993	Stochastic	APEM (2023a)
OWF-041	180	Inch Cape	28.0	18.2	4.2	22.4	50.4	0.989	Deterministic	Royal HaskoningDHV (2023b)
OWF-054	579	Norfolk Boreas	9.3	22.5	8.3	30.9	40.2	0.989	Deterministic	Royal HaskoningDHV (2023a)
OWF-055	585	Norfolk Vanguard	15.3	11.5	13.5	25.0	40.3	0.989	Deterministic	Royal HaskoningDHV (2023a)
OWF-059	48	Salamander	14.7	1.4	0.3	1.7	16.4	0.993	Stochastic	ERM (2024c)
OWF-068	168	Culzean	0.1	0.0	0.0	0.0	0.1	0.993	Stochastic	MD-LOT (2024)
OWF-072	196	West of Orkney	17.9	16.3	21.9	38.2	56.0	0.9928	Stochastic	MacArthur Green (2024a)
OWF-073	187	Pentland Floating	4.9	4.9	0.0	4.9	9.8	0.989	Deterministic	HiDef (2022c)
OWF-141	819	Rampion 2	1.2	9.8	17.3	27.0	28.2	0.993	Stochastic	APEM (2023b)
OWF-142	432	Hornsea Project Four	74.5	13.9	4.6	18.5	93.0	0.989	Stochastic	APEM and GoBe (2022)

'Other development' ID	Distance	Project	Breeding season	Post-breeding migration	Return migration	Total non-breeding	Annual total	Original avoidance rate	Original modelling approach*	Reference Source
Tier 1d										
OWF-014	22	Buchan	1.4	3.5	3.0	6.5	8.2	0.9929	Stochastic	Natural Power Ltd (2025b)
OWF-015	83	Caledonia	55.3	7.0	4.8	11.7	67.0	0.993	Stochastic	GoBe (2024b)
OWF-017	141	Cenos	8.0	0.0	0.0	5.0	13.0	0.9929	Stochastic	HiDef (2024b)
OWF-023, OWF-135	385	Dogger Bank South (East and West)	191.1	79.3	29.5	108.8	299.9	0.993	Stochastic	RWE (2025)
OWF-029	690	Five Estuaries	11.9	7.9	5.5	13.4	25.3	0.993	Stochastic	MacArthur Green (2024c)
OWF-052	59	Muir Mhor	61.7	0.9	8.3	9.3	69.4	0.993	Stochastic	Natural Power Ltd (2024b)
OWF-056	126	Ossian	28.1	5.4	6.2	11.6	39.7	0.993	Stochastic	SSE Renewables (2022)
OWF-057	501	Outer Dowsing	27.2	3.0	2.9	6.0	33.2	0.9929	Stochastic	GoBe (2025c)
OWF-143	708	North Falls	8.8	3.6	7.9	11.5	20.3	0.993	Stochastic	Royal HaskoningDHV (2023b)
Tier 2										
OWF-085	391	Dogger Bank D	67.9	36.8	31.2	68.0	135.9	0.9929	Stochastic	APEM (2025b)

'Other development' ID	Distance	Project	Breeding season	Post-breeding migration	Return migration	Total non-breeding	Annual total	Original avoidance rate	Original modelling approach*	Reference Source
MarramWind			22.5	-	-	16.1	38.6	-	-	-
Totals			924.3 / 1,946.0	1,130.1	914.8	2,066.0	4,010.6	-	-	-

Table note: *Developments presented in green are those with breeding season connectivity to the Project based on a MMFR plus one SD foraging range of 300.6km (NatureScot, 2023a). Non-highlighted developments in the breeding season are presented to provide context for how the annual total was derived. Where an old avoidance rate has been used, collision mortalities have been adjusted to reflect updated NatureScot guidance (0.9923 for deterministic, 0.9929 for stochastic) using the method outlined within Royal HaskoningDHV (2023a).

4.3 Great black-backed gull

4.3.1 Sensitivity or value of receptor

4.3.1.1 As concluded within **Volume 1, Chapter 12: Offshore and Intertidal Ornithology**, the overall sensitivity of the receptor to collision risk is considered to be **medium**.

4.3.2 Magnitude of impact

4.3.2.1 The level of predicted cumulative impact in relation to collision risk during the operation and maintenance stage is provided in **Table 4.4**, with the predicted collision risk mortality values for each wind farm presented in **Table 4.6**. As summarised in **Table 4.6**, many of the project impacts included within the CEA were published prior to recent NatureScot guidance on CRM parameters (NatureScot, 2025). Therefore, where relevant, project impacts have been updated to reflect current advised avoidance rates based on the approached provided by Royal HaskoningDHV (2023a).

4.3.2.2 As noted within Section 12.6.2 of **Volume 1, Chapter 12: Offshore and Intertidal Ornithology**, no great black-backed gull colonies are within foraging range of the Project. The regional breeding season assessment is therefore made against the number of immatures only within the North Sea BDMPS defined in Furness (2015).

Table 4.4 Summary of seasonal cumulative collision risk impacts predicted for great black-backed gull during the operation and maintenance stage

Season	Regional baseline populations (individuals)	Predicted impact	
		Estimated number of great black-backed gull subject to mortality (individuals per annum)	Reduction in survival rate (%)
Breeding	59,329	3.3	0.006
Non-breeding	91,399	1,024.5	1.121
Annual	91,399	1,250.5	1.368

4.3.2.3 As concluded within **Table 4.4**, the level of impact predicted annually or seasonally exceeds the 0.02% change in the regional baseline population survival rate when considering either approach. In accordance with NatureScot Guidance Note 11 (NatureScot, 2023c), further consideration of the potential impact is required in the form of PVA.

4.3.2.4 PVA outputs are presented in **Table 4.5** below, including the CGR and CPS values. PVA modelling was undertaken using density independent modelling, and therefore the CGR value is considered a more reliable metric than CPS for interpreting impacts (Cook and Robinson, 2016). For full details on PVA methodology, see **Appendix 12.4**.

Table 4.5 PVA results for annual cumulative collision risk impact predicted for great black-backed gull

Scenario modelled	Increase in mortality	Density independent counterfactual metric (35yrs)		Reduction in annual growth rate (%)	Reduction in final population size after 35yrs (%)
		Median CGR	Median CPS		
Annual cumulative total CRM impact	1,250.5	0.984	0.450	1.56	55.04

4.3.2.5 The Scottish breeding great black-backed gull population has declined by 63% between the Seabirds 2000 Census, and Seabirds Count (2015 to 2021) (Burnell *et al*., 2023). Across the five SPAs designated for great black-backed gull in Scotland, four showed a decline over this period, ranging from 91% (Calf of Eday SPA) to 95% (North Rona and Sula Sgeir SPA). However, the current largest great black-backed gull colony at East Caithness Cliffs SPA did increase by 35% over this period. It should be noted that no great black-backed gull colonies have breeding season connectivity to the proposed development (i.e., all colonies are outside the mean-maximum foraging range of 16.7km (Woodward *et al*., 2019). Consequently, the relevant population is drawn from immature birds and the non-breeding population which is drawn from a wider area across the North Sea. However, it is acknowledged that worldwide, the great black-backed gull populations have also been in decline at a rate of 1.2 to 1.3% per annum between 1985 and 2021 (Burnell *et al*., 2023). Although the reasons for great black-backed gulls population decline are not fully understood, it is likely linked to a reduction in food availability caused by changes in fishing discard practices and waste management at land fill sites (Burnell *et al*., 2023). Additionally, there has been a significant shift in large gull populations moving from marine and coastal environments to urban environments, where accurate censusing of populations is difficult. It is therefore unclear as to whether great black-backed gulls are truly in decline or if the population is stabilising or redistributing in response to changing anthropogenic factors.

4.3.2.6 A review of pre and post HPAI outbreak colony trends by Tremlett *et al.* (2024) found great black-backed gull AON counts remained similar between pre-HPAI and during counts conducted in 2023 post the outbreak. It must be noted that colony specific trends do differ in terms of colony count change. A further, less significant outbreak of HPAI occurred at seabird colonies in 2023, although limited impacts to great black-backed gulls were reported (Tremlett *et al.*, 2024).

4.3.2.7 As previously outlined in Section 12.10.4 of **Volume 1, Chapter 12: Offshore and Intertidal Ornithology** there are significant uncertainties in the input parameters recommended which have the potential to result in highly conservative assumptions. This is then further compounded when developments are assessed cumulatively, introducing multiple layers of conservatism into the predicted impact.

4.3.2.8 When considering the predicted impact, it cannot be ruled out that a 1.56% reduction in growth rate has the potential to impact the regional population if true. Consequently, the magnitude is assessed as **high**.

4.3.3 Significance of residual effect

4.3.3.1 With a predicted sensitivity of **medium** and a magnitude of impact of **high,** the effect significance is therefore, **Major** (**Significant**) in EIA terms.

4.3.3.2 As the effect significance has been concluded as significant in EIA terms, the Project has considered the feasibility of mitigation to reduce the residual effect significance. However, the reason for the significant effect conclusion is due to the pre-existing scale of predicted impact, rather than due to the Project 's contribution to the CEA. There are no feasible mitigation measures that could sufficiently reduce the CEA adverse effects to a level that is not significant in EIA terms. For context, the Project alone predicted effect was concluded as minor adverse significance at most, which is not significant.

4.3.3.3 As detailed within **Volume 1, Chapter 12: Offshore and Intertidal Ornithology**, there is currently significant uncertainty around the current best practice approach to predicting potential collision impacts, likely leading to over estimation of predicted effects for the Project alone and cumulatively. Additionally, caution should be taken with respect to consideration of compensation for great black-backed gull.

4.3.3.4 Feasible effective compensation measures which the Project could implement, targeted at increasing great black-backed gull numbers is considered significantly limited. The key drivers of population decline in great black-backed gulls relate to prey availability, culling and predator suppression (Lopez *et al*., 2023a). These key factors are considered predominately outside of the control of a private developer to intervene. Another key consideration with respect to great black-backed gull compensation, would be the negative effect on other seabirds that increasing the numbers of great black-backed gulls could have due to increased predation pressure. For example, a pair of great black-back gulls could consume anywhere between seven and 65 puffins in a single breeding season (Lopez *et al*., 2023b). Similarly on Gull Island and the Gannet Islands in eastern Canada, nesting great black-backed gulls are known to predate on Leach's storm-petrel (*Hydrobates leucorhous*), kittiwake, guillemot and razorbill, though the degree of predation varies depending on availability of other prey sources and environmental factors (Veitch *et al*., 2016). Further, increasing great black-backed gull numbers in urban environments has the potential to lead to conflicts with humans (Belant, 1997; Spelt *et al*., 2019).

4.3.3.5 When considering the level of uncertainty in assessments and environmental risks outlined above with compensating for great black-backed gull. The Project proposes that undertaking post-consent monitoring to better understand the true impact of the Project on great black-backed gulls is strongly advised before commitment to compensation is made, given the potential for adverse effects on other seabird species as highlighted above.

Table 4.6 Great black-backed gull cumulative seasonal estimates of collision risk mortality

'Other development' ID	Distance	Project	Breeding season	Non-breeding season	Annual total	Original avoidance rate*	Original modelling approach*	Reference source
Tier 1a								
OWF-001	265	2B Energy Methil Demonstration (Methil)	-	-	-	N/A	N/A	HiDef (2022b)
OWF-002	109	Aberdeen (EOWDC)	0.7	2.9	3.6	0.995	Deterministic	Royal HaskoningDHV (2023a)
OWF-005	112	Beatrice	36.2	145.0	181.2	0.995	Deterministic	Royal HaskoningDHV (2023a)
OWF-010	321	Blyth Demonstration Project	1.6	6.1	7.6	0.995	Deterministic	Royal HaskoningDHV (2023a)
OWF-020	375	Teesside	10.4	41.8	52.3	0.995	Deterministic	Royal HaskoningDHV (2023a)
OWF-025	534	Dudgeon	-	-	-	Unknown	Unknown	Royal HaskoningDHV (2023a)
OWF-027	654	East Anglia ONE	0.0	55.2	55.2	0.995	Deterministic	Royal HaskoningDHV (2023a)
OWF-030	687	Galloper	5.4	21.6	27.0	0.995	Deterministic	Royal HaskoningDHV (2023a)
OWF-031	690	Greater Gabbard	18.0	72.0	90.0	0.995	Deterministic	Royal HaskoningDHV (2023a)
OWF-033	785	Gunfleet Sands	-	-	-	N/A	N/A	Royal HaskoningDHV (2023a)
OWF-036	475	Hornsea Project One	20.6	82.3	103.0	0.995	Deterministic	Royal HaskoningDHV (2023a)
OWF-038	467	Hornsea Project Two	3.6	24.0	27.6	0.995	Deterministic	Royal HaskoningDHV (2023a)

'Other development' ID	Distance	Project	Breeding season	Non-breeding season	Annual total	Original avoidance rate*	Original modelling approach*	Reference source
OWF-039	485	Humber Gateway	1.6	6.1	7.6	0.995	Deterministic	Royal HaskoningDHV (2023a)
OWF-040	67	Hywind	0.4	5.4	5.8	0.995	Deterministic	Royal HaskoningDHV (2023a)
OWF-044	856	Kentish Flats and Extension	-	-	-	N/A	N/A	Royal HaskoningDHV (2023a)
OWF-045	126	Kincardine	-	-	-	Unknown	Unknown	Royal HaskoningDHV (2023a)
OWF-046	593	Lincs & LID	-	-	-	Unknown	Unknown	Royal HaskoningDHV (2023a)
OWF-047	796	London Array	-	-	-	N/A	N/A	Royal HaskoningDHV (2023a)
OWF-049	101	Moray East	11.4	30.6	42.0	0.995	Deterministic	Royal HaskoningDHV (2023a)
OWF-050	117	Moray West	4.8	6.0	10.8	0.995	Deterministic	Royal HaskoningDHV (2023a)
OWF-053	208	Neart na Gaoithe	-	3.6	3.6	0.995	Deterministic	GoBe (2018)
OWF-058	525	Race Bank	-	-	-	Unknown	Unknown	Royal HaskoningDHV (2023a)
OWF-061	159	Seagreen (Alpha & Bravo)	16.1	64.1	80.2	0.995	Deterministic	Royal HaskoningDHV (2023a)
OWF-063	548	Sheringham Shoal	-	-	-	Unknown	Unknown	Royal HaskoningDHV (2023a)
OWF-067	356	Dogger Bank A & B	7.0	28.0	34.9	0.995	Deterministic	Royal HaskoningDHV (2023a)
OWF-069	504	Triton Knoll	29.3	117.1	146.4	0.995	Deterministic	Royal HaskoningDHV (2023a)
OWF-070	464	Westermost Rough	-	-	0.1	0.995	Deterministic	Royal HaskoningDHV (2023a)

'Other development' ID	Distance	Project	Breeding season	Non-breeding season	Annual total	Original avoidance rate*	Original modelling approach*	Reference source
OWF-136	265	Levenmouth Demonstration	1.0	1.0	1.9	0.995	Deterministic	Royal HaskoningDHV (2023a)
OWF-137	612	Scroby Sands	-	-	-	N/A	N/A	Royal HaskoningDHV (2023a)
OWF-139	741	Thanet	0.1	0.5	0.6	0.995	Deterministic	Royal HaskoningDHV (2023a)
Tier 1b								
OWF-037	455	Hornsea Project Three	9.6	33.6	43.2	0.995	Deterministic	Royal HaskoningDHV (2023a)
OWF-140	619	East Anglia THREE	5.5	41.3	46.8	0.995	Deterministic	Royal HaskoningDHV (2023a)
Tier 1c								
OWF-009	176	Berwick Bank	-	-	-	N/A	N/A	Pelagica and Cork Ecology (2022)
OWF-022	358	Dogger Bank C & Sofia	7.7	30.6	38.3	0.995	Deterministic	Royal HaskoningDHV (2023a)
OWF-025	535	Dungeon and Sheringham Shoal	5.7	0.3	6.0	0.994	Deterministic	Royal HaskoningDHV (2023a)
OWF-027	646	East Anglia ONE North	4.4	1.4	6.0	0.995	Deterministic	Royal HaskoningDHV (2023a)
OWF-028	666	East Anglia TWO	4.2	4.1	8.3	0.995	Deterministic	Royal HaskoningDHV (2023a)
OWF-032	9	Green Volt	0.1	6.9	7.0	0.994	Stochastic	APEM (2023a)
OWF-041	180	Inch Cape	-	44.2	44.2	0.995	Deterministic	Royal HaskoningDHV (2023a)

'Other development' ID	Distance	Project	Breeding season	Non-breeding season	Annual total	Original avoidance rate*	Original modelling approach*	Reference source
OWF-054	579	Norfolk Boreas	8.3	34.4	42.7	0.995	Deterministic	Royal HaskoningDHV (2023a)
OWF-055	585	Norfolk Vanguard	5.4	25.8	31.2	0.995	Deterministic	Royal HaskoningDHV (2023a)
OWF-059	48	Salamander	-	3.0	3.0	0.994	Stochastic	ERM (2024c)
OWF-068	168	Culzean	0.1	0.2	0.3	0.994	Stochastic	MD-LOT (2024)
OWF-072	196	West of Orkney	0.8	11.1	11.9	0.9939	Stochastic	MacArthur Green (2024a)
OWF-073	187	Pentland Floating	-	-	-	0.989 (BO3)	Deterministic	HiDef (2022c)
OWF-142	432	Hornsea Project Four	1.0	10.6	11.5	0.995	Deterministic	APEM and GoBe (2022)
Tier 1d								
OWF-014	22	Buchan	-	2.9	2.9	0.994	Stochastic	Natural Power Ltd (2025b)
OWF-015	83	Caledonia	-	15.0	15.0	0.994	Stochastic	GoBe (2024b)
OWF-017	141	Cenos	-	-	-	N/A	N/A	HiDef (2024b)
OWF-023, OWF-135	385	Dogger Bank South (East and West)	0.9	4.0	4.9	0.994	Stochastic	RWE (2025)
OWF-029	690	Five Estuaries	0.7	1.2	1.8	0.994	Stochastic	MacArthur Green (2024c)

'Other development' ID	Distance	Project	Breeding season	Non-breeding season	Annual total	Original avoidance rate*	Original modelling approach*	Reference source
OWF-052	59	Muir Mhor	-	17.4	17.4	0.994	Stochastic	Natural Power Ltd (2024b)
OWF-056	126	Ossian	-	-	-	N/A	N/A	SSE Renewables (2022)
OWF-057	501	Outer Dowsing	0.5	3.4	4.0	0.994	Stochastic	GoBe (2025c)
OWF-143	708	North Falls	-	3.0	3.0	0.9939	Stochastic	Royal HaskoningDHV (2023b)
Tier 2								
OWF-085	391	Dogger Bank D	-	0.4	0.4	0.994	Stochastic	APEM (2025b)
MarramWind			2.8	16.7	19.5	-	-	-
Total			3.3 / 225.9	1,024.5	1,250.5	-	-	-

Table Note: Developments presented in green are those with breeding season connectivity to the Project based on a MMFR plus one SD of 73km (NatureScot, 2023a). Non-highlighted developments in the breeding season are presented to provide context for how the annual total was derived. *Where an old avoidance rate has been used, collision mortalities have been adjusted to reflect updated NatureScot guidance (0.994) using the method outlined within Royal HaskoningDHV (2023a).

4.4 Herring gull

4.4.1 Sensitivity or value of receptor

4.4.1.1 As concluded within **Volume 1, Chapter 12: Offshore and Intertidal Ornithology**, the overall sensitivity of the receptor to collision risk is considered to be **medium**.

4.4.2 Magnitude of impact

4.4.2.1 The level of predicted cumulative impact in relation to collision risk during the operation and maintenance stage is provided in **Table 4.7**, with the predicted collision risk mortality values for each wind farm presented in **Table 4.8**. As summarised in **Table 4.8**, many of the project impacts included within the CEA were published prior to recent NatureScot guidance on CRM parameters (NatureScot, 2025). Therefore, where relevant, project impacts have been updated to reflect current advised avoidance rates based on the approached provided by Royal HaskoningDHV (2023a).

4.4.2.2 As per NatureScot advice (see Section 12.3 of **Volume 1, Chapter 12: Offshore and Intertidal Ornithology**), the non-breeding population is considered to be the same as the breeding season, drawn from colonies within MMFR plus one SD of the Project only (though adding a correction factor in the non-breeding season to account for influx of continental breeding birds). Consequently, the cumulative assessment only considers developments within this range also. As discussed within Section 12.6.2 of **Volume 1, Chapter 12: Offshore and Intertidal Ornithology**, no herring gull colonies are within foraging range of the Project, and so the regional breeding season assessment is against the number of immatures only within the North Sea BDMPS defined in Furness (2015).

Table 4.7 Summary of seasonal cumulative collision risk impacts predicted for herring gull during the operation and maintenance stage

Season	Regional baseline populations (individuals)	Predicted Impact	
		Estimated number of herring gull subject to mortality (individuals per annum)	Reduction in survival rate (%)
Breeding	256,222	2.2	0.001
Non-breeding	307,422	26.4	0.009
Annual	307,422	28.3	0.009

4.4.2.3 As concluded within **Table 4.8**, the level of impact predicted annually or seasonally does not exceed the 0.02% change in the regional baseline population survival rate. In accordance with NatureScot Guidance Note 11 (NatureScot, 2023c) no further consideration of the potential impact is required. Such a minimal change in survival rate would be indistinguishable from natural fluctuations in the population, therefore the magnitude of the impact is considered to be **very low**.

4.4.3 Significance of residual effect

4.4.3.1 With a predicted sensitivity of **medium** and a magnitude of impact of **very low**, the effect significance is therefore, **Minor Adverse** (**Not Significant**) in EIA terms.

Table 4.8 Herring gull cumulative seasonal estimates of collision risk mortality

'Other development' ID	Distance	Project	Breeding season	Non-breeding season	Annual total	Model option	Avoidance rate	Source
Tier 1a								
OWF-001	265	2B Energy Methil Demonstration (Methil)	-	-	-	-	-	-
OWF-002	109	Aberdeen (EOWDC)	-	-	-	-	-	-
OWF-005	112	Beatrice	-	-	-	-	-	-
OWF-010	321	Blyth Demo	-	-	-	-	-	-
OWF-040	67	Hywind	0.7	9.4	10.1	1	0.995	Royal HaskoningDHV (2023a)
OWF-045	126	Kincardine	-	-	-	-	-	-
OWF-049	101	Moray East	-	-	-	-	-	-
OWF-050	117	Moray West	-	-	-	-	-	-
OWF-053	208	Neart na Gaoithe	-	-	-	-	-	-
OWF-061	159	Seagreen (Alpha & Bravo)	-	-	-	-	-	-

'Other development' ID	Distance	Project	Breeding season	Non-breeding season	Annual total	Model option	Avoidance rate	Source
OWF-136	265	Levenmouth Demonstration	-	-	-	-	-	-
Tier 1c								
OWF-009	176	Berwick Bank	-	-	-	-	-	-
OWF-032	9	Green Volt	0.1	5.8	5.9	2	0.994	APEM (2023b)
OWF-041	180	Inch Cape	-	-	-	-	-	-
OWF-059	48	Salamander	0	4	4	2	0.994	ERM (2024c)
OWF-068	168	Culzean	-	-	-	-	-	-
OWF-072	196	West of Orkney	-	-	-	-	-	-
OWF-073	187	Pentland Floating	-	-	-	-	-	-
Tier 1d								
OWF-014	22	Buchan	-	-	-	-	-	-
OWF-015	83	Caledonia	0	3.1	3.1	2	0.994	GoBe (2024b)
OWF-017	141	Cenos	-	-	-	-	-	-
OWF-052	59	Muir Mhor	0.9	1.7	2.6	2	0.994	Natural Power Ltd (2024b)

'Other development' ID	Distance	Project	Breeding season	Non-breeding season	Annual total	Model option	Avoidance rate	Source
OWF-056	126	Ossian	-	-	-	-	-	-
MarramWind			0.8	6.4	7.2	-	-	-
Totals			2.2	26.4	28.3	-	-	-

Table note: Developments presented in green are those with breeding season connectivity to the Project based on a MMFR plus one SD of 85.6km (NatureScot, 2023a). Non-highlighted developments in the breeding season are presented to provide context for how the annual total was derived. *Where an old avoidance rate has been used, collision mortalities have been adjusted to reflect updated NatureScot guidance (0.994) using the method outlined within Royal HaskoningDHV (2023a).

4.5 Gannet

4.5.1 Sensitivity or value of receptor

4.5.1.1 As concluded within **Volume 1, Chapter 12: Offshore and Intertidal Ornithology**, the overall sensitivity of the receptor to collision risk is considered to be **medium**.

4.5.2 Magnitude of impact

4.5.2.1 The level of predicted cumulative impact in relation to collision risk during the operation and maintenance stage is provided in **Table 4.9**, with the predicted collision risk mortality values for each wind farm presented in **Table 4.10**.

4.5.2.2 As agreed with NatureScot during consultation, the breeding season CEA is based on those developments (highlighted in green within **Table 4.11**) which are within MMFR plus one SD due to assessments being undertaken against a regional population as defined in Section 12.6 of **Volume 1, Chapter 12: Offshore and Intertidal Ornithology**. It should be noted that many of the project impacts included within the CEA were published prior to recent NatureScot guidance on CRM parameters (NatureScot, 2025). Therefore, where relevant, project impacts have been updated to reflect currently advised avoidance rates. Additionally, for Scottish developments, 70% macro-avoidance has been applied in the non-breeding season (where not already applied), and across all seasons for English developments in line with Natural England guidance.

Table 4.9 Summary of seasonal cumulative collision risk impacts predicted for gannet during the operation and maintenance stage

Season	Regional baseline populations (individuals)	Predicted impact	
		Estimated number of gannet subject to mortality (individuals per annum)	Reduction in survival rate (%)
Breeding	404,306	788.9	0.195
Non-breeding	456,298	240.1	0.053
Annual	456,298	1,071.2	0.235

4.5.2.3 As concluded within **Table 4.9**, the level of impact predicted annually or seasonally exceeds the 0.02% change in the regional baseline population survival rate when considering the Guidance approach. In accordance with NatureScot Guidance Note 11 (NatureScot, 2023c), further consideration of the potential impact is required in the form of PVA.

4.5.2.4 PVA outputs are presented in **Table 4.10** below, including the CGR and CPS values. PVA modelling was undertaken using density independent modelling, and therefore the CGR value is considered a more reliable metric than CPS for interpreting impacts (Cook and Robinson, 2016). For full details on PVA methodology, see **Appendix 12.4**.

Table 4.10 PVA results for annual cumulative collision risk impact predicted for gannet

Scenario modelled	Increase in mortality	Density independent counterfactual metric (35yrs)		Reduction in annual growth rate (%)	Reduction in final population size after 35yrs (%)
		Median CGR	Median CPS		
Annual cumulative total CRM impact	1,071.2	0.997	0.868	0.28	13.23

4.5.2.5 The Scottish breeding gannet population has increased by 40% between the Seabirds 2000 Census, and Seabirds Count (2015 to 2021), with all eight Scottish SPAs for gannet showing an increase over this period (Burnell *et al*., 2023). The largest gannet colony on the east coast of Scotland, Forth Islands SPA, increased by 57% over this period, though it is acknowledged that this population has more recently seen declines as a result of HPAI.

4.5.2.6 As gannet is assessed for both distributional responses and collision, full consideration of the combined impact in the context of the regional population is presented within that assessment (**Section 5.3**).

4.5.2.7 As previously outlined in Section 12.10.4 of **Volume 1, Chapter 12: Offshore and Intertidal Ornithology**, there are significant uncertainties in the input parameters recommended which have the potential to result in highly conservative assumptions. This is then further compounded when developments are assessed cumulatively, introducing multiple layers of conservatism into the predicted impact.

4.5.2.8 Given the consistent growth in gannet numbers over the last 20+ years (Burnell *et al.,* 2023), even after accounting for temporary declines due to HPAI, the predicted reduction in growth rate is sufficiently small that it will not significantly hinder any population recovery in the short term or hinder long term population growth rate. The magnitude of impact is therefore assessed as **low**.

4.5.3 Significance of residual effect

4.5.3.1 With a predicted sensitivity of **medium** and a magnitude of impact of **low**. The effect significance is therefore, **Minor Adverse** (**Not Significant**) in EIA terms.

Table 4.11 Gannet cumulative seasonal estimates of collision risk mortality

'Other development' ID	Distance to OAA (km)	Project	Breeding season	Post-breeding Migration	Return migration	Total non-breeding	Annual total	Original avoidance rate*	Original modelling approach	Macro-avoidance previously applied?**	Reference Source
Tier 1a											
OWF-001	265	2B Energy Methil Demonstration (Methil)	4.2	-	-	-	4.2	0.98	Deterministic	N	HiDef (2022b)
OWF-002	109	Aberdeen (EOWDC)	2.9	1.1	0.0	1.1	4.0	0.989	Deterministic	N	Royal HaskoningDHV (2023a)
OWF-005	112	Beatrice	26.2	10.2	2.0	12.2	38.4	0.989	Deterministic	N	Royal HaskoningDHV (2023a)
OWF-010	321	Blyth Demonstration Project	0.7	0.4	0.6	1.0	1.8	0.989	Deterministic	N	Royal HaskoningDHV (2023a)
OWF-020, OWF-021	356	Dogger Bank A & B	17.0	17.5	11.4	29.0	46.0	0.989	Deterministic	N	Royal HaskoningDHV (2023a)
OWF-025	534	Dudgeon	4.7	8.2	4.0	12.2	16.9	0.989	Deterministic	N	Royal HaskoningDHV (2023a)
OWF-026	654	East Anglia ONE	0.7	27.5	1.3	28.8	29.5	0.989	Deterministic	N	Royal HaskoningDHV (2023a)
OWF-030	687	Galloper	3.8	6.5	2.6	9.1	12.9	0.989	Deterministic	N	Royal HaskoningDHV (2023a)
OWF-031	690	Greater Gabbard	2.9	1.8	1.0	2.9	5.8	0.989	Deterministic	N	Royal HaskoningDHV (2023a)
OWF-033	785	Gunfleet Sands	-	-	-	-	-	N/A	Deterministic	N	Royal HaskoningDHV (2023a)
OWF-036	475	Hornsea Project One	2.4	6.7	4.7	11.4	13.9	0.989	Deterministic	N	Royal HaskoningDHV (2023a)
OWF-038	467	Hornsea Project Two	1.5	2.9	1.3	4.2	5.7	0.989	Deterministic	N	Royal HaskoningDHV (2023a)
OWF-039	485	Humber Gateway	0.4	0.2	0.3	0.5	0.9	0.989	Deterministic	N	Royal HaskoningDHV (2023a)
OWF-040	67	Hywind	3.9	0.2	0.2	0.3	4.3	0.989	Deterministic	N	Royal HaskoningDHV (2023a)
OWF-044	856	Kentish Flats and Extension	0.3	0.2	0.2	0.4	0.7	0.989	Deterministic	N	Royal HaskoningDHV (2023a)
OWF-045	126	Kincardine	2.1	0.0	0.0	0.0	2.1	0.989	Deterministic	N	Royal HaskoningDHV (2023a)
OWF-046	593	Lincs & LID	0.5	0.3	0.4	0.7	1.2	0.989	Deterministic	N	Royal HaskoningDHV (2023a)
OWF-047	796	London Array	0.5	0.3	0.4	0.7	1.2	0.989	Deterministic	N	Royal HaskoningDHV (2023a)
OWF-049	101	Moray East	56.4	7.4	1.9	9.3	65.7	0.989	Deterministic	N	Royal HaskoningDHV (2023a)
OWF-050	117	Moray West	7.0	0.4	0.2	0.6	7.6	0.989	Deterministic	N	Royal HaskoningDHV (2023a)

'Other development' ID	Distance to OAA (km)	Project	Breeding season	Post-breeding Migration	Return migration	Total non-breeding	Annual total	Original avoidance rate*	Original modelling approach	Macro-avoidance previously applied?**	Reference Source
OWF-053	208	Neart na Gaoithe	62.3	1.5	1.5	2.9	65.2	0.989	Deterministic	N	Royal HaskoningDHV (2023b)
OWF-058	525	Race Bank	7.1	2.5	0.9	3.3	10.4	0.989	Deterministic	N	Royal HaskoningDHV (2023a)
OWF-061	159	Seagreen (Alpha & Bravo)	207.1	3.0	1.5	4.5	211.5	0.989	Deterministic	N	Royal HaskoningDHV (2023b)
OWF-063	548	Sheringham Shoal	3.0	0.7	-	0.7	3.7	0.989	Deterministic	N	Royal HaskoningDHV (2023a)
OWF-067	375	Teesside	1.0	0.4	0.0	0.4	1.4	0.989	Deterministic	N	Royal HaskoningDHV (2023a)
OWF-069	504	Triton Knoll	5.6	13.5	6.3	19.8	25.4	0.989	Deterministic	N	Royal HaskoningDHV (2023a)
OWF-070	464	Westermost Rough	0.0	0.0	0.0	0.1	0.1	0.989	Deterministic	N	Royal HaskoningDHV (2023a)
OWF-136	265	Levenmouth Demonstration	0.4	-	-	-	0.385	0.989	Deterministic	N	Royal HaskoningDHV (2023a)
OWF-137	612	Scroby Sands	-	-	-	-	-	N/A	Deterministic	N	Royal HaskoningDHV (2023a)
OWF-138	813	Rampion	7.6	13.3	0.4	13.8	21.4	0.989	Deterministic	N	Royal HaskoningDHV (2023a)
OWF-139	741	Thanet	0.2	-	-	-	0.2	0.989	Deterministic	N	Royal HaskoningDHV (2023a)
Tier 1b											
OWF-037	455	Hornsea Project Three	2.1	1.1	0.8	1.9	4.0	0.989	Deterministic	N	Royal HaskoningDHV (2023a)
OWF-140	619	East Anglia THREE	1.3	7.0	2.0	9.0	10.3	0.989	Deterministic	N	Royal HaskoningDHV (2023a)
Tier 1c											
OWF-009	176	Berwick Bank	119.0	3.8	0.6	4.4	123.4	0.989	Deterministic	N	Pelagica and Cork Ecology (2022)
OWF-022, OWF-065	358	Dogger Bank C & Sofia	3.1	2.1	2.3	4.4	7.5	0.989	Deterministic	N	Royal HaskoningDHV (2023a)
OWF-025, OWF-063	535	Dudgeon and Sheringham Shoal	0.4	0.6	0.0	0.7	1.1	0.992	Deterministic	N	Royal HaskoningDHV (2023a)
OWF-027	646	East Anglia ONE North	2.6	2.3	0.2	2.5	5.1	0.989	Deterministic	N	Royal HaskoningDHV (2023a)
OWF-028	666	East Anglia TWO	2.6	4.9	0.8	5.7	8.3	0.989	Deterministic	N	Royal HaskoningDHV (2023a)
OWF-032	9	Green Volt	14.9	0.1	0.7	0.8	15.7	0.993	Stochastic	N	APEM (2023a)
OWF-041	180	Inch Cape	75.6	1.1	0.8	1.9	77.5	0.989	Deterministic	N	Royal HaskoningDHV (2023b)

'Other development' ID	Distance to OAA (km)	Project	Breeding season	Post-breeding Migration	Return migration	Total non-breeding	Annual total	Original avoidance rate*	Original modelling approach	Macro-avoidance previously applied?**	Reference Source
OWF-054	579	Norfolk Boreas	3.0	2.7	0.8	3.5	6.4	0.989	Deterministic	N	Royal HaskoningDHV (2023a)
OWF-055	585	Norfolk Vanguard	1.7	3.9	1.1	5.0	6.7	0.989	Deterministic	N	Royal HaskoningDHV (2023a)
OWF-059	48	Salamander	5.2	0.5	0.2	0.6	5.8	0.993	Stochastic	N	ERM (2024c)
OWF-068	168	Culzean	-	-	-	-	-	0.993	Stochastic	N	MD-LOT (2024)
OWF-072	196	West of Orkney	35.3	2.3	0.6	2.9	38.2	0.9928	Stochastic	N	MacArthur Green (2024a)
OWF-073	187	Pentland Floating	1.4	-	-	-	1.4	0.989	Deterministic	N	HiDef (2022c)
OWF-141	816	Rampion 2	2.9	1.4	0.6	2.0	4.9	0.993	Stochastic	Y 70% all seasons	APEM (2023b)
OWF-142	432	Hornsea Project Four	3.3	1.1	0.3	1.4	4.7	0.989	Stochastic	Y 70% all seasons	APEM and GoBe (2022)
Tier 1d											
OWF-014	22	Buchan	3.0	0.2	0.1	0.2	3.2	0.9929	Stochastic	N	Natural Power Ltd (2025b)
OWF-015	83	Caledonia	12.4	0.6	0.1	0.7	13	0.993	Stochastic	Y - 70% non-breeding only	GoBe (2024b)
OWF-017	141	Cenos	17.1	2.4	0.6	2.9	20.1	0.9929	Stochastic	Y - 70% non-breeding only	HiDef (2024b)
OWF-023, OWF-135	385	Dogger Bank South (East and West)	8.3	3.7	0.2	3.9	12.2	0.992	Stochastic	Y 70% all seasons	RWE (2025)
OWF-029	690	Five Estuaries	2	2.3	0.2	2.5	4.5	0.9979	Stochastic	Y - incorporated within the avoidance rate	MacArthur Green (2024c)
OWF-052	59	Muir Mhor	9.6	2.3	0.5	2.8	12.4	0.993	Stochastic	Unknown	Natural Power Ltd (2024b)
OWF-056	126	Ossian	28.2	1.1	0.1	1.2	29.4	0.993	Stochastic	N	SSE Renewables (2022)
OWF-057	501	Outer Dowsing	1.2	0.4	0.1	0.5	1.7	0.9929	Stochastic	Y 70% all seasons	GoBe (2025c)
OWF-143	708	North Falls	0.6	0.9	0.6	1.5	2.1	0.993	Stochastic	Y 70% all seasons	Royal HaskoningDHV (2023b)
Tier 2											
OWF-085	391	Dogger Bank D	2.0	3.5	0.5	4.0	6.0	0.9929	Stochastic	Y 70% all seasons	APEM (2025b)

'Other development' ID	Distance to OAA (km)	Project	Breeding season	Post-breeding Migration	Return migration	Total non-breeding	Annual total	Original avoidance rate*	Original modelling approach	Macro-avoidance previously applied?**	Reference Source
MarramWind			39.8	-	-	3.2	43.0		Stochastic	Y - 70% non-breeding only	-
Total			788.9 / 831.0	178.8	58.1	240.1	1,071.2		-	-	-

Table note: Developments presented in green are those with breeding season connectivity to the Project based on a MMFR plus one SD of 508.4km (NatureScot, 2023a). Non-highlighted developments in the breeding season are presented to provide context for how the annual total was derived. *Where an old avoidance rate has been used, collision mortalities have been adjusted to reflect updated NatureScot guidance (0.9923 for deterministic, 0.9929 for stochastic). ** For Scottish developments, 70% macro-avoidance has been applied in the non-breeding season (where not already applied), and across all seasons for English developments in line with Natural England guidance.

5. Impact O2 And O3: Combined Collision Risk And Distributional Response Impacts (Option Agreement Area)

5.1.1.1 For a limited number of bird species there may be a need to consider combining several impacts, such as collision risk and distributional responses, together as well as cumulatively from all appropriate other developments to understand the potential wider effect on such species. For this CEA both kittiwake and gannet are considered for the impacts from both collision risk and distributional responses. This section considers the combined cumulative impact from these two pathways.

5.1.1.2 Combining both effect pathways can lead to overestimation because individuals displaced from a project OAA would not simultaneously be at risk of collision. If macro-avoidance is not included in the collision risk assessment, mortalities may be double-counted when the two assessments are combined. For gannet, a macro-avoidance rate has been applied to the non-breeding season only as per NatureScot (2025) guidance. Consequently, predicted breeding season mortalities for gannet are considered to be an overestimate, and therefore highly precautionary.

5.1.1.3 For kittiwake, the avoidance rate used in CRM (drawn from Ozsanlav-Harris *et al*., 2023), unlike gannet, already incorporates macro-avoidance and as such applying further macro-avoidance to the CRM analysis is not recommended by NatureScot (2025). However, as outlined in Section 12.10.2 of **Volume 1, Chapter 12: Offshore and Intertidal Ornithology**, kittiwake are not considered vulnerable to distributional responses based on available evidence, and so the combined impact of collision risk and distributional responses is still considered an over-estimate based on available evidence.

5.2 Kittiwake

5.2.1 Sensitivity or value of receptor

5.2.1.1 As concluded within **Volume 1, Chapter 12: Offshore and Intertidal Ornithology**, the overall sensitivity of the receptor to distributional response effects is considered to be **medium**.

5.2.2 Magnitude of impact

5.2.2.1 The level of predicted cumulative impact in relation to combined collision risk and distributional response impacts during the operation and maintenance stage is provided in **Table 5.1**.

Table 5.1 Summary of seasonal cumulative combined collision risk and distributional response impacts predicted for kittiwake during the operation and maintenance stage

Season	Regional baseline populations (individuals)	Predicted Impact	
		30% Disp; 1% to 3% Mort plus CRM	Reduction in survival rate (%)
Breeding	283,312	1,078.5 to 1,386.8	0.38 to 0.49
Non-breeding	829,937	2,196.9 to 2,458.8	0.27 to 0.30
Annual	829,937	4,313.4 to 4,918.8	0.52 to 0.59

5.2.2.2 As concluded within **Table 5.1**, the level of impact predicted annually or seasonally exceeds the 0.02% change in the regional baseline population survival rate. In accordance with NatureScot Guidance Note 11 (NatureScot, 2023c), further consideration of the potential impact is required in the form of PVA.

5.2.2.3 PVA outputs are presented in **Table 5.2** below, including the CGR and CPS values. PVA modelling was undertaken using density independent modelling, and therefore the CGR value is considered a more reliable metric than CPS for interpreting impacts (Cook and Robinson, 2016). For full details on PVA methodology, see **Appendix 12.4**.

Table 5.2 PVA results for annual cumulative distributional response impacts predicted for kittiwake, following the Guidance approach

Scenario modelled	Increase in mortality	Density independent counterfactual metric (35yrs)		Reduction in annual growth rate (%)	Reduction in final population size after 35yrs (%)
		Median CGR	Median CPS		
Annual cumulative total, 30% Disp; 1% Mort plus CRM	4,313.35	0.994	0.730	0.61	26.97
Annual cumulative total, 30% Disp; 3% Mort plus CRM	4,918.79	0.993	0.699	0.70	30.13

5.2.2.4 The Scottish breeding kittiwake population has declined by 57% between the Seabirds 2000 Census, and Seabirds Count (2015 to 2021) (Burnell *et al.,* 2023). This trend is consistent across Scottish SPAs, with 27 out of 29 Scottish SPAs declining over this period. Declines during the 2000s are attributed to decreases in availability of primary food resources such as sandeel, specifically through impacts of climate change and sandeel fisheries (Burnell *et al.,* 2023). However, remedial actions have been taken to reduce the risk of reduced prey availability impacting kittiwake via The Sandeel (Prohibition of Fishing) (Scotland) Order 2024. Additionally, HPAI may provide an indirect benefit to kittiwake via a reduction in

predation pressure from great skua and large gull species, when considering the degree of impact on such species (Burnell *et al.,* 2023).

5.2.2.5 A review of pre and post HPAI outbreak colony trends was conducted by Tremlett *et al*. (2024) for various seabird species. Kittiwake AONs were shown to have increased by 8% when comparing pre-HPAI records to counts conducted in 2023 post the outbreak. It must be noted that colony specific trends do differ in terms of colony count change. A further, less significant outbreak of HPAI occurred at seabird colonies in 2023, although the virus was not noted to affect kittiwakes until June, July and August, after colony counts were completed, suggesting impacts may be worse that reported in Tremlett *et al.* (2024).

5.2.2.6 As previously outlined in Section 12.10.4 of **Volume 1, Chapter 12: Offshore and Intertidal Ornithology**, there are significant uncertainties in the input parameters recommended for CRM which have the potential to result in highly conservative assumptions. This is then further compounded when developments are assessed cumulatively, introducing multiple layers of conservatism into the predicted impact. Further, there is limited evidence to support the conclusion that kittiwake are sensitive to distributional response effects as detailed within Section 12.10.3 of **Volume 1, Chapter 12: Offshore and Intertidal Ornithology**.

5.2.2.7 When considering the predicted impact and the ongoing declines in the Scottish kittiwake population, it cannot be ruled out that up to a 0.70% reduction in growth rate has the potential to impact the regional population. Consequently, the magnitude is assessed as **medium**.

5.2.3 Significance of residual effect

5.2.3.1 With a predicted sensitivity of **medium** and a magnitude of impact of **medium**, the effect significance is therefore, up to **Moderate Adverse** (**Significant**) in EIA terms.

5.2.3.2 As the effect significance has been concluded as significant in EIA terms, the Project has considered the feasibility of mitigation to reduce the residual effect significance. However, the reason for the significant effect conclusion is due to the pre-existing scale of predicted impact, rather than due to the Project 's contribution to the CEA. There are no feasible mitigation measures that could sufficiently reduce the CEA adverse effects to a level that is not significant in EIA terms or avoid a potential AEoSI (please refer to **Derogation Case**). For context, the Project alone predicted effect was concluded as minor adverse significance at most, which is not significant.

5.2.3.3 To note, the Project has provided potential options for compensation with respect to kittiwake, as presented within the **Derogation Case**. Although such compensation options are focussed on offsetting the predicted impacts apportioned to selected qualifying features of designated sites, such potential measures if implemented are expected to significantly offset the Project’s contribution to regional scale impacts.

5.3 Gannet

5.3.1 Sensitivity or value of receptor

5.3.1.1 As concluded within **Volume 1, Chapter 12: Offshore and Intertidal Ornithology**, the overall sensitivity of the receptor to distributional response effects and collision risk is considered to be **medium**.

5.3.2 Magnitude of impact

5.3.2.1 The level of predicted cumulative impact in relation to combined collision risk and distributional response impacts during the operation and maintenance stage is provided in **Table 3.1** and **Table 4.9**.

5.3.2.2 The impact predictions presented in **Table 5.3** are based on the Developers preferred approach, whilst impact predictions in **Table 5.4** are based on displacement and mortality rates recommended within NatureScot's Guidance Note 8 (NatureScot, 2023b) forming the Guidance approach.

Table 5.3 Summary of seasonal cumulative combined collision risk and distributional response impacts predicted for gannet during the operation and maintenance stage, using the Developers approach

Season	Regional baseline populations (individuals)	Predicted Impact	
		Estimated number of gannet subject to mortality (individuals per annum)	Reduction in survival rate (%)
Breeding	404,306	970.4 to 1,031.0	0.240 to 0.255
Non-breeding	456,298	469.0 to 545.3	0.103 to 0.120
Annual	456,298	1,509.9 to 1,656.2	0.331 to 0.363

Table 5.4 Summary of seasonal cumulative combined collision risk and distributional response impacts predicted for gannet during the operation and maintenance stage, using the Guidance approach

Season	Regional baseline populations (individuals)	Predicted Impact	
		Estimated number of gannet subject to mortality (individuals per annum)	Reduction in survival rate (%)
Breeding	404,306	1000.7 to 1424.4	0.248 to 0.352
Non-breeding	456,298	507.2 to 1,041.3	0.111 to 0.228
Annual	456,298	1,583.0 to 2,606.8	0.347 to 0.571

5.3.2.3 As concluded within **Table 5.3** and **Table 5.4**, the level of impact predicted annually or seasonally exceeds the 0.02% change in the regional baseline population survival rate when considering the Guidance approach. In accordance with NatureScot Guidance Note 11 (NatureScot, 2023c), further consideration of the potential impact is required in the form of PVA.

5.3.2.4 PVA outputs are presented in **Table 5.5** below, including the CGR and CPS values. PVA modelling was undertaken using density independent modelling, and therefore the CGR value is considered a more reliable metric than CPS for interpreting impacts (Cook and Robinson, 2016). For full details on PVA methodology, see **Appendix 12.**.

Table 5.5 PVA results for annual cumulative distributional response impacts predicted for gannet

Scenario modelled	Increase in mortality	Density independent counterfactual metric (35yrs)		Reduction in annual growth rate (%)	Reduction in final population size after 35yrs (%)
		Median CGR	Median CPS		
Annual cumulative total, 60% Displacement and 1% Mortality plus CRM (Developers approach)	1,509.9	0.996	0.819	0.39	18.13
Annual cumulative total, 80% Displacement and 1% Mortality plus CRM	1,656.2	0.996	0.803	0.43	19.71

Scenario modelled	Increase in mortality	Density independent counterfactual metric (35yrs)		Reduction in annual growth rate (%)	Reduction in final population size after 35yrs (%)
		Median CGR	Median CPS		
(Developers approach)					
Annual cumulative total, 70% Displacement and 1% Mortality plus CRM (Guidance approach)	1,583.0	0.996	0.811	0.41	18.93
Annual cumulative total, 70% Displacement and 3% Mortality plus CRM (Guidance approach)	2,606.8	0.993	0.708	0.68	29.25

5.3.2.5 The Scottish breeding gannet population has increased by 40% between the Seabirds 2000 Census, and Seabirds Count (2015 to 2021), with all eight Scottish SPAs for gannet showing an increase over this period (Burnell *et al*., 2023). The largest gannet colony on the east coast of Scotland, Forth Islands SPA, increased by 57% over this period, though it is acknowledged that this population has more recently declined as a result of HPAI.

5.3.2.6 Gannets in the UK were first recorded as having HPAI in May 2022 (DEFRA, 2022) with cases of the virus in this species increasing in number and location since. A review of pre and post HPAI outbreak colony trends was conducted by Tremlett *et al*. (2024) for various seabird species. Gannet AONs and apparently occupied sites (AOS) were shown to have decreased by 25% when comparing pre-HPAI records to counts conducted in 2023 post the outbreak. It must be noted that colony specific trends do differ in terms of colony count change.

5.3.2.7 The timeframe for recovery for the UK population from effects of HPAI is unknown. Though based on previous colony trends over the past 50 years (Burnell *et al*., 2023), it can be expected that the population will have significantly recovered by the time the Project becomes operational and begins contributing to any cumulative effect in 2037.

5.3.2.8 The predicted impact of up to a 0.68% reduction in annual growth rate is unlikely to have any significant impact on ongoing gannet population trends, especially when considering the lower Guidance approach, and upper Developer approach values both represent an impact that is <0.5% reduction in annual growth rate, and both of these are considered sufficiently precautionary. As outlined in **Section 4.2** there are several layers of precaution within the CRM assessment, both for the Project alone and for all developments included in the cumulative assessment, and therefore in reality this predicted impact will be substantially lower. Furthermore, this assessment only considers macro-avoidance in the non-breeding season for Scottish developments, which is highly conservative and

effectively double counts mortality in the breeding season. If macro-avoidance were applied to both the Project and other Scottish developments in the breeding season, this would substantially reduce the predicted impacts further.

5.3.2.9 Considering this, and the consistent growth in gannet numbers over the last 20+ years, the predicted reduction in growth rate is sufficiently small that it will not significantly hinder any population recovery in the long term population growth rate. However, there is a small degree of uncertainty with respect to the long-term impact of HPAI. The magnitude of impact is therefore assessed as **low** to **medium.**

5.3.3 Significance of residual effect

5.3.3.1 With a predicted sensitivity of **medium** and a magnitude of impact of up to **medium**, the effect significance is therefore, **Moderate Adverse** (**Significant**) in EIA terms.

5.3.3.2 As the effect significance has been concluded as significant in EIA terms, the Project has considered the feasibility of mitigation to reduce the residual effect significance. However, the reason for the significant effect conclusion is due to the pre-existing scale of predicted impact, rather than due to the Project 's contribution to the CEA. There are no feasible mitigation measures that could sufficiently reduce the CEA adverse effects to a level that is not significant in EIA terms or avoid a potential AEoSI (please refer to **Derogation Case**). For context, the Project alone predicted effect was concluded as minor adverse significance at most, which is not significant.

5.3.3.3 To note, the Project has provided potential options for compensation with respect to gannet, as presented within the **Derogation Case**. Although such compensation options are focussed on offsetting the predicted impacts apportioned to selected qualifying features of designated sites, such potential measures if implemented are expected to significantly offset the Project’s contribution to regional scale impacts.

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7. Glossary And Abbreviations

7.1 Abbreviations

Acronym	Definition
AON	Apparently Occupied Nest
AOS	Apparently Occupied Site
BDMPS	Biologically Defined Minimum Population Scale
CEA	Cumulative effects assessment
CEF	Cumulative Effects Framework
CGR	Counterfactual of Growth-Rate
CPS	Counterfactual of Population Size
CRM	Collision Risk Modelling
EIA	Environmental Impact Assessment
HDD	Horizontal directional drilling
HPAI	Highly Pathogenic Avian Influenza
HRA	Habitats Regulations Appraisal
MHWS	Mean High Water Springs
MLWS	Mean Low Water Springs
MMFR	Mean Maximum Foraging Range
O&M	Operation and Maintenance
OAA	Option Agreement Area
OOWFL	Ossian Offshore Wind Farm Limited
PINS	Planning Inspectorate
PVA	Population Viability Analysis
SD	Standard Deviation
SPA	Special Protection Area
SPR	ScottishPower Renewables
WWT	Wildfowl and Wetlands Trust
ZOI	Zone of Influence

7.2 Glossary of terms

Term	Definition
Cumulative Effects	The effect of the Offshore Project taken together with similar effects from a number of different projects, on the same single receptor / resource. Cumulative impacts are those that result from changes caused by other past, present or reasonably foreseeable actions together with the Offshore Project.

MarramWind