NORTH FALLS

Offshore Wind Farm

Updated Information for Offshore Ornithology Cumulative Effects Assessment

Document Reference No: 9.29
Volume: 9
Date: March 2025
Revision: 0

Project Reference: EN010119

Project	North Falls Offshore Wind Farm
Document Title	Updated Information for Offshore Ornithology Cumulative Effects Assessment
Document Reference	9.29
Revision	0
Supplier Reference No	PB9244-RHD-ZZ-OF-RP-OF-0371

Revision	Date	Status/Reason for Issue	Originator	Checked	Approved
0	March 2025	Deadline 3	RHDHV	NFOW	NFOW

Contents

Tables

Glossary of Acronyms

AR	Avoidance Rate (Collision Risk Modelling)
BDMPS	Biologically Defined Minimum Population Scales
CEA	Cumulative Effects Assessment
CRM	Collision Risk Modelling
DCO	Development Consent Order
DEP	Dudgeon Extension Project
EIA	Environmental Impact Assessment
EPP	Evidence Plan Process
ES	Environmental Statement
HRA	Habitats Regulations Assessment
MA	Macro-avoidance
OWF	Offshore Wind Farm
RIAA	Report to Inform Appropriate Assessment
SeaMAST	The Seabird Mapping and Sensitivity Tool
SEP	Sheringham Shoal Extension Project
SNCB	Statutory Nature Conservation Body
SPA	Special Protection Area
WTG	Wind Turbine Generator

Glossary of Terminology

Array area	The offshore wind farm area, within which the wind turbine generators, array cables, platform interconnector cable, offshore substation platform(s) and/or offshore converter platform will be located.
Array cables	Cables which link the wind turbine generators with each other, the offshore substation platform(s) and/or the offshore converter platform.
Landfall	The location where the offshore export cables come ashore at Kirby Brook.
Migration free breeding season	The breeding season for migratory seabird species is defined as a wider breeding season and a narrower window known as the migration free breeding season. In a given species, the timing of breeding will vary depending on the location of the breeding area; with the start of breeding usually later in more northerly locations. Thus, while birds at some colonies are beginning to nest, others may still be migrating to breeding sites. A core or migration free breeding season is defined as the period when all or the majority of breeding adults of a given species are present at breeding colonies.
Offshore convertor Platform	Should an offshore connection to a third party HVDC cable be selected, an offshore converter platform would be required. This is a fixed structure located within the array area, containing HVAC and HVDC electrical equipment to aggregate the power from the wind turbine generators, increase the voltage to a more suitable level for export and convert the HVAC power generated by the wind turbine generators into HVDC power for export to shore via a third party HVDC cable.
Offshore export cables	The cables which bring electricity from the array area to the landfall.
The Applicant	North Falls Offshore Wind Farm Limited (NFOW).
The Project or 'North Falls'	North Falls Offshore Wind Farm, including all onshore and offshore infrastructure.
Wind turbine generator	Power generating device that is driven by the kinetic energy of the wind

1 Introduction

1.1 Background

1. This document provides an update to the information provided in Appendix 13.3 Supplementary Information for the Offshore Ornithology Cumulative Effects Assessment, Document Reference 3.3.14 Revision 0 [**APP-104**] and the cumulative numbers presented in the offshore ornithology ES Chapter 13 Document Reference 3.1.15, Revision 0 [**APP-027**].
2. Updates are provided as a cut-off date of the end of March 2024 was used for the inclusion of information on displacement and collision risk for other OWFs in the offshore ornithology assessment for North Falls. This was due to the time required to review and finalise the assessment prior to DCO submission. Thus, the offshore ornithology Cumulative Effect Assessment (CEA) in ES Chapter 13 [**APP-027**] did not include the most recent information available for a number of projects, including Five Estuaries, Dogger Bank South, Outer Dowsing and West of Orkney Offshore Wind Farms (OWFs).
3. Updates have been made for all species except red-throated diver, where the cumulative assessment focused on estimates of predicted abundance derived from SeaMAST data, for which no updates are necessary.
4. Significant changes to the text and updates to the numbers and references in the tables in this document are highlighted green. Numbers corrected from errors identified in the original Appendix 13.3 Rev 0 [**APP-104**] are highlighted yellow.
5. The updates also respond to the following:
    - a request from Natural England in their Relevant Representation for updates to the cumulative assessment (see Applicant's Response to Relevant Representations from Natural England, Document reference 9.1, Revision 0 [**REP1-044**], NE-238, F13].
    - Q1.2.1 part (iv) of the Examining Authority's Written Questions and requests for information (see Applicant's Response to Written Questions (ExQ1), Document Reference 9.19, Revision 0 [**REP2-020**]). The Examining Authority asked the Applicant to review whether updates to the cumulative numbers would result in a change to any cumulative conclusion of the ES, and this is considered in Section 4 below.

1.2 Approach

6. There is considerable complexity associated with the evolution of OWF project envelopes and changes to collision risk and displacement estimates over time (for example as a project progresses through Development Consent Order (DCO) Examination). In general, this assessment uses the consented designs for OWFs unless otherwise stated, and the latest available estimates for OWFs which are not yet consented. A number of OWFs have been built out with designs that have lower predicted collision risk than the worst case at consent. Thus, using the consented parameters, as recommended by Natural England on the basis that this is a legally secured design, results in a substantial degree of precaution being

included in the predicted impacts of collision risk. It has been estimated that the use of consented rather than as-built OWF parameters may lead to the overestimation of collision rates by up to 40% (MacArthur Green, 2017; The Crown Estate and Womble Bond Dickinson, 2021). Notes are included in the species tables below to identify OWFs where there were considerable changes in the as-built layout compared with the worst-case consented design. For Scottish OWFs the values for the as-built designs, if different from consented designs (and if available), are used, as these are accepted by Marine Scotland and NatureScot.

7. For each species scoped in for the CEA, tabulated estimates of collision risk mortality and the number of birds at risk of displacement are provided in Section 3 and Section 4 respectively. These numbers are provided as seasonal and annual totals and include all age classes of birds. An explanation of the biologically relevant seasons used for each offshore ornithology receptor is provided in ES Chapter 13 Offshore Ornithology (Document Reference: 3.1.15 [**APP-027**]).

8. The key source of information for the majority of the OWFs included in this CEA was the assessment carried out for the Sheringham Shoal and Dudgeon Extension Projects (SEP/DEP). For collision risk the latest values are taken from The Deadline 3 Collision Risk Modelling (CRM) updates (Royal HaskoningDHV, 2023a); for displacement the values are based on Appendix 11.2 of the Environmental Statement (Royal HaskoningDHV 2022). The SEP/DEP assessment was in turn principally informed by the post-Examination update of the cumulative and in-combination collision risk and displacement assessment produced for the East Anglia ONE North and East Anglia TWO OWFs (MacArthur Green and Royal HaskoningDHV, 2021).

9. Sources of data for all OWFs included in the CEA are referenced in the tables below. The cut off for inclusion of other OWFs into this update was 11th March 2025.

10. OWFs included in the tables below are assigned to Tiers as set out in Table 1.1 of ES Appendix 13.3, Document Reference 3.3.14, Revision 0 [**APP-104**].

2 Cumulative collision risk

2.1 Gannet

11. The area considered for the CEA is the UK North Sea and Channel BDMPS (Furness, 2015). Predicted seasonal and annual numbers of gannet collisions for OWFs included in the cumulative assessment are given in Table 2-1. This table includes predictions for consented designs, where an OWF has been consented, and the latest publicly available predictions for OWFs which have not been consented. This table updates Table 2.1 in Appendix 13.3, Document Reference 3.3.14, Revision 0 [**APP-104**].

12. Since the DCO submission for North Falls, joint SNCB guidance on collision risk modelling (CRM) for OWFs has been published (SNCBs, 2024). The CRM carried out for the DCO was based on interim advice from Natural England provided during the Evidence Plan Process (EPP), as described in Appendix 13.3

[**APP-104**], paragraph 13 (see also ES Chapter 13, Document Reference 3.1.15 [**APP-027**], section 13.6.2.2 and Appendix 13.2 Document Reference 3.3.13 [**APP-103**], Section 3.1 for more detail on the North Falls CRM). Under SNCBs (2024), a small change has been made to the recommended avoidance rate for gannet, from the value used for the North Falls DCO submission, from 0.9928 (±0.0003) to 0.9929 (±0.0003) for the stochastic (MacGregor et al., 2018; Caneco et al., 2022) model, and from 0.9924 to 0.9923 for the basic Band (2012) model. In addition, there is clear evidence that gannets display behavioural responses beyond the perimeter of an OWF, and most individuals avoid entering the turbine array ('macro-avoidance') (Pavat et al., 2023). Natural England advice to North Falls during the EPP was that densities from baseline surveys within OWF array areas should be reduced by a mean of 70% (or a range of 65-85%), in all seasons, to account for this macro-avoidance ([**APP-104**], paragraph 13). This advice was reiterated by Natural England in their response to the Examining Authority's written questions [**REP2-054**].

13. The collision risk predictions in Table 2-1 are based on the parameters as consented or as most recently published, and details of the CRM model, flight height option and avoidance rate which was used are included. In relation to flight height, Option 1 indicates that flight height data from baseline surveys for a given OWF was used for modelling (usually where baseline surveys were carried out from boats), and Option 2 that the industry standard dataset for flight height (Johnston et al., 2014a,b) was used (usually where digital aerial surveys were carried out).

14. To reflect the most recent SNCB (2024) advice and increase parity between collision risk estimates from OWFs included in the CEA, collision predictions in Table 2-2 have been adjusted for 70% macro-avoidance and updated avoidance rates. Where not included in the original CRM prediction, adjustments for macro-avoidance were applied first, multiplying the consented/latest predicted collisions (Table 2-1) by (1-0.7). Avoidance rate adjustments were applied subsequently using the formula Ca = (Co/(1-Ao) x (1-Aa)), where Ca is the adjusted collision prediction, Co the prediction before adjustment for avoidance rate (incorporating the macro-avoidance adjustment if applied), Ao the original avoidance rate and Aa the most recently advised avoidance rate. Where the original collision risk was estimated using the Band (2012) or an earlier Band model, the avoidance rate was adjusted to 0.9923; where the original collision risk was estimated using the stochastic CRM, the avoidance rate was adjusted to 0.9929. In a few cases, the avoidance rate for the consented design of an OWF was unknown (Table 2-1), in which case adjustments for macro-avoidance were applied, but not for avoidance rate.

Table 2-1 Predicted gannet collisions at OWFs included in the cumulative assessment (original consented or most recent publicly available value). This table updates Table 2.1 in Appendix 13.3, Document Reference 3.3.14, Revision 0 [APP-104].

Tier	OWF	Predicted gannet collisions				Original CRM model parameters			Source and notes
		Breeding	Autumn	Spring	Annual	Iteration	Option[1]	Avoidance Rate	
1	Beatrice	37.4	48.8	9.5	95.7	Band *et al*. (2007)	1	0.989	Royal HaskoningDHV (2023a, 2021). Calculated for 277 turbines; 84 were installed.
1	Beatrice (demonstrator)	0.6	0.9	0.7	2.2	Unknown	Unknown	Unknown	Royal HaskoningDHV (2023a, 2021).
1	Blyth Demonstration	3.5	2.1	2.8	8.4	Band *et al*. (2007)	1	0.989	Royal HaskoningDHV (2023a, 2021).
1	Dudgeon	22.3	38.9	19.1	80.3	Band (2000)	1	0.989	Royal HaskoningDHV (2023a, 2021). Calculated for 168 x 3MW turbines; 67 x 6MW were installed.
1	East Anglia ONE	3.4	131.0	6.3	140.7	Band (2012)	1	0.989	Royal HaskoningDHV (2023a, 2021). Consented with 240 turbines; 102 x 7MW were installed
1	EOWDC (Aberdeen)	4.2	5.1	0.1	9.4	Band (2012)	2	0.989	Royal HaskoningDHV (2023a, 2021).
1	Galloper	18.1	30.9	12.6	61.6	Band *et al*. (2007)	1	0.989	Royal HaskoningDHV (2023a, 2021). Calculated for 140 turbines; 56 x 6.3MW were installed.
1	Greater Gabbard	14.0	8.8	4.8	27.6	Band (2000)	1	0.989	Royal HaskoningDHV (2023a, 2021).
1	Gunfleet Sands	-	-	-	-	-	-	-	Royal HaskoningDHV (2023a), GE Wind Energy (2002), RPS Group (2007).
1	Hornsea Project One	11.5	32.0	22.5	66.0	Band (2012)	2	0.989	Royal HaskoningDHV (2023a, 2021).
1	Hornsea Project Two	7.0	14.0	6.0	27.0	Band (2012)	2	0.989	Royal HaskoningDHV (2023a, 2021).
1	Humber Gateway	1.9	1.1	1.5	4.5	Unknown	1	0.989	Royal HaskoningDHV (2023a, 2021).
1	Hywind	5.6	0.8	0.8	7.2	Band (2012)	1	0.989	Royal HaskoningDHV (2023a, 2021).

Tier	OWF	Predicted gannet collisions				Original CRM model parameters			Source and notes
		Breeding	Autumn	Spring	Annual	Iteration	Option[1]	Avoidance Rate	
1	Kentish Flats	1.4	0.8	1.1	3.3	Band (2012)	1	0.989	Royal HaskoningDHV (2023a). Unclear if this may also include collision risk for the extension project. MacArthur Green and RHDHV (2019) database attributes these values to Kentish Flats Extension and gives no collision risk value for Kentish Flats. Royal HaskoningDHV (2021) attributes values to Kentish Flats and Extension.
1	Kentish Flats Extension	-	-	-	-	-	-	-	Royal HaskoningDHV (2023a). May be included in figures for Kentish Flats, see above.
1	Kincardine	3.0	0.0	0.0	3.0	Band (2012)	1	0.989	Royal HaskoningDHV (2023a, 2021).
1	Lincs	2.1	1.3	1.7	5.1	Band (2000)	1	0.989	Royal HaskoningDHV (2023a, 2021).
1	London Array	2.3	1.4	1.8	5.5	Band (2000)	1	0.989	Royal HaskoningDHV (2023a, 2021).
1	Lynn and Inner Dowsing	0.2	0.1	0.2	0.5	Unknown			Royal HaskoningDHV (2023a, 2021).
1	Methil	6.0	0.0	0.0	6.0	Unknown			Royal HaskoningDHV (2023a, 2021).
1	Moray East	80.6	35.4	8.9	124.9	Band (2012)	1	0.989	Royal HaskoningDHV (2023a, 2021).
1	Race Bank	33.7	11.7	4.1	49.5	Band (2000)	1	0.989	Royal HaskoningDHV (2023a, 2021). Calculated for 206 turbines; 91 x 6MW installed.
1	Rampion	36.2	63.5	2.1	101.8	Band (2012)	1	0.989	Royal HaskoningDHV (2023a, 2021). Calculated for 175 x 4MW turbines; 116 x 3.4MW installed. 2011 draft of Band (2012) was used.
1	Scroby Sands	-	-	-	-	-			Royal HaskoningDHV (2023a). No CRM in original ES (PowerGen Renewables 2001).
1	Sheringham Shoal	14.1	3.5	0.0	17.6	Band (2000)	1	0.989	Royal HaskoningDHV (2023a, 2021). Calculated for 108 x 3MW turbines; 88 x 3.6MW installed.

Tier	OWF	Predicted gannet collisions				Original CRM model parameters			Source and notes
		Breeding	Autumn	Spring	Annual	Iteration	Option[1]	Avoidance Rate	
1	Teesside	4.9	1.7	0.0	6.7	Band (2000)	1	0.989	Royal HaskoningDHV (2023a, 2021).
1	Thanet	1.1	0.0	0.0	1.1	Band (2000)	1	0.989	Royal HaskoningDHV (2023a, 2021).
1	Triton Knoll	26.8	64.1	30.1	121.0	Band (2012)	1	0.989	Royal HaskoningDHV (2023a, 2021). Consented with 288 turbines, 90 installed.
1	Westermost Rough	0.2	0.1	0.2	0.5	Band *et al*. (2007)	1	0.989	Royal HaskoningDHV (2021).
2	Dogger Bank A and B (Formerly Creyke Beck A and B)	81.1	83.5	54.4	219.0	Band 2012	1	0.989	Royal HaskoningDHV (2023a, 2021).
2	Dogger Bank C and Sofia (Formerly Teeside A and B)	14.8	10.1	10.8	35.7	Band (2012)	2	0.989	Royal HaskoningDHV (2023a).
2	Moray West	10.0	2.0	1.0	13.0	Band (2012)	2	0.989	Royal HaskoningDHV (2023a, 2021).
2	Neart na Gaoithe	88.7	7.0	6.9	102.6	Band (2012)	2	0.989	EDF Renewables (2019).
2	Seagreen Alpha and Bravo	295.8	14.2	7.1	317.0	Band (2012)	2	0.989	Seagreen (2022). This gives only an annual total, seasonal totals derived by apportioning monthly collisions from monthly predictions in Seagreen (2020).
3	East Anglia ONE North	12.4	11.0	1.1	24.5	Band (2012)	2	0.989	Royal HaskoningDHV (2023a, 2021).
3	East Anglia THREE	6.1	33.3	9.6	49.0	Band (2012)	1	0.989	Royal HaskoningDHV (2023a). Consented with 172 turbines, amended to 121 in 2020 (Non-Material Change; MacArthur Green and Royal HaskoningDHV 2020).
3	East Anglia TWO	12.5	23.1	4.0	39.6	Band (2012)	2	0.989	Royal HaskoningDHV (2023a).

Tier	OWF	Predicted gannet collisions				Original CRM model parameters			Source and notes
		Breeding	Autumn	Spring	Annual	Iteration	Option[1]	Avoidance Rate	
3	Green Volt	14.5	0.6	2.4	17.5	McGregor *et al*. (2018)	2	0.993	APEM (2023a), SNCB approach.
3	Hornsea Project Three	10.0	5.0	4.0	19.0	Band (2012)	1	0.989	Royal HaskoningDHV (2023a).
3	Hornsea Project Four	15.8	5.2	1.3	22.3	Band (2012)	2	0.989	Royal HaskoningDHV (2023a), APEM and GoBe (2022) Natural England approach.
3	Inch Cape	108	5	4	117	Band (2012)	2	0.989	ICOL (2018).
3	Norfolk Boreas	14.1	12.7	3.9	30.7	Band (2012)	2	0.989	Royal HaskoningDHV (2023a, 2021).
3	Norfolk Vanguard	8.2	18.6	5.3	32.1	Band (2012)	2	0.989	Royal HaskoningDHV (2023a, 2021).
3	Sheringham and Dudgeon Extension Projects	0.4	0.6	0.0	1.1	Band (2012)	2 + 70% MA	0.992	Royal HaskoningDHV (2023a).
TOTALS (tiers 1-3)		**1,034**	**730**	**253**	**2,017**				
Previous totals (tiers 1-3) from Appendix 13.3 [APP-104]		**1,035**	**730**	**252**	**2,017**				
4	Berwick Bank	138.4	12.8	2.3	153.5	Band (2012)	2	0.989	HiDef (2022), Pelagica and Cork Ecology (2022), Developer Approach
4	Dogger Bank South	8.3	3.7	0.2	12.2	Caneco *et al.* (2022)	2 + 70%	0.9979	MacArthur Green (2024a). Worst-case scenario (200 WTGs).
4	Five Estuaries	2.0	2.3	0.2	4.5	Caneco *et al.* (2022)	2 + 70% MA	0.993	MacArthur Green (2024b)
4	Outer Dowsing	1.2	0.4	0.1	1.7	Caneco *et al.* (2022)	2 + 70% MA	0.9929	GoBe (2024a)

Tier	OWF	Predicted gannet collisions				Original CRM model parameters			Source and notes
		Breeding	Autumn	Spring	Annual	Iteration	Option[1]	Avoidance Rate	
4	Rampion 2	2.9	1.4	0.6	4.9	McGregor *et al*. (2018)	2 + 70% MA	0.993	GoBe (2024b)
4	West of Orkney	35.3	7.7	2.0	45.1	Caneco *et al.* (2022)	2	0.9928	MacArthur Green (2024c)
	North Falls	0.6	0.9	0.6	2.1	McGregor *et al*. (2018)	2 + 70% MA	0.9928	Appendix 13.2 [APP-103], ES Chapter 13 [APP-027], Table 13.37
TOTALS (all tiers)		**1,223**	**759**	**259**	**2,241**				
Previous totals (all tiers) from Appendix 13.3 [APP-104]		**1,229**	**759**	**257**	**2,245**				
- = CRM estimate understood not to be provided in the ES for a given OWF (based on Royal HaskoningDHV (2023). 1. MA= macro-avoidance.									

Table 2-2 Predicted gannet collisions at OWFs included in the cumulative assessment: adjusted for macro-avoidance (MA) and avoidance rate (AR). 1. This table updates Table 2-2 in Appendix 13.3, Ref 3.3.14 [APP-104].

Tier	OWF	Predicted gannet collisions with 70% MA				Predicted collisions, 70% MA and adjusted AR			
		Breeding	Autumn	Spring	Annual	Breeding	Autumn	Spring	Annual
1	Beatrice	11.2	14.6	2.9	28.7	7.9	10.2	2.0	20.1
1	Beatrice (demonstrator)	0.2	0.3	0.2	0.7	0.2	0.3	0.2	0.7
1	Blyth Demonstration	1.1	0.6	0.8	2.5	0.7	0.4	0.6	1.8
1	Dudgeon	6.7	11.7	5.7	24.1	4.7	8.2	4.0	16.9
1	East Anglia ONE	1.0	39.3	1.9	42.2	0.7	27.5	1.3	29.5
1	EOWDC (Aberdeen)	1.3	1.5	0.0	2.8	0.9	1.1	0.0	2.0
1	Galloper	5.4	9.3	3.8	18.5	3.8	6.5	2.6	12.9
1	Greater Gabbard	4.2	2.6	1.4	8.3	2.9	1.8	1.0	5.8
1	Gunfleet Sands	n/a							
1	Hornsea Project One	3.5	9.6	6.8	19.8	2.4	6.7	4.7	13.9
1	Hornsea Project Two	2.1	4.2	1.8	8.1	1.5	2.9	1.3	5.7
1	Humber Gateway	0.6	0.3	0.5	1.4	0.4	0.2	0.3	0.9
1	Hywind	1.7	0.2	0.2	2.2	1.2	0.2	0.2	1.5
1	Kentish Flats	0.4	0.2	0.3	1.0	0.3	0.2	0.2	0.7
1	Kentish Flats Extension	n/a							
1	Kincardine	0.9	0.0	0.0	0.9	0.6	0.0	0.0	0.6
1	Lincs	0.6	0.4	0.5	1.5	0.4	0.3	0.4	1.1
1	London Array	0.7	0.4	0.5	1.7	0.5	0.3	0.4	1.2
1	Lynn and Inner Dowsing	0.1	0.0	0.1	0.2	0.1	0.0	0.1	0.2
1	Methil	1.8	0.0	0.0	1.8	1.8	0.0	0.0	1.8
1	Moray Firth East	24.2	10.6	2.7	37.5	16.9	7.4	1.9	26.2

Tier	OWF	Predicted gannet collisions with 70% MA				Predicted collisions, 70% MA and adjusted AR			
		Breeding	Autumn	Spring	Annual	Breeding	Autumn	Spring	Annual
1	Race Bank	10.1	3.5	1.2	14.9	7.1	2.5	0.9	10.4
1	Rampion	10.9	19.1	0.6	30.5	7.6	13.3	0.4	21.4
1	Scroby Sands	n/a							
1	Sheringham Shoal	4.2	1.1	0.0	5.3	3.0	0.7	0.0	3.7
1	Teesside	1.5	0.5	0.0	2.0	1.0	0.4	0.0	1.4
1	Thanet	0.3	0.0	0.0	0.3	0.2	0.0	0.0	0.2
1	Triton Knoll	8.0	19.2	9.0	36.3	5.6	13.5	6.3	25.4
1	Westermost Rough	0.1	0.0	0.1	0.2	0.0	0.0	0.0	0.1
2	Dogger Bank A and B (Formerly Creyke Beck A and B)	24.3	25.1	16.3	65.7	17.0	17.5	11.4	46.0
2	Dogger Bank C and Sofia (Formerly Teeside A and B)	4.4	3.0	3.2	10.7	3.1	2.1	2.3	7.5
2	Moray West	3.0	0.6	0.3	3.9	2.1	0.4	0.2	2.7
2	Neart na Gaoithe	26.6	2.1	2.1	30.8	18.6	1.5	1.4	21.5
2	Seagreen Alpha and Bravo	88.7	4.2	2.1	95.1	62.1	3.0	1.5	66.6
3	East Anglia ONE North	3.7	3.3	0.3	7.4	2.6	2.3	0.2	5.1
3	East Anglia THREE	1.8	10.0	2.9	14.7	1.3	7.0	2.0	10.3
3	East Anglia TWO	3.8	6.9	1.2	11.9	2.6	4.9	0.8	8.3
3	Green Volt	4.4	0.2	0.7	5.3	4.4	0.2	0.7	5.3
3	Hornsea Project Three	3.0	1.5	1.2	5.7	2.1	1.1	0.8	4.0
3	Hornsea Project Four	4.7	1.6	0.4	6.7	3.3	1.1	0.3	4.7
3	Inch Cape	32.4	1.5	1.2	35.1	22.7	1.1	0.8	24.6
3	Norfolk Boreas	4.2	3.8	1.2	9.2	3.0	2.7	0.8	6.4

Tier	OWF	Predicted gannet collisions with 70% MA				Predicted collisions, 70% MA and adjusted AR			
		Breeding	Autumn	Spring	Annual	Breeding	Autumn	Spring	Annual
3	Norfolk Vanguard	2.5	5.6	1.6	9.6	1.7	3.9	1.1	6.7
3	Sheringham and Dudgeon Extension Projects	0.4	0.6	0.0	1.1	0.4	0.6	0.0	1.1
TOTALS (tiers 1-3)		**311**	**219**	**76**	**606**	**220**	**154**	**53**	**427**
Previous totals (tiers 1-3) from Appendix 13.3 [APP-104], ES Chapter 13 [APP-027] Table 15.32 (excluded Green Volt and SEPDEP)		**306**	**219**	**75**	**600**	**212**	**151**	**52**	**415**
4	Berwick Bank	41.5	3.8	0.7	46.1	29.1	2.7	0.5	32.2
4	Dogger Bank South	8.3	3.7	0.2	12.2	8.4	3.8	0.3	12.4
4	Five Estuaries	2.0	2.3	0.2	4.5	2.0	2.3	0.2	4.6
4	Rampion 2	2.9	1.4	0.6	4.9	2.9	1.4	0.6	5.0
4	Outer Dowsing	1.2	0.4	0.1	1.7	1.2	0.4	0.1	1.7
4	West of Orkney	10.6	2.3	0.6	13.5	10.4	2.3	0.6	13.3
	North Falls	0.6	0.9	0.6	2.1	0.6	0.9	0.6	2.1
TOTALS (all tiers)		**378**	**234**	**79**	**691**	**274**	**168**	**56**	**498**
Previous totals from Appendix 13.3 [APP-104]		**381**	**234**	**78**	**693**	**274**	**165**	**55**	**494**

2.2 Kittiwake

15. The area considered for the CEA is the UK North Sea and Channel BDMPS (Furness, 2015). Predicted seasonal and annual numbers of kittiwake collisions for OWFs included in the cumulative assessment are given in Table 2-3. This table includes predictions for consented designs, where an OWF has been consented, and the latest publicly available predictions for OWFs which have not been consented. This table updates Table 2.3 in Appendix 13.3, Document Reference 3.3.14, Revision 0 [**APP-104**].

16. Since the DCO submission for North Falls, joint SNCB guidance on CRM for OWFs has been published (SNCBs, 2024). The CRM carried out for the DCO was based on interim advice from Natural England provided during the EPP, as described in Appendix 13.3 [**APP-104**], paragraph 18 (see also ES Chapter 13, Document Reference 3.1.15 [**APP-027**], section 13.6.2.2 and Appendix 13.2 Document Reference 3.3.13 [**APP-103**], Section 3.1 for more detail on the North Falls CRM). Under SNCBs (2024), a small change has been made to the recommended avoidance rate for kittiwake, from the value used for the North Falls DCO submission; from 0.9928 (±0.0003) to 0.9929 (±0.0003) for the basic stochastic model (MacGregor et al., 2018; Caneco et al., 2022), and from 0.9924 to 0.9923 for the basic Band (2012) model.

17. The collision risk predictions for OWFs in Table 2-3 are based on the parameters as consented or as most recently published, and details of the CRM model, flight height option and avoidance rate which was used are included. In relation to flight height, Option 1 indicates that flight height data from baseline surveys for a given OWF was used for modelling (usually where baseline surveys were carried out from boats), and Option 2 that the industry standard dataset for flight height (Johnston et al., 2014a,b) was used (usually where digital aerial surveys were carried out).

18. To reflect the most recent Natural England advice and increase parity between collision risk estimates from OWFs included in the CEA, the collision predictions in Table 2-4 have been adjusted for the updated avoidance rates. This was done using the formula Ca = (Co/(1-Ao) x (1-Aa)), where Ca is the adjusted collision prediction, Co the prediction before adjustment for avoidance rate, Ao the original avoidance rate and Aa the most recently advised avoidance rate. Where the original collision risk was estimated using the Band (2012) or an earlier Band model, the avoidance rate was adjusted to 0.9923; where the original collision risk was estimated using the stochastic CRM, the avoidance rate was adjusted to 0.9929. In a few cases, the avoidance rate for the consented design of an OWF was unknown (Table 2-3), in which case no avoidance rate adjustments were applied.

Table 2-3 Predicted kittiwake collisions at OWFs included in the cumulative assessment (original consented or most recent value). This table updates Table 2-3 in Appendix 13.3, Ref 3.3.14 [APP-104].

Tier	OWF	Predicted kittiwake collisions				Original CRM model parameters			Source and notes
		Breeding	Autumn	Spring	Annual	Iteration	Option	Avoidance Rate	
1	Beatrice	94.7	10.7	39.8	145.2	Band *et al*. (2007)	1	0.989	Royal HaskoningDHV (2023a, 2021). Calculated for 140 turbines; 84 were installed.
1	Beatrice (demonstrator)	0	2.1	1.7	3.8	Band (2000)	1	0.992	Royal HaskoningDHV (2023a, 2021).
1	Blyth Demonstration	1.7	2.3	1.4	5.4	Band *et al*. (2007)	1	0.989	Royal HaskoningDHV (2023a, 2021).
1	Dudgeon	0	0	0	0	Band (2000)	1	0.989	Royal HaskoningDHV (2023a, 2021).
1	East Anglia ONE	1.8	160.4	46.8	209.0	Band (2012)	1	0.989	Royal HaskoningDHV (2023a, 2021). Calculated for 240 turbines, 102 were installed.
1	EOWDC (Aberdeen)	11.8	5.8	1.1	18.7	Band (2012)	2	0.989	Royal HaskoningDHV (2023a, 2021).
1	Galloper	6.3	27.8	31.8	65.9	Band *et al*. (2007)	1	0.989	Royal HaskoningDHV (2023a, 2021). Calculated for 140 turbines, 56 installed.
1	Greater Gabbard	1.1	15.0	11.4	27.5	Band (2000)	1	0.989	Royal HaskoningDHV (2023a, 2021).
1	Gunfleet Sands	-	-	-	-	Unknown	Unknown	Unknown	Royal HaskoningDHV (2023a, 2021).
1	Hornsea Project One	44.0	55.9	20.9	120.8	Band (2012)	2	0.989	Royal HaskoningDHV (2023a, 2021).
1	Hornsea Project Two	16.0	9.0	3.0	28.0	Band (2012)	1	0.989	Royal HaskoningDHV (2023a, 2021).
1	Humber Gateway	2.6	3.2	1.9	7.6	Unknown	1	0.989	Royal HaskoningDHV (2021).
1	Hywind	16.6	0.9	0.9	18.3	Band (2012)	1	0.989	Royal HaskoningDHV (2023a, 2021).
1	Kentish Flats	0.0	0.9	0.7	1.6	Band (2000)	1	0.989	Royal HaskoningDHV (2023a).
1	Kentish Flats Extension	0.0	0.0	2.7	2.7	Unknown	Unknown	Unknown	Royal HaskoningDHV (2023a).
1	Kincardine	22.0	9.0	1.0	32.0	Band (2012)	1	0.989	Royal HaskoningDHV (2023a, 2021).
1	Lincs	0.9	1.2	0.7	2.8	Band (2000)	1	0.989	Royal HaskoningDHV (2021).

Tier	OWF	Predicted kittiwake collisions				Original CRM model parameters			Source and notes
		Breeding	Autumn	Spring	Annual	Iteration	Option	Avoidance Rate	
1	London Array	1.4	2.3	1.8	5.5	Band (2000)	1	0.989	Royal HaskoningDHV (2023a, 2021).
1	Lynn and Inner Dowsing	-	-	-	-	Unknown	Unknown	Unknown	Royal HaskoningDHV (2023a).
1	Methil	0.4	0.0	0.0	0.4	Unknown	Unknown	Unknown	Royal HaskoningDHV (2023a).
1	Moray East	43.6	2.0	19.3	64.9	Band (2012)	1	0.989	Royal HaskoningDHV (2023a, 2021).
1	Race Bank	1.9	23.9	5.6	31.4	Band (2000)	1	0.989	Royal HaskoningDHV (2023a, 2021). Calculated for 206 turbines, 91 installed.
1	Rampion	54.4	37.4	29.7	121.5	Band (2012)	1	0.989	Royal HaskoningDHV (2023a, 2021). Calculated for 175 turbines, 116 installed. Draft 2011 version of Band (2012) used.
1	Scroby Sands	-	-	-	-	n/a	n/a	n/a	Royal HaskoningDHV (2023a). No CRM carried out for original ES (Powergen Renewables 2001).
1	Sheringham Shoal	-	-	-	-	Unknown	Unknown	Unknown	Royal HaskoningDHV (2023a).
1	Teesside	38.4	24.0	2.5	64.9	Band (2000)	1	0.989	Royal HaskoningDHV (2023a, 2021).
1	Thanet	0.2	0.5	0.4	1.1	Band (2000)	1	0.989	Royal HaskoningDHV (2023a).
1	Triton Knoll	24.6	139.0	45.4	209.0	Band (2012)	1	0.989	Royal HaskoningDHV (2023a, 2021). Calculated for 288 turbines, 90 installed.
1	Westermost Rough	0.2	0.2	0.1	0.5	Band *et al*. (2007)	1	0.989	Royal HaskoningDHV (2021).
2	Dogger Bank A and B (Formerly Creyke Beck A and B)	288.6	135.0	295.4	719.0	Band (2012)	2	0.989	Royal HaskoningDHV (2023a, 2021), Dogger Bank Wind Farms (2018).
2	Dogger Bank C and Sofia (Formerly Teeside A and B)	136.9	90.7	216.9	444.5	Band (2012)	2	0.989	Royal HaskoningDHV (2023a, 2021).
2	Moray West	79.0	24.0	7.0	110.0	Band (2012)	2	0.989	Royal HaskoningDHV (2023a).

Tier	OWF	Predicted kittiwake collisions				Original CRM model parameters			Source and notes
		Breeding	Autumn	Spring	Annual	Iteration	Option	Avoidance Rate	
2	Neart na Gaoithe	8.5	16.8	1.7	26.9	Band (2012)	2	0.989	EDF Renewables (2019).
2	Seagreen Alpha and Bravo	171.1	142.3	33.6	347.0	Band (2012)	2	0.989	Seagreen (2022). This gives only an annual total, seasonal totals derived by apportioning monthly collisions from monthly predictions in Seagreen (2020).
3	East Anglia ONE North	40.4	8.1	3.5	52.0	Band (2012)	2	0.989	Royal HaskoningDHV (2023a).
3	East Anglia THREE	6.1	69	37.6	112.7	Band (2012)	1	0.989	Royal HaskoningDHV (2023a), MacArthur Green (2016). Consented with 172 turbines, amended to 121 in 2020 (Non-Material Change; MacArthur Green and Royal HaskoningDHV 2020).
3	East Anglia TWO	29.5	5.4	7.4	42.3	Band (2012)	2	0.989	Royal HaskoningDHV (2023a).
3	Green Volt	7.0	5.5	1.3	13.9	McGregor *et al*. (2018)	2	0.993	APEM (2023a), SNCB approach.
3	Hornsea Project Four	74.5	13.9	4.6	93.0	Band (2012)	2	0.989	Royal HaskoningDHV (2023a), APEM and GoBe (2022) Natural England approach.
3	Hornsea Project Three	77.0	38.0	8.0	123.0	Band (2012)	2	0.989	Royal HaskoningDHV (2023a).
3	Inch Cape	40	26	6	72	Band (2012)	2	0.989	ICOL (2018).
3	Norfolk Boreas	13.3	32.2	11.9	57.5	Band (2012)	2	0.989	Royal HaskoningDHV (2023a, 2021).
3	Norfolk Vanguard	21.8	16.4	19.3	57.5	Band (2012)	2	0.989	Royal HaskoningDHV (2023a, 2021).
3	Sheringham and Dudgeon Extension Projects	7.2	4.3	0.9	12.4	Band (2012)	2	0.992	Royal HaskoningDHV (2023a).
TOTALS (tiers 1-3)		**1,386**	**1,161**	**926**	**3,452**				
Previous totals (tiers 1-3), Appendix 13.3 [APP-104]		**1,386**	**1,161**	**926**	**3,452**				
4	Berwick Bank	426	155	104	685	Band (2012)	2	0.989	Pelagica and Cork Ecology (2022), HiDef (2022a), Developer Approach

Tier	OWF	Predicted kittiwake collisions				Original CRM model parameters			Source and notes
		Breeding	Autumn	Spring	Annual	Iteration	Option	Avoidance Rate	
4	Dogger Bank South	191.1	79.3	29.5	299.9	Caneco *et al.*(2022)	2	0.993	MacArthur Green (2024a).
4	Five Estuaries	11.9	7.9	5.52	25.3	Caneco *et al.*(2022)	2	0.993	MacArthur Green (2024b).
4	Outer Dowsing	27.2	3.0	2.9	33.2	Caneco *et al.*(2022)	2	0.9929	GoBe (2024a).
4	Rampion 2	1.2	9.8	17.3	28.3	McGregor *et al.* (2018)	2	0.993	GoBe (2024b).
4	West of Orkney	17.9	16.3	21.9	56.0	Caneco *et al.*(2022)	2	0.9928	MacArthur Green (2024c).
	North Falls	8.8	3.6	7.8	20.2	McGregor *et al.* (2018)	2	0.9928	Appendix 13.2 [APP-103], ES Chapter 13 [APP-027] Table 13.39
TOTALS (all tiers)		**2,070**	**1,436**	**1,115**	**4,620**				
Previous totals (all tiers) from Appendix 13.3 [APP-104]		**2,071**	**1,424**	**1,148**	**4,642**				
- = CRM estimate understood not to be provided in the ES for a given OWF (based on Royal HaskoningDHV (2023)									

Table 2-4 Predicted kittiwake collisions at OWFs included in the cumulative assessment, adjusted for latest guidance on avoidance rate. This table updates Table 2-4 in the Environmental Statement, Appendix 13.3, Ref 3.3.14 [APP-104].

Tier	OWF	Predicted kittiwake collisions (AR 0.9923, Band (2012) or earlier versions of the Band model; AR 0.9929, McGregor *et al.* (2018) or Caneco *et al*. (2022))			
		Breeding	Autumn	Spring	Annual
1	Beatrice	66.3	7.5	27.9	101.6
1	Beatrice (demonstrator)	0.0	2.0	1.6	3.7
1	Blyth Demonstration	1.2	1.6	1.0	3.8

Tier	OWF	Predicted kittiwake collisions (AR 0.9923, Band (2012) or earlier versions of the Band model; AR 0.9929, McGregor *et al.* (2018) or Caneco *et al*. (2022))			
		Breeding	Autumn	Spring	Annual
1	Dudgeon	0.0	0.0	0.0	0.0
1	East Anglia ONE	1.3	112.3	32.8	146.3
1	EOWDC (Aberdeen OWF)	8.3	4.1	0.8	13.1
1	Galloper	4.4	19.5	22.3	46.1
1	Greater Gabbard	0.8	10.5	8.0	19.3
1	Gunfleet Sands	0	0	0	0
1	Hornsea Project One	30.8	39.1	14.6	84.6
1	Hornsea Project Two	11.2	6.3	2.1	19.6
1	Humber Gateway	1.8	2.2	1.3	5.3
1	Hywind	11.6	0.6	0.6	12.8
1	Kentish Flats	0.0	0.6	0.5	1.1
1	Kentish Flats Extension	0	0	2.7	2.7
1	Kincardine	15.4	6.3	0.7	22.4
1	Lincs	0.6	0.8	0.5	2.0
1	London Array	1.0	1.6	1.3	3.9
1	Lynn and Inner Dowsing	0	0	0	0
1	Methil	0.4	0	0	0.4
1	Moray East	30.5	1.4	13.5	45.4
1	Race Bank	1.3	16.7	3.9	22.0
1	Rampion	38.1	26.2	20.8	85.1
1	Scroby Sands	0	0	0	0
1	Sheringham Shoal	0	0	0	0

Tier	OWF	Predicted kittiwake collisions (AR 0.9923, Band (2012) or earlier versions of the Band model; AR 0.9929, McGregor *et al.* (2018) or Caneco *et al*. (2022))			
		Breeding	Autumn	Spring	Annual
1	Teesside	26.9	16.8	1.8	45.4
1	Thanet	0.1	0.4	0.3	0.8
1	Triton Knoll	17.2	97.3	31.8	146.3
1	Westermost Rough	0.1	0.1	0.1	0.4
2	Dogger Bank A and B	202.0	94.5	206.8	503.3
2	Dogger Bank C and Sofia	95.8	63.5	151.8	311.2
2	Moray West	55.3	16.8	4.9	77.0
2	Neart na Gaoithe	6.0	11.8	1.2	18.9
2	Seagreen Alpha and Bravo	119.8	99.6	23.5	242.9
3	East Anglia ONE North	28.3	5.7	2.5	36.4
3	East Anglia THREE	4.3	48.3	26.3	78.9
3	East Anglia TWO	20.7	3.8	5.2	29.6
3	Green Volt	7.1	5.6	1.3	14.3
3	Hornsea Project Four	52.2	9.7	3.2	65.1
3	Hornsea Project Three	53.9	26.6	5.6	86.1
3	Inch Cape	28.0	18.2	4.2	50.4
3	Norfolk Boreas	9.3	22.5	8.3	40.3
3	Norfolk Vanguard	15.3	11.5	13.5	40.3
3	Sheringham and Dudgeon Extension Projects	6.9	4.1	0.9	11.8
TOTALS (tiers 1-3)		**974**	**816**	**650**	**2,425**
Previous totals (tiers 1-3), Appendix 13.3 [APP-104], ES Chapter 13 [APP-027] Table 13.54 (excluded Green Volt and SEPDEP)		**948**	**796**	**639**	**2,369**

Tier	OWF	Predicted kittiwake collisions (AR 0.9923, Band (2012) or earlier versions of the Band model; AR 0.9929, McGregor *et al.* (2018) or Caneco *et al*. (2022))			
		Breeding	Autumn	Spring	Annual
4	Berwick Bank	298.2	108.5	72.8	479.5
4	Dogger Bank South	193.9	80.5	29.9	304.2
4	Five Estuaries	12.1	8.0	5.6	25.7
4	Outer Dowsing	27.2	3.0	2.9	33.2
4	Rampion 2	1.2	9.9	17.5	28.7
4	West of Orkney	17.6	16.1	21.6	55.3
	North Falls	8.6	3.6	7.7	20.0
TOTALS (all tiers)		**1,533**	**1,046**	**808**	**3,387**
Previous totals (all tiers) from Appendix 13.3		**1,510**	**1,020**	**833**	**3,348**

2.3 Lesser black-backed gull

19. The area considered for the CEA is the UK North Sea and Channel BDMPS (Furness, 2015). Predicted seasonal and annual numbers of lesser black-backed gull collisions for OWFs included in the cumulative assessment are given in Table 2-5. This table includes predictions for consented designs, where an OWF has been consented, and the latest publicly available predictions for OWFs which have not been consented. This table updates Table 2.5 in Appendix 13.3, Document Reference 3.3.14, Revision 0 [**APP-104**].

20. Since the DCO submission for North Falls, joint SNCB guidance on CRM for OWFs has been published (SNCBs, 2024). The CRM carried out for the DCO was based on interim advice from Natural England provided during the EPP, as described in Appendix 13.3 [**APP-104**], paragraph 22 (see also ES Chapter 13, Document Reference 3.1.15 [**APP-027**], section 13.6.2.2 and Appendix 13.2 Document Reference 3.3.13 [**APP-103**], Section 3.1 for more detail on the North Falls CRM).Under SNCBs (2024), a small change has been made to the recommended avoidance rate for lesser black-backed gull, from the value used for the North Falls DCO submission, from 0.9939 (±0.0004) to 0.9940 (±0.0004) for the basic stochastic (MacGregor et al., 2018; Caneco and Humphries, 2022) model. No change has been made to the value of 0.9936 for the basic Band (2012) model.

21. To reflect the most recent SNCB (2024) advice and increase parity between collision risk estimates from OWFs included in the CEA, the collision predictions in Table 2-6 have been adjusted for the updated avoidance rates. This was done using the formula Ca = (Co/(1-Ao) x (1-Aa)), where Ca is the adjusted collision prediction, Co the prediction before adjustment for avoidance rate, Ao the original avoidance rate and Aa the most recently advised avoidance rate. Where the original collision risk was estimated using the Band (2012) or an earlier Band model, the avoidance rate was adjusted to 0.9936; where the original collision risk was estimated using the stochastic CRM, the avoidance rate was adjusted to 0.9940. In a few cases, the avoidance rate for the consented design of an OWF was unknown (Table 2-5), in which case no avoidance rate adjustments were applied.

Table 2-5 Predicted lesser black-backed gull collisions at OWFs included in the cumulative assessment (original consented or most recent value). This table updates Table 2-5 in the Environmental Statement, Appendix 13.3 [APP-104].

Tier	OWF	Predicted LBBG collisions			Original CRM model parameters			Source and notes
		Breeding	Non-breeding	Annual	Iteration	Option[1]	Avoidance Rate	
1	Beatrice	0	0	0	n/a	n/a	n/a	Royal HaskoningDHV (2023a)
1	Beatrice (demonstrator)	-	-	-	Unknown	Unknown	Unknown	Royal HaskoningDHV (2023a, 2021).
1	Blyth Demonstration	0	0	0	n/a	n/a	n/a	Royal HaskoningDHV (2023a).
1	Dudgeon	7.7	30.6	38.3	Band (2000)	1	0.995	Royal HaskoningDHV (2023a). Calculated for 168 x 3MW turbines; 67 x 6MW were installed.
1	East Anglia ONE	5.9	33.8	39.7	Band (2012)	1	0.995	Royal HaskoningDHV (2023a, 2021). Consented with 240 turbines; 102 x 7MW were installed
1	EOWDC (Aberdeen)	0	0	0	n/a	n/a	n/a	Royal HaskoningDHV (2023a).
1	Galloper	27.8	111.0	138.8	Band *et al*. (2007)	1	0.995	Royal HaskoningDHV (2023a, 2021). Calculated for 140 turbines; 56 x 6.3MW were installed.
1	Greater Gabbard	12.4	49.6	62.0	Band (2000)	1	0.995	Royal HaskoningDHV (2023a, 2021).
1	Gunfleet Sands	1.0	0	1.0	Unknown	Unknown	0.990	Royal HaskoningDHV (2023a).
1	Hornsea Project One	4.4	17.4	21.8	Band (2012)	1	0.995	Royal HaskoningDHV (2023a, 2021). Calculated for 332 turbines, 174 x 7MW installed
1	Hornsea Project Two	2.0	2.0	4.0	Band (2012)	1	0.995	Royal HaskoningDHV (2023a, 2021).
1	Humber Gateway	0.3	1.1	1.4	Unknown	1	0.995	Royal HaskoningDHV (2023a, 2021).
1	Hywind	0	0	0	n/a	n/a	n/a	Royal HaskoningDHV (2023a).
1	Kentish Flats	0.3	1.3	1.6	Band *et al*. 2007	1	0.995	Royal HaskoningDHV (2023a). Same values as extension below. MacArthur Green and RHDHV (2019) database attributes these values to Kentish Flats Extension and gives no collision risk value for Kentish Flats.
1	Kentish Flats Extension	0.3	1.3	1.6	Unknown	Unknown	Unknown	Royal HaskoningDHV (2023a). See above.

Tier	OWF	Predicted LBBG collisions			Original CRM model parameters			Source and notes
		Breeding	Non-breeding	Annual	Iteration	Option[1]	Avoidance Rate	
1	Kincardine	0	0	0	n/a	n/a	n/a	Royal HaskoningDHV (2023a, 2021).
1	Lincs	1.7	6.8	8.5	Band (2000)	1	0.995	Royal HaskoningDHV (2023a).
1	London Array	-	-	-	Unknown	Unknown	Unknown	Royal HaskoningDHV (2023a).
1	Lynn and Inner Dowsing	-	-	-	Unknown	Unknown	Unknown	Royal HaskoningDHV (2023a).
1	Methil	0.5	0	0.5	Unknown	Unknown	Unknown	Royal HaskoningDHV (2023a, 2021).
1	Moray East	0	0	0	n/a	n/a	n/a	Royal HaskoningDHV (2023a).
1	Race Bank	43.2	10.8	54.0	Band (2000)	1	0.995	Royal HaskoningDHV (2023a, 2021). Calculated for 206 turbines; 91 x 6MW installed.
1	Rampion	1.6	6.3	7.9	Band (2012)	1	0.995	Royal HaskoningDHV (2023a, 2021). Calculated for 175 x 4MW turbines; 116 x 3.4MW installed. 2011 draft of Band (2012) was used.
1	Scroby Sands	-	-	-	n/a	n/a	n/a	Royal HaskoningDHV (2023a). No CRM in original ES (PowerGen Renewables, 2001).
1	Sheringham Shoal	1.7	6.6	8.3	Band (2000)	1	0.995	Royal HaskoningDHV (2023a). Calculated for 108 x 3MW turbines; 88 x 3.6MW installed.
1	Teesside	0	0	0	n/a	n/a	n/a	Royal HaskoningDHV (2023a).
1	Thanet	3.2	12.8	16.0	Band (2000)	1	0.995	Royal HaskoningDHV (2023a, 2021).
1	Triton Knoll	7.4	29.6	37.0	Band (2012)	1	0.995	Royal HaskoningDHV (2023a, 2021). Consented with 288 turbines, 90 installed.
1	Westermost Rough	0.1	0.3	0.4	Band *et al.* (2007)	1	0.995	Royal HaskoningDHV (2023a, 2021).
2	Dogger Bank A and B (Formerly Creyke Beck A and B)	2.6	10.4	13.0	Band (2012)	1	0.995	Royal HaskoningDHV (2023a, 2021).

Tier	OWF	Predicted LBBG collisions			Original CRM model parameters			Source and notes
		Breeding	Non-breeding	Annual	Iteration	Option[1]	Avoidance Rate	
2	Dogger Bank C and Sofia (Formerly Teeside A and B)	2.4	9.6	12.0	Band (2012)	2	0.995	Royal HaskoningDHV (2023a, 2021).
2	Moray West	-	-	-	n/a	n/a	n/a	Royal HaskoningDHV (2023a), Moray Offshore Wind Farm (West) Ltd (2018).
2	Neart na Gaoithe	1	0	1	Band (2012)	2	0.995	Cork Ecology (2018).
2	Seagreen Alpha and Bravo	2.1	8.4	10.5	Band (2012)	1	0.995	Royal HaskoningDHV (2023a, 2021).
3	East Anglia ONE North	0.9	0.6	1.5	Band (2012)	2	0.995	Royal HaskoningDHV (2023a, 2021).
3	East Anglia THREE	1.8	8.2	10.0	Band (2012)	1	0.995	Royal HaskoningDHV (2023a, 2021). Consented with 172 turbines, amended to 121 in 2020 (Non-Material Change; MacArthur Green and Royal HaskoningDHV 2020).
3	East Anglia TWO	4.2	0.5	4.7	Band (2012)	2	0.995	Royal HaskoningDHV (2023a, 2021).
3	Green Volt	0	0	0	n/a	n/a	n/a	APEM (2023a).
3	Hornsea Project Three	8.0	1.0	9.0	Band (2012)	2	0.995	Royal HaskoningDHV (2023a).
3	Hornsea Project Four	0.9	0	0.9	MacGregor *et al*. (2018)	2	0.995	APEM (2021), SNCB approach (stochastic CRM appears to have been run deterministically).
3	Inch Cape	0	0	0	n/a	n/a	n/a	Royal HaskoningDHV (2023a)
3	Norfolk Boreas	6.2	8.1	14.3	Band (2012)	2	0.995	Royal HaskoningDHV (2023a, 2021).
3	Norfolk Vanguard	8.4	3.6	12.0	Band (2012)	2	0.995	Royal HaskoningDHV (2023a, 2021).
3	Sheringham and Dudgeon Extension Projects	1.9	0.3	2.2	Band (2012)	2	0.994	Royal HaskoningDHV (2023a).
TOTALS (tiers 1-3)		**162**	**372**	**534**				

Tier	OWF	Predicted LBBG collisions			Original CRM model parameters			Source and notes
		Breeding	Non-breeding	Annual	Iteration	Option[1]	Avoidance Rate	
Previous totals (tiers 1-3) from Appendix 13.3		**160**	**372**	**532**				
4	Berwick Bank	6	0	6	Band (2012)	2	0.995	Pelagica and Cork Ecology (2022), HiDef (2022a), Developer Approach
4	Dogger Bank South	1.2	0	1.2	Caneco *et al*. (2022)	2	0.994	MacArthur Green (2024a).
4	Five Estuaries	35.1	5.5	40.6	McGregor *et al*. (2018)	2	0.994	MacArthur Green (2024b).
4	Outer Dowsing	1.5	0.3	1.9	Caneco *et al* (2022)	2	0.994	GoBe (2024a)
4	Rampion 2	3.1	1.2	4.4	McGregor *et al*. (2018)	2	0.994	Gobe 2024)b
4	West of Orkney	0	0	0	n/a	n/a	n/a	MacArthur Green (2024c)
	North Falls	6.5	2.0	8.5	McGregor *et al*. (2018)	2	0.9939	Appendix 13.2 [**APP-103**], ES Chapter 13 [**APP-027**], Table 13.40
TOTALS (all tiers)		**215**	**381**	**597**				
Previous totals (all tiers) from Appendix 13.3 [APP-104]		**217**	**382**	**598**				

- = No estimate provided in the ES for a given OWF (based on Royal HaskoningDHV 2023), for sites where this has been checked it was because no or very few LBBGs were recorded during baseline surveys so collision risk modelling was not undertaken for this species, thus collision risk would be very close to or equal to zero.

Table 2-6 Predicted lesser black-backed gull collisions at OWFs included in the cumulative assessment, adjusted for latest guidance on avoidance rate. This table updates Table 2-6 in the Environmental Statement, Appendix 13.3 [APP-104]. Note some of the numbers were assigned to the wrong OWF in [APP-104] but the totals in that document were correct.

Tier	OWF	Predicted lesser black-backed gull collisions (AR 0.9936 for Band (2012) (or earlier versions of Band model) and 0.9940 for MacGregor *et al.*, (2018); SNCBs, (2024))		
		Breeding	Non-breeding	Annual
1	Beatrice	0	0	0
1	Beatrice (demonstrator)	0	0	0
1	Blyth Demonstration	0	0	0
1	Dudgeon	9.9	39.2	49.0
1	East Anglia ONE	7.6	43.3	50.8
1	EOWDC (Aberdeen OWF)	0	0	0
1	Galloper	35.6	142.1	177.7
1	Greater Gabbard	15.9	63.5	79.4
1	Gunfleet Sands	1.0	0.0	1.0
1	Hornsea Project One	5.6	22.3	27.9
1	Hornsea Project Two	2.6	2.6	5.1
1	Humber Gateway	0.4	1.4	1.8
1	Hywind	0.0	0.0	0.0
1	Kentish Flats	0.4	1.7	2.0
1	Kentish Flats Extension	0.3	1.3	1.6
1	Kincardine	0	0	0
1	Lincs	2.2	8.7	10.9
1	London Array	0	0	0
1	Lynn and Inner Dowsing	0	0	0
1	Methil	0.5	0.0	0.5

Tier	OWF	Predicted lesser black-backed gull collisions (AR 0.9936 for Band (2012) (or earlier versions of Band model) and 0.9940 for MacGregor *et al.*, (2018); SNCBs, (2024))		
		Breeding	Non-breeding	Annual
1	Moray East	0	0	0
1	Race Bank	55.3	13.8	69.1
1	Rampion	2.0	8.1	10.1
1	Scroby Sands	0	0	0
1	Sheringham Shoal	2.2	8.4	10.6
1	Teesside	0	0	0
1	Thanet	4.1	16.4	20.5
1	Triton Knoll	9.5	37.9	47.4
1	Westermost Rough	0.1	0.4	0.5
2	Dogger Bank A and B	3.3	13.3	16.6
2	Dogger Bank C and Sofia	3.1	12.3	15.4
2	Moray West	0	0	0
2	Neart na Gaoithe	1.3	0	1.3
2	Seagreen Alpha and Bravo	2.7	10.8	13.4
3	East Anglia ONE North	1.2	0.8	1.9
3	East Anglia THREE	2.3	10.5	12.8
3	East Anglia TWO	5.4	0.6	6.0
3	Green Volt	0	0	0
3	Hornsea Project Three	10.2	1.3	11.5
3	Hornsea Project Four	1.1	0	1.1
3	Inch Cape	0	0	0
3	Norfolk Boreas	7.9	10.4	18.3

Tier	OWF	Predicted lesser black-backed gull collisions (AR 0.9936 for Band (2012) (or earlier versions of Band model) and 0.9940 for MacGregor *et al.*, (2018); SNCBs, (2024))		
		Breeding	Non-breeding	Annual
3	Norfolk Vanguard	10.8	4.6	15.4
3	Sheringham and Dudgeon Extension Projects	2.0	0.3	2.3
TOTALS (tiers 1-3)		**206**	**476**	**682**
Previous totals (tiers 1-3) from ES Chapter 13 [APP-027], Table 13.55		**204**	**475**	**680**
4	Berwick Bank	7.7	0.0	7.7
4	Dogger Bank South	1.2	0.0	1.2
4	Five Estuaries	35.1	5.5	40.6
4	Outer Dowsing	1.5	0.3	1.9
4	Rampion 2	3.1	1.2	4.4
4	West of Orkney	0	0	0
	North Falls	6.4	2.0	8.4
TOTALS (all tiers)		**261**	**485**	**746**
Previous totals (all tiers) from Appendix 13.3		**265**	**486**	**751**

2.4 Great black-backed gull

22. The area considered for the CEA is the UK North Sea BDMPS (Furness, 2015)[1]. Predicted seasonal and annual numbers of lesser black-backed gull collisions for OWFs included in the cumulative assessment are given in Table 2-7. This table includes predictions for consented designs, where an OWF has been consented, and the latest publicly available predictions for OWFs which have not been consented. This table updates Table 2.5 in Appendix 13.3, Document Reference 3.3.14, Revision 0 [**APP-104**].

23. Since the DCO submission for North Falls, joint SNCB guidance on CRM for OWFs has been published (SNCBs, 2024). The CRM carried out for the DCO was based on interim advice from Natural England provided during the EPP, as described in Appendix 13.3 [**APP-104**], paragraph 26 (see also ES Chapter 13, Document Reference 3.1.15 [**APP-027**], section 13.6.2.2 and Appendix 13.2 Document Reference 3.3.13 [**APP-103**], Section 3.1 for more detail on the North Falls CRM). Under SNCBs (2024), a small change has been made to the recommended avoidance rate for great black-backed gull, from the value used for the North Falls DCO submission, from 0.9939 (±0.0004) to 0.9940 (±0.0004) for the basic stochastic (MacGregor et al., 2018; Caneco and Humphries, 2022) model. No change has been made to the value of 0.9936 for the basic Band (2012) model.

24. The collision risk predictions for OWFs in Table 2-7 are based on the parameters as consented or as most recently published, and details of the CRM model, flight height option and avoidance rate which was used are included. In relation to flight height, Option 1 indicates that flight height data from baseline surveys for a given OWF was used for modelling (usually where baseline surveys were carried out from boats), and Option 2 that the industry standard dataset for flight height (Johnston et al., 2014a,b) was used (usually where digital aerial surveys were carried out).

25. To reflect the most recent SNCBs (2024) advice and increase parity between collision risk estimates from OWFs included in the CEA, the collision predictions in Table 2-8 have been adjusted for the updated avoidance rates. This was done using the formula Ca = (Co/(1-Ao) x (1-Aa)), where Ca is the adjusted collision prediction, Co the prediction before adjustment for avoidance rate, Ao the original avoidance rate and Aa the most recently advised avoidance rate. Where the original collision risk was estimated using the Band (2012) or an earlier Band model, the avoidance rate was adjusted to 0.9936; where the original collision risk was estimated using the stochastic CRM, the avoidance rate was adjusted to 0.9940. In a few cases, the avoidance rate for the consented design of an OWF was unknown (Table 2-7), in which case no avoidance rate adjustments were applied.

[1] Note in the DCO submission, Rampion and Rampion 2 OWFs were mistakenly included in the CEA totals for great black-backed gull (Appendix 13.3 [APP-104] Tables 2.7 and 2.8, whereas these two OWFs are located in the UK South-west and Channel BDMPS (Furness 2015). They have been removed from the tables in this document.

Table 2-7 Predicted great black-backed gull collisions at OWFs included in the cumulative assessment. This table updates Table 2-7 in the ES Chapter Appendix 13.3, ref 3.3.14 [APP-104].

Tier	OWF	Predicted GBBG collisions			Original CRM model parameters			Source and notes
		Breeding	Non-breeding	Annual	Iteration	Option[1]	Avoidance Rate	
1	Beatrice	30.2	120.8	151.0	Band *et al*. (2007)	1	0.995	Royal HaskoningDHV (2023a, 2021). Calculated for 140 turbines; 84 were installed.
1	Beatrice (demonstrator)	0	0	0	n/a	n/a	n/a	Royal HaskoningDHV (2023a, 2021).
1	Blyth Demonstration	1.3	5.1	6.3	Band *et al*. (2007)	1	0.995	Royal HaskoningDHV (2023a, 2021).
1	Dudgeon	0	0	0	n/a	n/a	n/a	Royal HaskoningDHV (2023a, 2021).
1	East Anglia ONE	0	46.0	46.0	Band (2012)	1	0.995	Royal HaskoningDHV (2023a, 2021). Consented with 240 turbines; 102 x 7MW were installed
1	EOWDC (Aberdeen)	0.6	2.4	3	Band (2012)	2	0.995	Royal HaskoningDHV (2023a, 2021).
1	Galloper	4.5	18	22.5	Band *et al*. (2007)	1	0.995	Royal HaskoningDHV (2023a, 2021). Calculated for 140 turbines; 56 x 6.3MW were installed.
1	Greater Gabbard	15.0	60.0	75.0	Band (2000)	1	0.9982	Royal HaskoningDHV (2023a, 2021).
1	Gunfleet Sands	-	-	-	Unknown	Unknown	Unknown	Royal HaskoningDHV (2023a, 2021).
1	Hornsea Project One	17.2	68.6	85.8	Band (2012)	1	0.995	Royal HaskoningDHV (2023a, 2021). Calculated for 332 turbines, 174 x 7MW installed
1	Hornsea Project Two	3.0	20.0	23.0	Band (2012)	1	0.995	Royal HaskoningDHV (2023a, 2021).
1	Humber Gateway	1.3	5.1	6.3	Unknown	1	0.995	Royal HaskoningDHV (2023a, 2021).
1	Hywind	0.3	4.5	4.8	Band (2012)	1	0.995	Royal HaskoningDHV (2023a).
1	Kentish Flats	-	-	-	Band *et al*. 2007	1	0.995	Royal HaskoningDHV (2023a).
1	Kentish Flats Extension	0.1	0.2	0.3	Unknown	Unknown	Unknown	Royal HaskoningDHV (2023a)
1	Kincardine	0	0	0	n/a	n/a	n/a	Royal HaskoningDHV (2023a, 2021).
1	Lincs	0	0	0	Unknown	Unknown	Unknown	Royal HaskoningDHV (2023a, 2021).

Tier	OWF	Predicted GBBG collisions			Original CRM model parameters			Source and notes
		Breeding	Non-breeding	Annual	Iteration	Option[1]	Avoidance Rate	
1	London Array	-	-	-	Unknown	Unknown	Unknown	Royal HaskoningDHV (2023a).
1	Lynn and Inner Dowsing	0	0	0	Unknown	Unknown	Unknown	Royal HaskoningDHV (2023a, 2021).
1	Methil	0.8	0.8	1.6	Unknown	Unknown	Unknown	Royal HaskoningDHV (2023a, 2021).
1	Moray East	9.5	25.5	35.0	Band (2012)	1	0.995	Royal HaskoningDHV (2023a, 2021).
1	Race Bank	0	0	0	n/a	n/a	n/a	Royal HaskoningDHV (2023a, 2021).
1	Scroby Sands	-	-	-	n/a	n/a	n/a	Royal HaskoningDHV (2023a). No CRM in original ES (PowerGen Renewables 2001).
1	Sheringham Shoal	0	0	0	Unknown	Unknown	Unknown	Royal HaskoningDHV (2023a).
1	Teesside	8.7	34.8	43.6	Band (2000)	1	0.995	Royal HaskoningDHV (2023a). Calculated for 30 turbines, 27 were installed.
1	Thanet	0.1	0.4	0.5	Band (2000)	1	0.995	Royal HaskoningDHV (2023a, 2021).
1	Triton Knoll	24.4	97.6	122.0	Band (2012)	1	0.995	Royal HaskoningDHV (2023a, 2021). Consented with 288 turbines, 90 installed.
1	Westermost Rough	0.0	0.0	0.1	Band *et al*. (2007)	1	0.995	Royal HaskoningDHV (2023a, 2021).
2	Dogger Bank A and B (Formerly Creyke Beck A and B)	5.8	23.3	29.1	Band (2012)	1	0.995	Royal HaskoningDHV (2023a, 2021).
2	Dogger Bank C and Sofia (Formerly Teeside A and B)	6.4	25.5	31.9	Band (2012)	2	0.995	Royal HaskoningDHV (2023a, 2021).
2	Moray West	4.0	5.0	9.0	Band (2012)	2	0.995	Royal HaskoningDHV (2023a), Moray Offshore Wind Farm (West) Ltd (2018).
2	Neart na Gaoithe	0.0	3.0	3.0	Band (2012)	2	0.995	Cork Ecology (2018).

Tier	OWF	Predicted GBBG collisions			Original CRM model parameters			Source and notes
		Breeding	Non-breeding	Annual	Iteration	Option[1]	Avoidance Rate	
2	Seagreen Alpha and Bravo	13.4	53.4	66.8	Band (2012)	1	0.995	Royal HaskoningDHV (2023a, 2021).
3	East Anglia ONE North	3.7	1.2	5.0	Band (2012)	2	0.995	Royal HaskoningDHV (2023a, 2021).
3	East Anglia THREE	4.6	34.4	39.0	Band (2012)	1	0.995	Royal HaskoningDHV (2023a, 2021). Consented with 172 turbines, amended to 121 in 2020 (Non-Material Change; MacArthur Green and Royal HaskoningDHV 2020).
3	East Anglia TWO	3.5	3.4	6.9	Band (2012)	2	0.995	Royal HaskoningDHV (2023a, 2021).
3	Green Volt	0.1	6.9	7.0	MacGregor *et al*. (2018)	2	0.994	APEM (2023a).
3	Hornsea Project Three	8.0	28.0	36.0	Band (2012)	2	0.995	Royal HaskoningDHV (2023).
3	Hornsea Project Four	0.8	8.8	9.6	MacGregor *et al*. (2018)	2	0.995	Royal HaskoningDHV (2023a), APEM and GoBe (2022) Natural England Approach. sCRM run deterministically.
3	Inch Cape	0	36.8	36.8	Band (2012)	1	0.995	Royal HaskoningDHV (2023a). Calculated for 2014 consent for 213 turbines, now superseded by 2019 consent for a maximum of 72 turbines.
3	Norfolk Boreas	6.9	28.7	35.6	Band (2012)	2	0.995	Royal HaskoningDHV (2023a, 2021).
3	Norfolk Vanguard	4.5	21.5	26.0	Band (2012)	2	0.995	Royal HaskoningDHV (2023a, 2021).
3	Sheringham and Dudgeon Extension Projects	0.8	8.8	9.6	Band (2012)	2	0.994	Royal HaskoningDHV (2023a).
TOTALS (tiers 1-3)		**180**	**799**	**978**				
Previous totals (tiers 1-3) from Appendix 13.3 [APP-104]		**184**	**804**	**988**				

Tier	OWF	Predicted GBBG collisions			Original CRM model parameters			Source and notes
		Breeding	Non-breeding	Annual	Iteration	Option[1]	Avoidance Rate	
4	Berwick Bank	-	-	-	n/a	n/a	n/a	Recorded rarely and at low density in Array Area HiDef (2022b).
4	Dogger Bank South	0.9	3.9	4.8	Caneco *et al.* (2022)	2	0.994	MacArthur Green (2024a)
4	Five Estuaries	0.7	1.2	1.9	Caneco *et al.* (2022)	2	0.994	MacArthur Green (2024b)
4	Outer Dowsing	0.5	3.4	4.0	Caneco *et al.* (2022)	2	0.994	GoBe (2024a)
4	West of Orkney	0.8	11.1	11.9	Caneco *et al.* (2022)	2	0.9939	MacArthur Green (2024b)
4	North Falls	0	3.0	3.0	McGregor *et al*. (2018)	2	0.9939	Appendix 13.2 [**APP-103**], ES Chapter 13 [**APP-027**], Table 13.38
TOTALS (all tiers)		**182**	**821**	**1,004**				
Previous totals (all tiers) from Appendix 13.3		**198**	**855**	**1,053**				
- = No estimate provided in the ES for a given OWF (based on Royal HaskoningDHV 2023), for sites where this has been checked it was because no or very few GBBGs were recorded during baseline surveys so collision risk modelling was not undertaken for this species, thus collision risk would be very close to or equal to zero.								

Table 2-8 Predicted great black-backed gull collisions at OWFs included in the cumulative assessment, adjusted for latest guidance on avoidance rate. This table updates Table 2-8 in the ES Chapter Appendix 13.3, ref 3.3.14 [APP-104].

Tier	OWF	Predicted great black-backed gull collisions (AR 0.9936 for Band (2012) (or earlier versions of Band model) and 0.994 for MacGregor *et al*. (2018) or Caneco et al. (2022))		
		Breeding	Non-breeding	Annual
1	Beatrice	38.7	154.6	193.3
1	Beatrice (demonstrator)	0.0	0.0	0.0

Tier	OWF	Predicted great black-backed gull collisions (AR 0.9936 for Band (2012) (or earlier versions of Band model) and 0.994 for MacGregor *et al*. (2018) or Caneco et al. (2022))		
		Breeding	Non-breeding	Annual
1	Blyth Demonstration	1.7	6.5	8.1
1	Dudgeon	0.0	0.0	0.0
1	East Anglia ONE	0.0	58.9	58.9
1	EOWDC (Aberdeen OWF)	0.8	3.1	3.8
1	Galloper	5.8	23.0	28.8
1	Greater Gabbard	53.3	213.3	266.7
1	Gunfleet Sands	0	0	0
1	Hornsea Project One	22.0	87.8	109.8
1	Hornsea Project Two	3.8	25.6	29.4
1	Humber Gateway	1.7	6.5	8.1
1	Hywind	0.4	5.8	6.1
1	Kentish Flats	0.0	0.0	0.0
1	Kentish Flats Extension	0.1	0.2	0.3
1	Kincardine	0	0	0
1	Lincs	0	0	0
1	London Array	0	0	0
1	Lynn and Inner Dowsing	0	0	0
1	Methil	0.8	0.8	1.6
1	Moray Firth East	12.2	32.6	44.8
1	Race Bank	0.0	0.0	0.0
1	Scroby Sands	0	0	0

Tier	OWF	Predicted great black-backed gull collisions (AR 0.9936 for Band (2012) (or earlier versions of Band model) and 0.994 for MacGregor *et al*. (2018) or Caneco et al. (2022))		
		Breeding	Non-breeding	Annual
1	Sheringham Shoal	0	0	0
1	Teesside	11.1	44.5	55.8
1	Thanet	0.1	0.5	0.6
1	Triton Knoll	31.2	124.9	156.2
1	Westermost Rough	0.0	0.0	0.1
2	Dogger Bank A and B	7.4	29.8	37.2
2	Dogger Bank C and Sofia	8.2	32.6	40.8
2	Moray West	5.1	6.4	11.5
2	Neart na Gaoithe	0.0	3.8	3.8
2	Seagreen Alpha and Bravo	17.2	68.4	85.5
3	East Anglia ONE North	4.7	1.5	6.4
3	East Anglia THREE	5.9	44.0	49.9
3	East Anglia TWO	4.5	4.4	8.8
3	Green Volt	0.5	3.4	4.0
3	Hornsea Project Three	10.2	35.8	46.1
3	Hornsea Project Four	1.0	10.6	11.5
3	Inch Cape	0.0	47.1	47.1
3	Norfolk Boreas	8.8	36.7	45.6
3	Norfolk Vanguard	5.8	27.5	33.3
3	Sheringham and Dudgeon Extension Projects	0.9	9.4	10.2
TOTALS (tiers 1-3)		**270**	**1,180**	**1,450**

Tier	OWF	Predicted great black-backed gull collisions (AR 0.9936 for Band (2012) (or earlier versions of Band model) and 0.994 for MacGregor *et al*. (2018) or Caneco et al. (2022))		
		Breeding	Non-breeding	Annual
Previous totals (tiers 1-3) from Appendix 13.3 [APP-104]		**269**	**1,164**	**1,434**
4	Berwick Bank	0.0	0.0	0.0
4	Dogger Bank South	0.9	3.9	4.8
4	Five Estuaries	0.7	1.2	1.9
4	Outer Dowsing	0.5	3.4	4.0
4	West of Orkney	0.8	10.9	11.7
4	North Falls	0.0	3.0	3.0
TOTALS (all tiers)		**266**	**1,176**	**1,442**
Previous totals (all tiers) from Appendix 13.3 [APP-104]		**284**	**1,217**	**1,501**

3 Cumulative displacement

3.1 Gannet

26. The area identified for the CEA is the UK North Sea and Channel BDMPS (Furness, 2015). The predicted seasonal and annual numbers of gannet at risk of displacement from OWFs included in the cumulative assessment are given in Table 3-1. These are seasonal peak mean populations taken from OWF ES's. The standard area for assessment of gannet displacement is the OWF array area plus a 2km buffer (SNCBs 2017); abundance estimates for this standard area are not available for all OWFs so the buffer area for which data was presented is different for some OWFs included in the table.

Table 3-1 Predicted numbers of gannet at risk of displacement from OWFs included in the cumulative assessment. This table updates Table 3-1 in the Environmental Statement, Appendix 13.3, Document Reference 3.3.14 [APP-104].

Tier	OWF	Breeding	Autumn	Spring	Annual	Source
1	Beatrice	151	0	0	151	Royal HaskoningDHV (2022)
1	Beatrice (demonstrator)	n/a				Royal HaskoningDHV (2022)
1	Blyth Demonstration	n/a				Royal HaskoningDHV (2022)
1	Dudgeon	53	25	11	89	Royal HaskoningDHV (2022)
1	East Anglia ONE	161	3,638	76	3,875	Royal HaskoningDHV (2022)
1	EOWDC (Aberdeen OWF)	35	5	0	40	Royal HaskoningDHV (2022)
1	Galloper	360	907	276	1,543	Royal HaskoningDHV (2022)
1	Greater Gabbard	252	69	105	426	Royal HaskoningDHV (2022)
1	Gunfleet Sands	0	12	9	21	Royal HaskoningDHV (2022)
1	Hornsea Project One	671	694	250	1,615	Royal HaskoningDHV (2022)
1	Hornsea Project Two	457	1,140	124	1,721	Royal HaskoningDHV (2022)
1	Humber Gateway	n/a				Royal HaskoningDHV (2022)
1	Hywind	10	0	4	14	Royal HaskoningDHV (2022)
1	Kentish Flats	n/a				Royal HaskoningDHV (2022)
1	Kentish Flats Extension	0	13	0	13	Royal HaskoningDHV (2022)
1	Kincardine	120	0	0	120	Royal HaskoningDHV (2022)
1	Lincs, Lynn and Inner Dowsing	n/a				Royal HaskoningDHV (2022), Royal HaskoningDHV (2019a)
1	London Array	n/a				Royal HaskoningDHV (2022)
1	Methil	23	0	0	23	Royal HaskoningDHV (2022)
1	Moray Firth East	564	292	27	883	Royal HaskoningDHV (2022)
1	Race Bank	92	32	29	153	Royal HaskoningDHV (2022)

Tier	OWF	Breeding	Autumn	Spring	Annual	Source
1	Rampion	0	590	0	590	Royal HaskoningDHV (2022)
1	Scroby Sands	n/a				Royal HaskoningDHV (2022)
1	Sheringham Shoal	47	31	2	80	Royal HaskoningDHV (2022)
1	Teesside	1	0	0	1	Royal HaskoningDHV (2022)
1	Thanet	n/a				Royal HaskoningDHV (2022)
1	Triton Knoll	211	15	24	250	Royal HaskoningDHV (2022)
1	Westermost Rough	n/a				Royal HaskoningDHV (2022)
2	Dogger Bank (formerly Creyke Beck) A and B	1,155	2,048	394	3,597	Royal HaskoningDHV (2022)
2	Dogger Bank C and Sofia (formerly Teeside A and B)	2,250	887	464	3,601	Royal HaskoningDHV (2022)
2	Moray West	2,827	439	144	3,410	Royal HaskoningDHV (2022)
2	Neart na Gaoithe	1,987	552	281	2,820	Royal HaskoningDHV (2022)
2	Seagreen Alpha and Bravo	2,956	664	332	3,952	Royal HaskoningDHV (2022)
3	East Anglia ONE North	149	468	44	661	Royal HaskoningDHV (2022)
3	East Anglia THREE	412	1,269	524	2,205	Royal HaskoningDHV (2022)
3	East Anglia TWO	192	891	192	1,275	Royal HaskoningDHV (2022)
3	Green Volt	198	24	102	324	APEM (2022a)
3	Hornsea Project Three	1,333	984	524	2,841	Royal HaskoningDHV (2022)
3	Hornsea Project Four	976	790	401	2,167	APEM and GoBe (2022)
3	Inch Cape	2,398	703	212	3,313	Royal HaskoningDHV (2022)
3	Norfolk Boreas	1,229	1,723	526	3,478	Royal HaskoningDHV (2022)
3	Norfolk Vanguard	271	2,453	437	3,161	Royal HaskoningDHV (2022)
3	Sheringham and Dudgeon Extension Projects	440	638	58	1,136	Royal HaskoningDHV (2022)
TOTALS (tiers 1-3)		**21,981**	**21,996**	**5,572**	**49,549**	
Previous totals (tiers 1-3), ES Chapter 13 [APP-027] Table 13.44 (excluded Green Volt and SEPDEP)		**21,343**	**21,334**	**5,412**	**48,089**	
4	Berwick Bank	4,735	1,500	269	6,504	HiDef (2022b)
4	Dogger Bank South	1,560	1,574	161	3,295	MacArthur Green (2024a)
4	Five Estuaries	233	640	67	940	MacArthur Green 2024b)
4	Outer Dowsing	554	496	69	1,119	GoBe (2024c)
4	Rampion 2	111	102	123	336	GoBe (2024b)
4	West of Orkney	852	1,368	140	2,359	MacArthur Green (2024d)
	North Falls	69	287	290	646	Appendix 13.2 [**APP-103**]

Tier	OWF	Breeding	Autumn	Spring	Annual	Source
TOTALS (all tiers)		**30,095**	**27,962**	**6,691**	**64,748**	
Previous totals (all tiers), Appendix 13.3 [APP-104], ES Chapter 13 [APP-027] Table 13.44		**29,894**	**26,877**	**6,535**	**63,304**	
Where 'n/a is used', it is understood that there was no estimate in the ES for a given OWF (based on Royal HaskoningDHV 2022)						

3.2 Guillemot

27. The area identified for the CEA is the UK North Sea and Channel BDMPS (Furness, 2015). The predicted seasonal and annual numbers of guillemots at risk of displacement from OWFs included in the cumulative assessment are given in Table 3-2. These are seasonal peak mean populations taken from OWF ES's. The standard area for assessment of guillemot displacement is the OWF array area plus a 2km buffer (SNCB 2017); abundance estimates for this standard area are not available for all OWFs so the buffer area for which data was presented is different for some OWFs included in the table.

28. For a small number of OWFs within the UK North Sea and Channel BDMPS, Natural England has advised that an additional post-breeding/moult season should be adopted for guillemot, during August and September. This includes a period where guillemot chicks jump from nests before they can fly and disperse out to sea accompanied by the male parent, and also covers the annual moult period for guillemots during which they become flightless for a time. This is considered a period of particular sensitivity for the species. Use of this additional season was first advised by Natural England for Hornsea Project Four (HP4) in relation to the Flamborough and Filey Coast SPA. This reflected large numbers of guillemot present in the array area and 2km buffer in August and September and it was considered by Natural England that, given the proximity of the array area to the Flamborough and Filey Coast (FFC) SPA, the vast majority of the individuals present were likely to be from the SPA breeding colonies. The Examining Authority for HP4 agreed that Natural England's bespoke approach to the definition of guillemot seasons for the FFC SPA should be used. In consenting HP4, the Secretary of State referred to the Natural England advice on seasons for guillemot at the FFC but didn't specifically comment on this in the conclusion of the appropriate assessment (DESNZ 2023). Subsequently Natural England has advised that a post-breeding/moult season should also be identified for Dogger Bank South and Outer Dowsing, OWFs, also in relation to guillemot at the FFC SPA. Thus Table 3-2 includes population estimates for the post-breeding moult period for these three projects. As the extra season was identified in relation to the FFC SPA, rather than the BDMPS, the annual totals for HP4, Dogger Bank South and Outer Dowsing are calculated from the sum of the breeding season and the largest number from the chick rearing/moult or non-breeding seasons. This is to make them comparable with the annual totals for other OWFs where the additional season has not been applied.

Table 3-2 Predicted numbers of guillemots at risk of displacement from OWFs included in the cumulative assessment. This table updates Table 3.2 in the Environmental Statement, Appendix 13.3, Document Reference 3.3.14 [APP-104].

Tier	OWF	Number of guillemots at risk of displacement				Source
		Breeding	Chick rearing/ moult	Non-breeding	Annual	
1	Beatrice	13,610	n/a	2,755	16,365	Royal HaskoningDHV (2022)
1	Beatrice (demonstrator)	n/a				Royal HaskoningDHV (2022)
1	Blyth Demonstration	1,220	n/a	1,321	2,541	Royal HaskoningDHV (2022)
1	Dudgeon	334	n/a	542	876	Royal HaskoningDHV (2022)
1	East Anglia ONE	274	n/a	640	914	Royal HaskoningDHV (2022)
1	EOWDC (Aberdeen)	547	n/a	225	772	Royal HaskoningDHV (2022)
1	Galloper	305	n/a	593	898	Royal HaskoningDHV (2022)
1	Greater Gabbard	345	n/a	548	893	Royal HaskoningDHV (2022)
1	Gunfleet Sands	0	n/a	363	363	Royal HaskoningDHV (2022)
1	Hornsea Project One	9,836	n/a	8,097	17,933	Royal HaskoningDHV (2022)
1	Hornsea Project Two	7,735	n/a	13,164	20,899	Royal HaskoningDHV (2022)
1	Humber Gateway	99	n/a	138	237	Royal HaskoningDHV (2022)
1	Hywind	249	n/a	2,136	2,385	Royal HaskoningDHV (2022)
1	Kentish Flats	0	n/a	3	3	Royal HaskoningDHV (2022)
1	Kentish Flats Extension	0	n/a	4	4	Royal HaskoningDHV (2022)
1	Kincardine	632	n/a	0	632	Royal HaskoningDHV (2022)
1	Lincs, Lynn and Inner Dowsing	582	n/a	814	1,396	Royal HaskoningDHV (2022)
1	London Array	192	n/a	377	569	Royal HaskoningDHV (2022)
1	Methil	25	n/a	0	25	Royal HaskoningDHV (2022)
1	Moray Firth East	9,820	n/a	547	10,367	Royal HaskoningDHV (2022)
1	Race Bank	361	n/a	708	1,069	Royal HaskoningDHV (2022)

Tier	OWF	Number of guillemots at risk of displacement				Source
		Breeding	Chick rearing/ moult	Non-breeding	Annual	
1	Rampion	10,887	n/a	15,536	26,423	Royal HaskoningDHV (2022)
1	Scroby Sands	n/a				Royal HaskoningDHV (2022)
1	Sheringham Shoal	390	n/a	715	1,105	Royal HaskoningDHV (2022)
1	Teesside	267	n/a	901	1,168	Royal HaskoningDHV (2022)
1	Thanet	18	n/a	124	142	Royal HaskoningDHV (2022)
1	Triton Knoll	425	n/a	746	1,171	Royal HaskoningDHV (2022)
1	Westermost Rough	347	n/a	486	833	Royal HaskoningDHV (2022)
2	Dogger Bank A (formerly Creyke Beck A)	5,407	n/a	6,142	11,549	Royal HaskoningDHV (2022)
2	Dogger Bank B (formerly Creyke Beck B)	9,479	n/a	10,621	20,100	Royal HaskoningDHV (2022)
2	Dogger Bank C (formerly Teesside A)	3,283	n/a	2,268	5,551	Royal HaskoningDHV (2022)
2	Moray West	24,426	n/a	38,174	62,600	Royal HaskoningDHV (2022)
2	Neart na Gaoithe	1,755	n/a	3,761	5,516	Royal HaskoningDHV (2022)
2	Seagreen (Forth) Alpha	13,606	n/a	4,688	18,294	Royal HaskoningDHV (2022)
2	Seagreen (Forth) Bravo	11,118	n/a	4,112	15,230	Royal HaskoningDHV (2022)
2	Sofia (formerly Teesside B)	5,211	n/a	3,701	8,912	Royal HaskoningDHV (2022)
3	East Anglia ONE North	4,183	n/a	1,888	6,071	Royal HaskoningDHV (2022)
3	East Anglia THREE	1,744	n/a	2,859	4,603	Royal HaskoningDHV (2022)
3	East Anglia TWO	2,077	n/a	1,675	3,752	Royal HaskoningDHV (2022)
3	Green Volt	4,429	n/a	16,105	20,534	APEM (2023b)
3	Hornsea Project Three	13,374	n/a	17,772	31,146	Royal HaskoningDHV (2022)
3	Hornsea Project Four	9,382	36,965	16,962	46,347	APEM (2022b), Natural England bespoke approach)

Tier	OWF	Number of guillemots at risk of displacement				Source
		Breeding	Chick rearing/ moult	Non-breeding	Annual	
3	Inch Cape	4,371	n/a	3,177	7,548	Royal HaskoningDHV (2022)
3	Norfolk Boreas	7,767	n/a	13,777	21,544	Royal HaskoningDHV (2022)
3	Norfolk Vanguard	4,320	n/a	4,776	9,096	Royal HaskoningDHV (2022)
3	Sheringham and Dudgeon Extension Projects	4,934	n/a	15,972	20,906	Royal HaskoningDHV (2022)
TOTALS (tiers 1-3)		**189,366**	**36,965**	**219,913**	**429,282**	
Previous totals (tiers 1-3) from ES Chapter 13 [APP-027] Table 13.46; (excluded HP4, Green Volt and SEPDEP)		**170,621**	**n/a**	**170,874**	**387,842**	
4	Berwick Bank	74,154	n/a	44,171	118,325	Pelagica & Cork Ecology (2022)
4	Dogger Bank South	17,814	20,176	22,447	40,261	MacArthur Green (2024a)
4	Five Estuaries	1,201	n/a	3,698	4,899	MacArthur Green (2024b)
4	Outer Dowsing (applicant approach)	14,371	n/a	9,215	23,586	GoBe (2024c)
	Outer Dowsing (NE approach)	16,081	9,950	4,349	26,030	
4	Rampion 2	134	n/a	5,723	5,857	GoBe (2024b)
4	West of Orkney	7,973	n/a	4,393	12,365	MacArthur Green (2024d)
	North Falls	866	n/a	5,365	6,231	Appendix 13.3 [APP-104]
TOTALS (NE Approach, Outer Dowsing)		**307,587**	**67,091**	**310,512**	**643,251**	
TOTALS (Applicant Approach, Outer Dowsing)		**305,878**	**57,142**	**314,925**	**640,806**	
Previous totals from ES Appendix 13.3 [APP-104] ES Chapter 13 [APP-027] Table 13.46		**288,631**	**n/a**	**369,681**	**658,312**	

3.3 Razorbill

29. The area identified for the CEA is the UK North Sea and Channel BDMPS (Furness, 2015). The predicted seasonal and annual numbers of razorbills at risk of displacement from OWFs included in the cumulative assessment are given in Table 3-3. These are seasonal peak mean populations taken from OWF ES's. The standard area for assessment of razorbill displacement is the OWF array area plus a 2km buffer (SNCBs 2017); abundance estimates for this standard area are not available for all OWFs so the buffer area for which data was presented is different for some OWFs included in the table.

Table 3-3 Predicted numbers of razorbills at risk of displacement from OWFs included in the cumulative assessment. This table updates Table 3.3 in the Appendix 13.3, Ref 3.3.14 [APP-104].

Tier	OWF	Breeding	Autumn	Winter	Spring	Annual	Source
1	Beatrice	873	833	555	833	3,094	Royal HaskoningDHV (2022)
1	Beatrice (demonstrator)	n/a					Royal HaskoningDHV (2022)
1	Blyth Demonstration	121	91	61	91	364	Royal HaskoningDHV (2022)
1	Dudgeon	256	346	745	346	1,694	Royal HaskoningDHV (2022)
1	East Anglia ONE	16	26	155	336	533	Royal HaskoningDHV (2022)
1	EOWDC (Aberdeen OWF)	161	64	7	26	258	Royal HaskoningDHV (2022)
1	Galloper	44	43	106	394	587	Royal HaskoningDHV (2022)
1	Greater Gabbard	0	0	387	84	471	Royal HaskoningDHV (2022)
1	Gunfleet Sands	0	0	30	0	30	Royal HaskoningDHV (2022)
1	Hornsea Project One	1,109	4,812	1,518	1,803	9,242	Royal HaskoningDHV (2022)
1	Hornsea Project Two	2,511	4,221	720	1,668	9,119	Royal HaskoningDHV (2022)
1	Humber Gateway	27	20	13	20	80	Royal HaskoningDHV (2022)
1	Hywind	30	719	10	0	759	Royal HaskoningDHV (2022)
1	Kentish Flats	n/a					Royal HaskoningDHV (2022)
1	Kentish Flats Extension	n/a					Royal HaskoningDHV (2022)
1	Kincardine	22	0	0	0	22	Royal HaskoningDHV (2022)
1	Lincs and LID	45	34	22	34	134	Royal HaskoningDHV (2022)
1	London Array	14	20	14	20	68	Royal HaskoningDHV (2022)
1	Methil	4	0	0	0	4	Royal HaskoningDHV (2022)
1	Moray Firth East	2,423	1,103	30	168	3,724	Royal HaskoningDHV (2022)
1	Race Bank	28	42	28	42	140	Royal HaskoningDHV (2022)
1	Rampion	630	66	1,244	3,327	5,267	Royal HaskoningDHV (2022)

Tier	OWF	Breeding	Autumn	Winter	Spring	Annual	Source
1	Scroby Sands	n/a					Royal HaskoningDHV (2022)
1	Sheringham Shoal	106	1,343	211	30	1,690	Royal HaskoningDHV (2022)
1	Teesside	16	61	2	20	99	Royal HaskoningDHV (2022)
1	Thanet	3	0	14	21	37	Royal HaskoningDHV (2022)
1	Triton Knoll	40	254	855	117	1,265	Royal HaskoningDHV (2022)
1	Westermost Rough	91	121	152	91	455	Royal HaskoningDHV (2022)
2	Dogger Bank A (formerly Creyke Beck A)	1,250	1,576	1,728	4,149	8,703	Royal HaskoningDHV (2022)
2	Dogger Bank B (formerly Creyke Beck B)	1,538	2,097	2,143	5,119	10,897	Royal HaskoningDHV (2022)
2	Dogger Bank C (formerly Teesside A)	834	310	959	1,919	4,022	Royal HaskoningDHV (2022)
2	Moray West	2,808	3,544	184	3,585	10,121	Royal HaskoningDHV (2022)
2	Neart na Gaoithe	331	5,492	508	0	6,331	Royal HaskoningDHV (2022)
2	Seagreen Alpha and Bravo	9,574	891	594	891	11,950	Royal HaskoningDHV (2022)
2	Sofia (formerly Dogger Bank Teesside B)	1,153	592	1,426	2,953	6,125	Royal HaskoningDHV (2022)
3	East Anglia ONE North	403	85	54	207	749	Royal HaskoningDHV (2022)
3	East Anglia THREE	1,807	1,122	1,499	1,524	5,952	Royal HaskoningDHV (2022)
3	East Anglia TWO	281	44	136	230	691	Royal HaskoningDHV (2022)
3	Green Volt	457	56	15	28	556	APEM (2022a)
3	Hornsea Project Three	630	2,020	3,649	2,105	8,404	Royal HaskoningDHV (2022)
3	Hornsea Project Four	386	4,311	455	449	5,601	APEM and GoBe (2022)
3	Inch Cape	1,436	2,870	651	0	4,957	Royal HaskoningDHV (2022)
3	Norfolk Boreas	630	263	1,065	345	2,303	Royal HaskoningDHV (2022)
3	Norfolk Vanguard	879	866	839	924	3,508	Royal HaskoningDHV (2022)
3	Sheringham and Dudgeon Extension Projects	4,500	1,239	464	1,531	7,734	Royal HaskoningDHV (2022)

Tier	OWF	Breeding	Autumn	Winter	Spring	Annual	Source
TOTALS (tiers 1-3)		**37,467**	**40,706**	**25,028**	**34,358**	**137,741**	
Previous totals (tiers 1-3) from ES Chapter 13 [APP-027] Table 13.48; (Green Volt, HP4 and SEPDEP were excluded)		**32,510**	**39,411**	**24,549**	**32,979**	**129,449**	
4	Berwick Bank	4,040	8,849	1,399	7,480	21,768	Pelagica & Cork Ecology (2022)
4	Dogger Bank South	2,836	9,573	8,443	8,034	28,886	MacArthur Green (2024a)
4	Five Estuaries	90	284	1,046	756	2,177	MacArthur Green (2024b)
4	Outer Dowsing	3,159	2,185	1,779	5,134	12,257	GoBe (2024c)
4	Rampion 2	32	26	1,193	6,303	7,554	GoBe (2024b)
4	West of Orkney	141	112	19	132	405	MacArthur Green (2024d)
	North Falls	104	248	1,781	1,741	3,874	Appendix 13.3 [APP-104]
TOTALS (all tiers)		**47,870**	**61,983**	**40,689**	**64,119**	**214,660**	
Previous totals (all tiers) from Appendix 13.3 [APP-104] and ES Chapter 13 [APP-027], Table 13.48		**49,090**	**57,118**	**38,221**	**63,741**	**208,169**	

4 Summary of changes to CEA totals

30. As a result of updates to the cumulative numbers for some OWFs included in the CEA, and some changes in recommended avoidance rate for collision risk, there have been changes in the cumulative totals compared with those presented in ES Appendix 13.3 Revision 0 [**APP-104**], submitted with the DCO application for North Falls. These are shown in the species tables above, and summarised in Table 4-1 below.

31. In most cases there has been a small increase in the predicted annual cumulative totals for collisions and/or birds at risk of displacement. However, the revisions to the cumulative totals are not considered to change any of the conclusions of the offshore ornithology CEA as set out in the ES Chapter 13 [**APP-027**], Section 13.8.3, and summarised in Table 13.59.

32. The reduction in the predicted collisions for lesser and great black-backed gull reflects mainly the small increase in avoidance rate for the stochastic CRM in the latest SNCB (2024) guidance, compared to the guidance available when the North Falls DCO was submitted; and for great black-backed gull, the correction of the BDMPS, such that two OWFs (Rampion 1 and Rampion 2) were removed from the cumulative totals.

33. The reduction in the total numbers of guillemot at risk of displacement is largely due to reduced numbers at Outer Dowsing and Dogger Bank South compared with the Totals in ES Appendix 13.3 [**APP-104**].

Table 4-1 Cumulative annual totals for collisions and birds at risk of displacement for OWFs included in the cumulative assessment: comparison between updated numbers (in bold) and numbers included in the DCO Application submission for each species.

Effect	Species	Source	Cumulative annual total
Collisions (adjusted for avoidance rate and (gannet only) macro-avoidance)	Gannet	Updated (Table 2-2)	**498**
		ES Appendix 13.3 [APP-104]	494
	Kittiwake	Updated (Table 2-4)	**3,387**
		ES Appendix 13.3 [APP-104]	3,348
	Lesser black-backed gull	Updated (Table 2-6)	**746**
		ES Appendix 13.3 [APP-104]	751
	Great black-backed gull	Updated (Table 2-8)	**1,442**
		ES Appendix 13.3 [APP-104]	1,501
Displacement (no. of birds at risk)	Gannet	Updated (Table 3-1)	**64,748**
		ES Appendix 13.3 [APP-104]	63,304
	Guillemot	Updated (Table 3-2, maximum)	**643,251**

Effect	Species	Source	Cumulative annual total
		ES Appendix 13.3 [APP-104]	658,312
	Razorbill	Updated (Table 3-3)	**214,660**
		ES Appendix 13.3 [APP-104]	208,169

5 References

APEM (2021) Offshore Ornithology Collision Risk Modelling. Hornsea Project Four Environmental Statement Volume A5, Annex 5.3. A5.5.3 Version B. Orsted.
APEM (2022a). Appendix 12.2 Offshore Ornithology Displacement Analysis. Offshore EIA Report Volume 2. Green Volt Offshore Wind Farm LTD.
APEM (2022b). Hornsea Project Four Revised Ornithology Baseline, Document Reference G6.9, Rev 01, Orsted.
APEM (2023a) Green Volt Technical Appendix 12.8. The Supplementary Ornithological Assessment. Offshore EIA Report: Volume 2. FLO-GRE-REP-0020. Green Volt Offshore Windfarm Ltd.
APEM, GoBe Consultants, (2022). Hornsea Project Four Ornithology EIA & HRA Annex. Deadline 6. Document Reference: G5.25, Revision:03. Orsted.
Band, B. (2012). Using a collision risk model to assess bird collision risks for offshore windfarms. British Trust for Ornithology.
Caneco, B., Humphries, G., Cook, A., Masden, E. (2022). Estimating bird collisions at offshore windfarms with stochLAB URL [redacted]
Cork Ecology (2018) Chapter 9 Ornithology. UK02-0504-0741-MRP-OFFSHORE_EIAR-RPT-A2. Neart na Gaoithe Offshore Wind.
Dogger Bank Wind Farms (2018) Non-Material Change Application: Appendix 1 Ornithological Technical Report. PM575-PMS-054–001. SSE, Equinor.
EDF Renewables (2019) Neart na Gaoithe Section 36 Consent Variation Report. NNG-05044-935-NnG-S36 CONSENT VARIATION--RPT-A2.
Furness, R., 2015. Non-breeding season populations of seabirds in UK waters: Population sizes for Biologically Defined Minimum Population Scales (BDMPS). Natural England Commissioned Report 164.
GE Wind Energy (2002) Gunfleet Sands Offshore Wind Farm Environmental Statement.
GoBe (2024a). Offshore Restricted Build Area and Revision to the Offshore Export Cable Corridor. Appendix E Collision Risk Modelling. Document Reference 15.9E, Revision 1.0. Outer Dowsing Offshore Wind.
GoBe (2024b). Chapter 12: Offshore and intertidal ornithology, Environmental Statement. Volume 2. Document Reference 6.2.12, Revision B. Rampion 2 Wind Farm.
GoBe (2024c). Offshore Restricted Build Area and Revision to the Offshore Export Cable Corridor, Appendix D Ornithology Baseline Summary. Document Reference 15.9D, Revision 1.0. Outer Dowsing Offshore Wind.
Hidef Aerial Surveying Ltd (2022a) Appendix 11.3: Ornithology Collision Risk Modelling Technical Report. Berwick Bank Wind Farm Offshore Environmental Impact Assessment. SSE Renewables Berwick Bank Wind Farm.

Hidef Aerial Surveying Ltd (2022b) Appendix 11.1, Annex I: Design-based Analysis – Population Estimates for Flying Birds Grouped by Species (Berwick Bank Development Array Only). Berwick Bank Wind Farm Offshore Environmental Impact Assessment. SSE Renewables Berwick Bank Wind Farm.

(ICOL) Inch Cape Offshore Limited (2018) Appendix 11C Estimation of the Development Alone and Cumulative Collision Risk. Inch Cape Offshore Wind Farm (Revised Design) Environmental Statement: Biological Environment.

Johnston, A., Cook, A.S., Wright, L.J., Humphreys, E.M. and Burton, N.H. (2014a). Modelling flight heights of marine birds to more accurately assess collision risk with offshore wind turbines. Journal of Applied Ecology 51(1), 31-41.

Johnston, A., Cook, A.S.C.P., Wright, L.J., Humphreys, E.M. and Burton, N.H.K. (2014b). Corrigendum. Journal of Applied Ecology [redacted]

MacArthur Green (2016) East Anglia THREE Revised CRM for Increase in Draft Height, East Anglia ONE Revised CRM for Final Wind Farm Design & Updated Cumulative CRM Tables. Project Update Information for Deadline 5. Revision A. ScottishPower Renewables.

MacArthur Green, (2017). Estimates of Ornithological Headroom in Offshore Wind Farm Collision Mortality (Report on behalf of the Crown Estate). Macarthur Green.

MacArthur Green (2024a). Chapter 12 - Offshore Ornithology (Revision 2), Dogger Bank South Offshore Wind Farms, Environmental Statement, Volume 7. Document Reference 7.12, Revision 02. RWE Renewables UK Dogger Bank South (West) Limited, RWE Renewables UK Dogger Bank South (East) Limited.

MacArthur Green (2024b). Environmental Statement, Vol 6, Part 2, Chapter 4: Offshore Ornithology. Document Reference 6.2.4, Revision A. Five Estuaries Offshore Wind Farm.

MacArthur Green (2024c). Offshore Ornithology Additional Information. Appendix 3 – HRA and EIA: Collision Risk Modelling Technical Report. West of Orkney Windfarm

MacArthur Green (2024d). Offshore Ornithology Additional Information. Offshore Ornithology EIA Report Chapter. Addendum to the Offshore EIA Report. West of Orkney Windfarm.

Macarthur Green and Royal HaskoningDHV (2019). Cumulative Ornithological Collision Risk Database: May 2019. [excel spreadsheet]

MacArthur Green and Royal HaskoningDHV (2020). East Anglia ONE North and East Anglia TWO Offshore Windfarms. Offshore Ornithology Cumulative and In-Combination Collision Risk Update. ExA.AS-7.D1.V1. ScottishPower Renewables.

MacArthur Green, Royal HaskoningDHV, (2021). East Anglia TWO and East Anglia ONE North Offshore Windfarms: Updated Offshore Ornithology Cumulative and In-Combination Collision Risk and Displacement Assessment (30th November 2021).

McGregor, R.M., King, S., Donovan, C.R., Caneco, B., and Webb, A. (2018) A Stochastic Collision Risk Model for Seabirds in Flight. Marine Scotland.

Moray Offshore Windfarm (West) Ltd (2018) Offshore Ornithology Technical Report. Technical Appendix 10.1: Moray Offshore Environmental Impact Assessment Report.
Pavat, D., Harker, A.J., Humphries, G., Keogan, K., Webb, A. and Macleod, K.. (2023). Consideration of avoidance behaviour of northern gannet (Morus bassanus) in collision risk modelling for offshore wind farm impact assessments. NECR490. Natural England.
Pelagica and Cork Ecology (2022). Volume 2, Chapter 11 Offshore and Intertidal Ornithology. Berwick Bank Wind Farm Environmental Impact Assessment Report. SSE Renewables Berwick Bank Wind Farm.
Powergen Renewables Offshore Wind Ltd (2001). Scroby Sands Wind Farm Environmental Statement.
Royal HaskoningDHV (2019a) Appendix 12.3 Supplementary Information for the Cumulative Assessment. East Anglia ONE North Offshore Windfarm: Environmental Statement Volume 3. 6.3.12.3.
Royal HaskoningDHV (2021). Dudgeon and Sheringham Shoal Offshore Wind Farm Extension. Preliminary Environmental Information Report Volume 3. Appendix 13.2 - Supplementary Information to Inform the Offshore Ornithology Cumulative Impact Assessment. PB8164-RHD-ZZ-OF-RP-Z-0035. Equinor.
Royal HaskoningDHV, (2022). Sheringham Shoal and Dudgeon Offshore Wind Farm Extension Projects Environmental Statement: Volume 3, Appendix 11.2 - Information to Inform the Offshore Ornithology Cumulative Impact Assessment (No. C282- RH- Z- GA- 00073 6.3.11.2).
Royal HaskoningDHV (2023a). Sheringham Shoal and Dudgeon Offshore Wind Farm Extension Projects Collision Risk Modelling (CRM) Updates (EIA Context) Technical Note (Revision B) Deadline 3. PINS document no. 13.2. C282-RH-Z-GA-00226. Equinor.
RPS Group (2007). Gunfleet Sands 2 Offshore Wind Farm Environmental Statement. Dong Energy.
Seagreen (2020) Seagreen Alpha and Bravo Offshore Wind Farms Collision Risk Modelling Update. LF000009-CST-OF-RPT-0033. Seagreen Wind Energy.
Seagreen (2022) Annex 1 - Collision Risk Model for Seagreen Wind Energy Wind Farm. Seagreen S36C Application Screening report January 2022. Seagreen Wind Energy.
SNCBs 2024. Joint advice note from the Statutory Nature Conservation Bodies (SNCBs) regarding bird collision risk modelling for offshore wind developments. JNCC, Peterborough. Available at: https://hub.jncc.gov.uk/f7892820-0f84-4e96-9eff-168f93bd343d.
The Crown Estate, Womble Bond Dickinson, 2021. Headroom in Cumulative Offshore Windfarm Impacts for Seabirds: Legal Issues and Possible Solutions (Offshore Wind Evidence and Change Programme).

NORTH FALLS

Offshore Wind Farm

sse Renewables | RWE

HARNESSING THE POWER OF NORTH SEA WIND

North Falls Offshore Wind Farm Limited

A joint venture company owned equally by SSE Renewables and RWE.

To contact please email contact@northfallsoffshore.com

North Falls Offshore Wind Farm Limited Registered Address: Windmill Hill Business Park, Whitehill Way, Swindon, Wiltshire, SN5 6PB, United Kingdom

Registered in England and Wales Company Number: 12435947