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Volume 7B Proposed Development (Offshore) Appendices

Appendix 6-2 Offshore Ornithology Distributional Responses Technical Report
Annex 3 Distributional Responses Results (Caledonia South)

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Volume 7B Appendix 6-2 Annex 3 Distributional Responses Results (Caledonia South)

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Acronyms and Abbreviations

BDMPS	Biologically Defined Minimum Population Scales
OWF	Offshore Wind Farm
SNCB	Statutory Nature Conservation Body

1 Introduction

- 1.1.1.1 The results of the distribution response assessment for the Caledonia Offshore Wind Farm (OWF), specifically Caledonia South, are provided within this annex. Displacement matrices for key species as per the NatureScot (2020¹) guidance defined seasons are presented in Section 2.1, followed by non-breeding displacement matrices as per the seasonal definitions presented in Furness (2015²) in Section 2.2. The full distributional response assessment methodology is outlined in Section 2 of Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report.
- 1.1.1.2 Monthly apportioned abundance estimates of birds (in flight and on sea, and accounting for availability bias of birds on the water in the case of guillemot, razorbill and puffin) within the boundaries of the Caledonia South Site (i.e., Array Area of Caledonia South) plus a 2km buffer were used within the distributional response assessment, derived from the 24 months of Digital Aerial Survey data. For further information see Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report and Volume 7B, Appendix 6-1: Offshore Ornithology Baseline Characterisation Report.
- 1.1.1.3 Each cell in the matrices represents the potential mortality of birds following displacement from Caledonia South during a defined season by considering the following:
- The seasonal mean peak population within the impacted area;
 - The assumed percentage of birds displaced from the impacted area; and
 - The assumed percentage mortality amongst the displaced birds.
- 1.1.1.4 The values highlighted within the matrices are based on displacement and mortality rates considered the 'most realistic' mortality estimates as advised by the following:
- Guidance Approach (highlighted in dark blue); and
 - Applicant Approach (highlighted in yellow), which is being proposed by Caledonia Offshore Wind Farm Limited (i.e., the Applicant).
- 1.1.1.5 Cells highlighted in light blue represent overlapping estimates from both the Guidance Approach and Applicant Approach, as advised by the Statutory Nature Conservation Bodies (SNCB, 2022³) guidance regarding matrix presentation.
- 1.1.1.6 For a detailed justification of the displacement and mortality rates selected for the Applicant Approach, see Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report and Volume 7B, Appendix 6-2, Annex 4: Review of Relevant Evidence.

2 Results

2.1 Displacement Matrices: NatureScot Seasonal Definitions

2.1.1 Overview

2.1.1.1 Displacement matrices as per the defined seasons in the NatureScot Guidance Note 9 (NatureScot, 2020¹) within Caledonia South plus a 2km buffer are provided in the following sections for the following species:

- Kittiwake (*Rissa tridactyla*);
- Common guillemot (*Uria aalge*), hereafter 'guillemot';
- Razorbill (*Alca torda*);
- Puffin (*Fratercula arctica*); and
- Gannet (*Morus bassanus*).

2.1.1.2 It should be noted the Applicant included the Year 1 August count for puffin in the non-breeding season rather than during the breeding season as part of the Applicant Approach. This is due to the monthly abundance data suggesting the August abundance reflecting the potential migration of puffin, rather than individuals present in the breeding season. Matrices for puffin have also been presented with the Year 1 August count included in the breeding season as per the Guidance Approach, meaning that for this species, there are two separate sets of matrices.

2.1.1.3 For further information regarding the seasonal considerations within the distributional response assessment see Section 2.6 of Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report.

2.1.2 Kittiwake

Table 2-1: Kittiwake breeding season (Mid-April to August) displacement matrix (Caledonia South Site + 2km buffer) (Model-based).

Breeding Season Displacement Rate (%)	Mortality Rate (%)														
	1	2	3	5	10	20	30	40	50	60	70	80	90	100	
10															
20															
30															
40															
50															
60															
70															
80															
90															
100															

Note, outputs highlighted in dark blue represent the predicted annual mortality estimates as per the Guidance Approach. The Applicant remains of the view that kittiwake do not require assessment for distributional response and thus no Applicant Approach is presented. For further information regarding the Guidance and Applicant Approaches see Section 2.5 of Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report.

Table 2-2: Kittiwake non-breeding season (September to early-April) displacement matrix (Caledonia South Site + 2km buffer) (Design-based).

Non-Breeding Season		Mortality Rate (%)													
		1	2	3	5	10	20	30	40	50	60	70	80	90	100
Displacement Rate (%)	10	0	1	1	2	4	9	13	17	21	26	30	34	38	43
	20	1	2	3	4	9	17	26	34	43	51	60	68	77	85
	30	1	3	4	6	13	26	38	51	64	77	90	102	115	128
	40	2	3	5	9	17	34	51	68	85	102	120	137	154	171
	50	2	4	6	11	21	43	64	85	107	128	149	171	192	214
	60	3	5	8	13	26	51	77	102	128	154	179	205	231	256
	70	3	6	9	15	30	60	90	120	149	179	209	239	269	299
	80	3	7	10	17	34	68	102	137	171	205	239	273	307	342
	90	4	8	12	19	38	77	115	154	192	231	269	307	346	384
	100	4	9	13	21	43	85	128	171	214	256	299	342	384	427

Note, outputs highlighted in dark blue represent the predicted annual mortality estimates as per the Guidance Approach. The Applicant remains of the view that kittiwake do not require assessment for distributional response and thus no Applicant Approach is presented. For further information regarding the Guidance and Applicant Approaches see Section 2.5 of Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report.

2.1.1.3 Guillemot

Table 2-3: Guillemot breeding season (April to mid-August) displacement matrix (Caledonia South Site + 2km buffer) (Model-based).

Breeding Season		Mortality Rate (%)												
		10	20	30	40	50	60	70	80	90	100			
Displacement Rate (%)	1	2	3	5	10	20	30	40	50	60	70	80	90	100
	11	23	34	57	113	226	340	453	566	679	793	906	1,019	1,132
	23	45	68	113	226	453	679	906	1,132	1,359	1,585	1,812	2,038	2,265
	34	68	102	170	340	679	1,019	1,359	1,698	2,038	2,378	2,718	3,057	3,397
	45	91	136	226	453	906	1,359	1,812	2,265	2,718	3,170	3,623	4,076	4,529
	57	113	170	283	566	1,132	1,698	2,265	2,831	3,397	3,963	4,529	5,095	5,661
	68	136	204	340	679	1,359	2,038	2,718	3,397	4,076	4,756	5,435	6,114	6,794
	79	159	238	396	793	1,585	2,378	3,170	3,963	4,756	5,548	6,341	7,133	7,926
	91	181	272	453	906	1,812	2,718	3,623	4,529	5,435	6,341	7,247	8,153	9,058
	102	204	306	510	1,019	2,038	3,057	4,076	5,095	6,114	7,133	8,153	9,172	10,191
	113	226	340	566	1,132	2,265	3,397	4,529	5,661	6,794	7,926	9,058	10,191	11,323

Note, outputs highlighted in dark blue represent the predicted annual mortality estimates as per the Guidance Approach and those highlighted in yellow represent the predicted annual mortality estimates as per the Applicant Approach. For further information regarding the Guidance and Applicant Approaches see Section 2.5 of Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report.

Table 2-4: Guillemot non-breeding season (late-August to March) displacement matrix (Caledonia South Site + 2km buffer) (Model-based).

Non-breeding Season		Mortality Rate (%)												
		1	2	3	5	10	20	30	40	50	60	70	80	90
10	6	12	17	29	58	116	174	232	289	347	405	463	521	579
20	12	23	35	58	116	232	347	463	579	695	810	926	1,042	1,158
30	17	35	52	87	174	347	521	695	868	1,042	1,215	1,389	1,563	1,736
40	23	46	69	116	232	463	695	926	1,158	1,389	1,621	1,852	2,084	2,315
50	29	58	87	145	289	579	868	1,158	1,447	1,736	2,026	2,315	2,605	2,894
60	35	69	104	174	347	695	1,042	1,389	1,736	2,084	2,431	2,778	3,125	3,473
70	41	81	122	203	405	810	1,215	1,621	2,026	2,431	2,836	3,241	3,646	4,051
80	46	93	139	232	463	926	1,389	1,852	2,315	2,778	3,241	3,704	4,167	4,630
90	52	104	156	260	521	1,042	1,563	2,084	2,605	3,125	3,646	4,167	4,688	5,209
100	58	116	174	289	579	1,158	1,736	2,315	2,894	3,473	4,051	4,630	5,209	5,788

Note, outputs highlighted in dark blue represent the predicted annual mortality estimates as per the Guidance Approach and those highlighted in yellow represent the predicted annual mortality estimates as per the Applicant Approach. For further information regarding the Guidance and Applicant Approaches see Section 2.5 of Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report.

2.1.4 Razorbill

Table 2-5: Razorbill breeding season (April to mid-August) displacement matrix (Caledonia South Site + 2km buffer) (Model-based).

Breeding Season		Mortality Rate (%)												
		10	20	30	40	50	60	70	80	90	100			
Displacement Rate (%)	1	2	3	5	10	20	30	40	50	60	70	80	90	100
10	1	2	3	5	11	22	33	44	54	65	76	87	98	109
20	2	4	7	11	22	44	65	87	109	131	152	174	196	218
30	3	7	10	16	33	65	98	131	163	196	229	261	294	327
40	4	9	13	22	44	87	131	174	218	261	305	348	392	436
50	5	11	16	27	54	109	163	218	272	327	381	436	490	545
60	7	13	20	33	65	131	196	261	327	392	457	523	588	653
70	8	15	23	38	76	152	229	305	381	457	534	610	686	762
80	9	17	26	44	87	174	261	348	436	523	610	697	784	871
90	10	20	29	49	98	196	294	392	490	588	686	784	882	980
100	11	22	33	54	109	218	327	436	545	653	762	871	980	1,089

Note, outputs highlighted in dark blue represent the predicted annual mortality estimates as per the Guidance Approach and those highlighted in yellow represent the predicted annual mortality estimates as per the Applicant Approach. For further information regarding the Guidance and Applicant Approaches see Section 2.5 of Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report.

Table 2-6: Razorbill non-breeding season (late-August to March) displacement matrix (Caledonia South Site + 2km buffer) (Design-based).

Non-breeding Season Displacement Rate (%)		Mortality Rate (%)													
		1	2	3	5	10	20	30	40	50	60	70	80	90	100
10	1	2	2	2	4	8	16	24	32	40	48	56	64	72	80
20	2	3	5	8	16	32	48	64	80	96	112	128	145	161	161
30	2	5	7	12	24	48	72	96	120	145	169	193	217	241	241
40	3	6	10	16	32	64	96	128	161	193	225	257	289	321	321
50	4	8	12	20	40	80	120	161	201	241	281	321	361	402	402
60	5	10	14	24	48	96	145	193	241	289	337	385	434	482	482
70	6	11	17	28	56	112	169	225	281	337	393	450	506	562	562
80	6	13	19	32	64	128	193	257	321	385	450	514	578	642	642
90	7	14	22	36	72	145	217	289	361	434	506	578	650	723	723
100	8	16	24	40	80	161	241	321	402	482	562	642	723	803	803

Note, outputs highlighted in dark blue represent the predicted annual mortality estimates as per the Guidance Approach and those highlighted in yellow represent the predicted annual mortality estimates as per the Applicant Approach. For further information regarding the Guidance and Applicant Approaches see Section 2.5 of Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report.

2.1.5 Puffin

Guidance Approach

Table 2-7: Puffin breeding season (April to mid-August) displacement matrix (Caledonia South Site + 2km buffer) (Model-based).

Breeding Season Displacement Rate (%)	Mortality Rate (%)													
	1	2	3	5	10	20	30	40	50	60	70	80	90	100
10	1	2	4	6	12	24	36	48	60	73	85	97	109	121
20	2	5	7	12	24	48	73	97	121	145	169	193	218	242
30	4	7	11	18	36	73	109	145	181	218	254	290	326	363
40	5	10	15	24	48	97	145	193	242	290	338	387	435	483
50	6	12	18	30	60	121	181	242	302	363	423	483	544	604
60	7	15	22	36	73	145	218	290	363	435	508	580	653	725
70	8	17	25	42	85	169	254	338	423	508	592	677	761	846
80	10	19	29	48	97	193	290	387	483	580	677	774	870	967
90	11	22	33	54	109	218	326	435	544	653	761	870	979	1,088
100	12	24	36	60	121	242	363	483	604	725	846	967	1,088	1,209

Note, outputs highlighted in dark blue represent the predicted annual mortality estimates as per the Guidance Approach and those highlighted in yellow represent the predicted annual mortality estimates as per the Applicant Approach (though the final Applicant Approach outputs are presented in Table 2-9 and Table 2-10). For further information regarding the Guidance and Applicant Approaches see Section 2.5 of Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report.

Table 2-8: Puffin non-breeding season (late August to March) displacement matrix (Caledonia South Site + 2km buffer) (Design-based).

Non-breeding Season Displacement Rate (%)	Mortality Rate (%)													
	1	2	3	5	10	20	30	40	50	60	70	80	90	100
10	1	2	2	4	8	15	23	31	38	46	54	61	69	77
20	2	3	5	8	15	31	46	61	77	92	108	123	138	154
30	2	5	7	12	23	46	69	92	115	138	161	184	207	231
40	3	6	9	15	31	61	92	123	154	184	215	246	277	307
50	4	8	12	19	38	77	115	154	192	231	269	307	346	384
60	5	9	14	23	46	92	138	184	231	277	323	369	415	461
70	5	11	16	27	54	108	161	215	269	323	377	430	484	538
80	6	12	18	31	61	123	184	246	307	369	430	492	553	615
90	7	14	21	35	69	138	207	277	346	415	484	553	622	692
100	8	15	23	38	77	154	231	307	384	461	538	615	692	769

Note, outputs highlighted in dark blue represent the predicted annual mortality estimates as per the Guidance Approach and those highlighted in yellow represent the predicted annual mortality estimates as per the Applicant Approach (though the final Applicant Approach outputs are presented in Table 2-9 and Table 2-10). For further information regarding the Guidance and Applicant Approaches see Section 2.5 of Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report.

Applicant Approach

Table 2-9: Puffin breeding season (April to mid-March) displacement matrix (Caledonia South Site + 2km buffer) (Model-based).

Breeding Season	Mortality Rate (%)														
	Displacement Rate (%)	1	2	3	5	10	20	30	40	50	60	70	80	90	100
10	1	1	2	3	5	10	20	30	40	50	60	70	80	90	100
20	1	2	3	5	10	21	31	41	51	62	72	82	93	103	
30	2	3	5	8	15	31	46	62	77	93	108	123	139	154	
40	2	4	6	10	21	41	62	82	103	123	144	165	185	206	
50	3	5	8	13	26	51	77	103	129	154	180	206	231	257	
60	3	6	9	15	31	62	93	123	154	185	216	247	278	309	
70	4	7	11	18	36	72	108	144	180	216	252	288	324	360	
80	4	8	12	21	41	82	123	165	206	247	288	329	370	411	
90	5	9	14	23	46	93	139	185	231	278	324	370	417	463	
100	5	10	15	26	51	103	154	206	257	309	360	411	463	514	

Note, this table presents the Applicant Approach for puffin, whereby the Year 1 August abundance has been incorporated as part of the non-breeding season (see Table 2-10). Outputs highlighted in dark blue represent the predicted annual mortality estimates as per the Guidance Approach and those highlighted in yellow represent the predicted annual mortality estimates as per the Applicant Approach. For further information regarding the Guidance and Applicant Approaches see Section 2.5 of Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report.

Table 2-10: Puffin non-breeding season (late-August to March) displacement matrix (Caledonia South Site + 2km buffer) (Design-based).

Non-breeding Season Displacement Rate (%)	Mortality Rate (%)													
	1	2	3	5	10	20	30	40	50	60	70	80	90	100
10	2	3	5	9	17	35	52	69	86	104	121	138	155	173
20	7	10	17	26	35	69	104	138	173	207	242	276	311	345
30	10	16	26	35	52	104	155	207	259	311	362	414	466	518
40	14	21	35	43	69	138	207	276	345	414	483	552	621	690
50	17	26	43	52	86	173	259	345	431	518	604	690	776	863
60	21	31	52	60	104	207	311	414	518	621	725	828	932	1,035
70	24	36	60	69	121	242	362	483	604	725	845	966	1,087	1,208
80	28	41	69	78	138	276	414	552	690	828	966	1,104	1,242	1,380
90	31	47	78	86	155	311	466	621	776	932	1,087	1,242	1,398	1,553
100	35	52	86	104	173	345	518	690	863	1,035	1,208	1,380	1,553	1,726

Note, this table presents the Applicant Approach for puffin, whereby the Year 1 August abundance has been incorporated as part of the non-breeding season. Outputs highlighted in dark blue represent the predicted annual mortality estimates as per the Guidance Approach and those highlighted in yellow represent the predicted annual mortality estimates as per the Applicant Approach. For further information regarding the Guidance and Applicant Approaches see Section 2.5 of Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report.

2.1.1.6 Gannet

Table 2-11: Gannet breeding season (mid-March to September) displacement matrix (Caledonia South Site + 2km buffer) (Design-based).

Breeding Season	Mortality Rate (%)														
	Displacement Rate (%)	1	2	3	5	10	20	30	40	50	60	70	80	90	100
10	1	1	2	4	7	14	21	28	35	42	50	57	64	71	
20	1	3	4	7	14	28	42	57	71	85	99	113	127	142	
30	2	4	6	11	21	42	64	85	106	127	149	170	191	212	
40	3	6	8	14	28	57	85	113	142	170	198	226	255	283	
50	4	7	11	18	35	71	106	142	177	212	248	283	318	354	
60	4	8	13	21	42	85	127	170	212	255	297	340	382	425	
70	5	10	15	25	50	99	149	198	248	297	347	396	446	495	
80	6	11	17	28	57	113	170	226	283	340	396	453	509	566	
90	6	13	19	32	64	127	191	255	318	382	446	509	573	637	
100	7	14	21	35	71	142	212	283	354	425	495	566	637	708	

Note, outputs highlighted in dark blue represent the predicted annual mortality estimates as per the Guidance Approach and those highlighted in light blue represent the overlapping predicted annual mortality estimates from both the Guidance Approach and Applicant Approach. For further information regarding the Guidance and Applicant Approaches see Section 2.5 of Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report.

Table 2-12: Gannet non-breeding season (October to early March) displacement matrix (Caledonia South Site + 2km buffer) (Design-based).

Non-breeding Season Displacement Rate (%)	Mortality Rate (%)													
	1	2	3	5	10	20	30	40	50	60	70	80	90	100
10	0	0	1	1	2	4	5	7	9	11	13	15	16	18
20	0	1	1	2	4	7	11	15	18	22	26	29	33	37
30	1	1	2	3	5	11	16	22	27	33	38	44	49	55
40	1	1	2	4	7	15	22	29	37	44	51	58	66	73
50	1	2	3	5	9	18	27	37	46	55	64	73	82	91
60	1	2	3	5	11	22	33	44	55	66	77	88	99	110
70	1	3	4	6	13	26	38	51	64	77	89	102	115	128
80	1	3	4	7	15	29	44	58	73	88	102	117	131	146
90	2	3	5	8	16	33	49	66	82	99	115	131	148	164
100	2	4	5	9	18	37	55	73	91	110	128	146	164	183

Note, outputs highlighted in dark blue represent the predicted annual mortality estimates as per the Guidance Approach and those highlighted in light blue represent the overlapping predicted annual mortality estimates from both the Guidance Approach and Applicant Approach. For further information regarding the Guidance and Applicant Approaches see Section 2.5 of Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report.

2.2 Displacement Matrices: Furness (2015) Seasonal Definitions

2.2.1 Overview

2.2.1.1 Non-breeding displacement matrices as per the defined seasons Furness (2015²) for species with defined autumn passage, spring passage and winter periods are provided in the following sections for the following species:

- Kittiwake;
- Razorbill; and
- Gannet.

2.2.1.2 The Furness (2015²) seasons have been adapted and shortened to align with the NatureScot breeding seasons For further information regarding the seasonal considerations within the distributional response assessment see Section 2.6 of Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report.

2.2.1.3 It should be noted that for kittiwake, the Applicant has decided to include the Year 3 April count (04 April 2023) in the breeding season rather than during the spring migration breeding season. This is due to the April 2023 abundance being considered to reflect nest site attendance rather than individuals present in the spring migration.

2.2.2 Kittiwake

Table 2-13: Kittiwake autumn migration (September to December) displacement matrix (Caledonia South Site + 2km buffer) (Design-based).

Autumn Migration		Mortality Rate (%)													
		1	2	3	5	10	20	30	40	50	60	70	80	90	100
10	0	1	1	1	2	4	9	13	17	21	26	30	34	38	43
20	1	2	3	4	4	9	17	26	34	43	51	60	68	77	85
30	1	3	4	6	13	26	38	51	64	77	90	102	115	128	
40	2	3	5	9	17	34	51	68	85	102	120	137	154	171	
50	2	4	6	11	21	43	64	85	107	128	149	171	192	214	
60	3	5	8	13	26	51	77	102	128	154	179	205	231	256	
70	3	6	9	15	30	60	90	120	149	179	209	239	269	299	
80	3	7	10	17	34	68	102	137	171	205	239	273	307	342	
90	4	8	12	19	38	77	115	154	192	231	269	307	346	384	
100	4	9	13	21	43	85	128	171	214	256	299	342	384	427	

Note, outputs highlighted in dark blue represent the predicted annual mortality estimates as per the Guidance Approach. The Applicant remains of the view that kittiwake do not require assessment for distributional response and thus no Applicant Approach is presented. For further information regarding the Guidance and Applicant Approaches see Section 2.5 of Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report.

Table 2-14: Kittiwake spring migration (January to April) displacement matrix (Caledonia South Site + 2km buffer) (Design-based).

Spring Migration Displacement Rate (%)	Mortality Rate (%)													
	1	2	3	5	10	20	30	40	50	60	70	80	90	100
10	0	0	0	0	0	1	1	2	2	3	3	4	4	5
20	0	0	0	0	1	2	3	4	5	6	7	8	9	10
30	0	0	0	1	1	3	4	6	7	9	10	12	13	15
40	0	0	1	1	2	4	6	8	10	12	14	16	18	20
50	0	0	1	1	2	5	7	10	12	15	17	20	22	25
60	0	1	1	1	3	6	9	12	15	18	21	24	27	30
70	0	1	1	2	3	7	10	14	17	21	24	28	31	35
80	0	1	1	2	4	8	12	16	20	24	28	32	36	40
90	0	1	1	2	4	9	13	18	22	27	31	36	40	45
100	0	1	1	2	5	10	15	20	25	30	35	40	45	50

Note, outputs highlighted in dark blue represent the predicted annual mortality estimates as per the Guidance Approach. The Applicant remains of the view that kittiwake do not require assessment for distributional response and thus no Applicant Approach is presented. For further information regarding the Guidance and Applicant Approaches see Section 2.5 of Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report.

2.2.3 Razorbill

Table 2-15: Razorbill autumn migration (late-August to October) displacement matrix (Caledonia South Site + 2km buffer) (Design-based).

Autumn Migration		Mortality Rate (%)													
		10	20	30	40	50	60	70	80	90	100				
Displacement Rate (%)	1	2	3	5	10	20	30	40	50	60	70	80	90	100	
10	1	2	2	4	8	16	24	32	40	48	56	64	72	80	
20	2	3	5	8	16	32	48	64	80	96	112	128	145	161	
30	2	5	7	12	24	48	72	96	120	145	169	193	217	241	
40	3	6	10	16	32	64	96	128	161	193	225	257	289	321	
50	4	8	12	20	40	80	120	161	201	241	281	321	361	402	
60	5	10	14	24	48	96	145	193	241	289	337	385	434	482	
70	6	11	17	28	56	112	169	225	281	337	393	450	506	562	
80	6	13	19	32	64	128	193	257	321	385	450	514	578	642	
90	7	14	22	36	72	145	217	289	361	434	506	578	650	723	
100	8	16	24	40	80	161	241	321	402	482	562	642	723	803	

Note, outputs highlighted in dark blue represent the predicted annual mortality estimates rates as per the Guidance Approach and those highlighted in yellow represent the predicted annual mortality estimates as per the Applicant Approach. For further information regarding the Guidance and Applicant Approaches see Section 2.5 of Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report.

Table 2-16: Razorbill winter period (November to December) displacement matrix (Caledonia South Site + 2km buffer) (Design-based)..

Winter Period		Mortality Rate (%)													
		1	2	3	5	10	20	30	40	50	60	70	80	90	100
Displacement Rate (%)	10	0	0	0	1	2	3	5	7	8	10	11	13	15	16
	20	0	1	1	2	3	7	10	13	16	20	23	26	30	33
	30	0	1	1	2	5	10	15	20	25	30	34	39	44	49
	40	1	1	2	3	7	13	20	26	33	39	46	52	59	66
	50	1	2	2	4	8	16	25	33	41	49	57	66	74	82
	60	1	2	3	5	10	20	30	39	49	59	69	79	89	98
	70	1	2	3	6	11	23	34	46	57	69	80	92	103	115
	80	1	3	4	7	13	26	39	52	66	79	92	105	118	131
	90	1	3	4	7	15	30	44	59	74	89	103	118	133	148
	100	2	3	5	8	16	33	49	66	82	98	115	131	148	164

Note, outputs highlighted in dark blue represent the predicted annual mortality estimates as per the Guidance Approach and those highlighted in yellow represent the predicted annual mortality estimates as per the Applicant Approach. For further information regarding the Guidance and Applicant Approaches see Section 2.5 of Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report.

Table 2-17: Razorbill spring migration (January to March) displacement matrix (Caledonia South Site + 2km buffer) (Design-based).

Spring Migration		Mortality Rate (%)												
		10	20	30	40	50	60	70	80	90	100			
Displacement Rate (%)	1	2	3	5	10	20	30	40	50	60	70	80	90	100
10	0	1	1	1	3	5	8	10	13	15	18	20	23	25
20	1	1	2	3	5	10	15	20	25	30	35	40	45	50
30	1	2	2	4	8	15	23	30	38	45	53	60	68	75
40	1	2	3	5	10	20	30	40	50	60	70	80	90	100
50	1	3	4	6	13	25	38	50	63	75	88	100	113	126
60	2	3	5	8	15	30	45	60	75	90	105	120	136	151
70	2	4	5	9	18	35	53	70	88	105	123	141	158	176
80	2	4	6	10	20	40	60	80	100	120	141	161	181	201
90	2	5	7	11	23	45	68	90	113	136	158	181	203	226
100	3	5	8	13	25	50	75	100	126	151	176	201	226	251

Note, outputs highlighted in dark blue represent the predicted annual mortality estimates as per the Guidance Approach and those highlighted in yellow represent the predicted annual mortality estimates as per the Applicant Approach. For further information regarding the Guidance and Applicant Approaches see Section 2.5 of Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report.

2.2.4 Gannet

Table 2-18: Gannet autumn migration (October to November) displacement matrix (Caledonia South Site + 2km buffer) (Design-based).

Autumn Migration		Mortality Rate (%)												
		1	2	3	5	10	20	30	40	50	60	70	80	90
Displacement Rate (%)	1	2	3	5	10	20	30	40	50	60	70	80	90	100
10	0	0	1	1	2	4	5	7	9	11	13	15	16	18
20	0	1	1	2	4	7	11	15	18	22	26	29	33	37
30	1	1	2	3	5	11	16	22	27	33	38	44	49	55
40	1	1	2	4	7	15	22	29	37	44	51	58	66	73
50	1	2	3	5	9	18	27	37	46	55	64	73	82	91
60	1	2	3	5	11	22	33	44	55	66	77	88	99	110
70	1	3	4	6	13	26	38	51	64	77	89	102	115	128
80	1	3	4	7	15	29	44	58	73	88	102	117	131	146
90	2	3	5	8	16	33	49	66	82	99	115	131	148	164
100	2	4	5	9	18	37	55	73	91	110	128	146	164	183

Note, outputs highlighted in dark blue represent the predicted annual mortality estimates as per the Guidance Approach and those highlighted in light blue represent the overlapping predicted annual mortality estimates from both the Guidance Approach and Applicant Approach. For further information regarding the Guidance and Applicant Approaches see Section 2.5 of Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report.

Table 2-19: Gannet spring migration (December to mid-March) displacement matrix (Caledonia South Site + 2km buffer) (Design-based).

Spring Migration Displacement Rate (%)	Mortality Rate (%)													
	1	2	3	5	10	20	30	40	50	60	70	80	90	100
10	0	0	0	0	0	0	0	1	1	1	1	1	1	2
20	0	0	0	0	0	1	1	1	2	2	2	3	3	3
30	0	0	0	0	0	1	1	2	2	3	3	4	4	5
40	0	0	0	0	1	1	2	3	3	4	5	5	6	7
50	0	0	0	0	1	2	2	3	4	5	6	7	7	8
60	0	0	0	0	1	2	3	4	5	6	7	8	9	10
70	0	0	0	1	1	2	3	5	6	7	8	9	10	12
80	0	0	0	1	1	3	4	5	7	8	9	11	12	13
90	0	0	0	1	1	3	4	6	7	9	10	12	13	15
100	0	0	0	1	2	3	5	7	8	10	12	13	15	17

Note, outputs highlighted in dark blue represent the predicted annual mortality estimates as per the Guidance Approach and those highlighted in light blue represent the overlapping predicted annual mortality estimates from both the Guidance Approach and Applicant Approach. For further information regarding the Guidance and Applicant Approaches see Section 2.5 of Volume 7B, Appendix 6-2: Offshore Ornithology Distributional Responses Technical Report.

3 References

¹ NatureScot (2020) 'Guidance Note 9 - Guidance to support Offshore Wind Applications: Seasonal periods for Birds in the Scottish Marine Environment'. Available at:

<https://www.nature.scot/doc/guidance-note-9-guidance-support-offshore-wind-applications-seasonal-periods-birds-scottish-marine> (Accessed 15/05/2024)

² Furness, R.W. (2015) 'Non-breeding season populations of seabirds in UK waters: Population sizes for Biologically Defined Minimum Population Scales (BDMPS)'. Natural England Commissioned Reports, Number 164

³ Statutory Nature Conservation Bodies (SNCB) (2022) 'Joint SNCB Interim Displacement Advice Note'. Statutory Nature Conservation Bodies in this case comprising Natural Resources Wales, Department of Agriculture, Environment and Rural Affairs/Northern Ireland Environment Agency, Natural England, Scottish Natural Heritage (NatureScot) and Joint Nature Conservation Committee. Available at:

<https://data.jncc.gov.uk/data/9aecb87c-80c5-4cfb-9102-39f0228dcc9a/joint-sncb-interim-displacement-advice-note-2022.pdf> (Accessed 15/05/2024)

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