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Volume 7B Proposed Development (Offshore) Appendices

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

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

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Table of Contents

1	Introduction.....	1
2	Results	2
2.1	Displacement Matrices: NatureScot Seasonal Definitions.....	2
2.1.1	Overview	2
2.1.2	Kittiwake	3
2.1.3	Guillemot	5
2.1.4	Razorbill	7
2.1.5	Puffin	9
2.1.6	Gannet	13
2.2	Displacement Matrices: Furness (2015) Seasonal Definitions	15
2.2.1	Overview	15
2.2.2	Kittiwake	16
2.2.3	Razorbill	18
2.2.4	Gannet	21
3	References	23

List of Tables

Table 2-1: Kittiwake breeding season (Mid-April to August) displacement matrix (Caledonia North Site + 2km buffer) (Model-based).	3
Table 2-2: Kittiwake non-breeding season (September to early-April) displacement matrix (Caledonia North Site + 2km buffer) (Design-based).	4
Table 2-3: Guillemot breeding season (April to mid-August) displacement matrix (Caledonia North Site + 2km buffer) (Model-based).	5
Table 2-4: Guillemot non-breeding season (Late-August to March) displacement matrix (Caledonia North Site + 2km buffer) (Model-based).....	6
Table 2-5: Razorbill breeding season (April to mid-August) displacement matrix (Caledonia North Site + 2km buffer) (Model-based).	7
Table 2-6: Razorbill non-breeding season (Late-August to March) displacement matrix (Caledonia North Site + 2km buffer) (Design-based).	8
Table 2-7: Puffin breeding season (April to mid-August) displacement matrix (Caledonia North Site + 2km buffer) (Model-based).	9
Table 2-8: Puffin non-breeding season (Late-August to March) displacement matrix (Caledonia North Site + 2km buffer) (Design-based).	10
Table 2-9: Puffin breeding season (April to mid-August) displacement matrix (Caledonia North Site + 2km buffer) (Model-based).	11
Table 2-10: Puffin non-breeding season (Late-August to March) displacement matrix (Caledonia North Site + 2km buffer) (Design-based).	12
Table 2-11: Gannet breeding season (Mid-March to September) displacement matrix (Caledonia North Site + 2km buffer) (Design-based).	13
Table 2-12: Gannet non-breeding season (October to early-March) displacement matrix (Caledonia North Site + 2km buffer) (Design-based).	14
Table 2-15: Kittiwake autumn migration (September to December) displacement matrix (Caledonia North Site + 2km buffer) (Design-based).	16
Table 2-16: Kittiwake spring migration (January to mid-April) displacement matrix (Caledonia North Site + 2km buffer) (Design-based).	17
Table 2-17: Razorbill autumn migration (Late-August to October) displacement matrix (Caledonia North Site + 2km buffer) (Design-based).	18
Table 2-18: Razorbill winter period (November to December) displacement matrix (Caledonia North Site + 2km buffer) (Design-based).	19
Table 2-19: Razorbill spring migration (January to March) displacement matrix (Caledonia North Site + 2km buffer) (Design-based).	20

Table 2-20: Gannet autumn migration (October to November) displacement matrix
(Caledonia North Site + 2km buffer) (Design-based). 21

Table 2-21: Gannet spring migration (December to mid-March) displacement matrix
(Caledonia North Site + 2km buffer) (Design-based). 22

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 North, 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 North Site (i.e., Array Area of Caledonia North) 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 North 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 North 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 North 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	1	2	4	7	14	21	28	36	43	50	57	64	71
20	1	3	4	7	14	28	43	57	71	85	99	114	128	142
30	2	4	6	11	21	43	64	85	107	128	149	170	192	213
40	3	6	9	14	28	57	85	114	142	170	199	227	256	284
50	4	7	11	18	36	71	107	142	178	213	249	284	320	355
60	4	9	13	21	43	85	128	170	213	256	298	341	384	426
70	5	10	15	25	50	99	149	199	249	298	348	398	448	497
80	6	11	17	28	57	114	170	227	284	341	398	455	511	568
90	6	13	19	32	64	128	192	256	320	384	448	511	575	639
100	7	14	21	36	71	142	213	284	355	426	497	568	639	710

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 North 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	1	1	2	3	6	10	13	16	19	22	26	29	32
20	1	1	2	3	6	13	19	26	32	38	45	51	58	64
30	1	2	3	5	10	19	29	38	48	58	67	77	87	96
40	1	3	4	6	13	26	38	51	64	77	90	103	115	128
50	2	3	5	8	16	32	48	64	80	96	112	128	144	160
60	2	4	6	10	19	38	58	77	96	115	135	154	173	192
70	2	4	7	11	22	45	67	90	112	135	157	179	202	224
80	3	5	8	13	26	51	77	103	128	154	179	205	231	256
90	3	6	9	14	29	58	87	115	144	173	202	231	260	288
100	3	6	10	16	32	64	96	128	160	192	224	256	288	321

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.

2.1.3 Guillemot

Table 2-3: Guillemot breeding season (April to mid-August) displacement matrix (Caledonia North 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	7	14	22	36	72	144	217	289	361	433	505	578	650	722	
20	14	29	43	72	144	289	433	578	722	866	1,011	1,155	1,300	1,444	
30	22	43	65	108	217	433	650	866	1,083	1,300	1,516	1,733	1,949	2,166	
40	29	58	87	144	289	578	866	1,155	1,444	1,733	2,022	2,311	2,599	2,888	
50	36	72	108	181	361	722	1,083	1,444	1,805	2,166	2,527	2,888	3,249	3,610	
60	43	87	130	217	433	866	1,300	1,733	2,166	2,599	3,033	3,466	3,899	4,332	
70	51	101	152	253	505	1,011	1,516	2,022	2,527	3,033	3,538	4,043	4,549	5,054	
80	58	116	173	289	578	1,155	1,733	2,311	2,888	3,466	4,043	4,621	5,199	5,776	
90	65	130	195	325	650	1,300	1,949	2,599	3,249	3,899	4,549	5,199	5,848	6,498	
100	72	144	217	361	722	1,444	2,166	2,888	3,610	4,332	5,054	5,776	6,498	7,220	

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 North Site + 2km buffer) (Model-based).

Non-breeding Season Displacement Rate (%)	Mortality Rate (%)													
	1	2	3	5	10	20	30	40	50	60	70	80	90	100
10	1	3	4	7	14	29	43	57	72	86	100	115	129	143
20	3	6	9	14	29	57	86	115	143	172	200	229	258	286
30	4	9	13	21	43	86	129	172	215	258	301	344	387	430
40	6	11	17	29	57	115	172	229	286	344	401	458	516	573
50	7	14	21	36	72	143	215	286	358	430	501	573	644	716
60	9	17	26	43	86	172	258	344	430	516	601	687	773	859
70	10	20	30	50	100	200	301	401	501	601	702	802	902	1,002
80	11	23	34	57	115	229	344	458	573	687	802	917	1,031	1,146
90	13	26	39	64	129	258	387	516	644	773	902	1,031	1,160	1,289
100	14	29	43	72	143	286	430	573	716	859	1,002	1,146	1,289	1,432

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 North 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	3	4	9	18	26	35	44	53	62	70	79	88
20	2	4	5	9	18	35	53	70	88	106	123	141	158	176
30	3	5	8	13	26	53	79	106	132	158	185	211	237	264
40	4	7	11	18	35	70	106	141	176	211	246	281	317	352
50	4	9	13	22	44	88	132	176	220	264	308	352	396	440
60	5	11	16	26	53	106	158	211	264	317	369	422	475	528
70	6	12	18	31	62	123	185	246	308	369	431	492	554	616
80	7	14	21	35	70	141	211	281	352	422	492	563	633	704
90	8	16	24	40	79	158	237	317	396	475	554	633	712	791
100	9	18	26	44	88	176	264	352	440	528	616	704	791	879

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 North 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	3	4	7	14	29	43	58	72	87	101	116	130	145
20	3	6	9	14	29	58	87	116	145	174	202	231	260	289
30	4	9	13	22	43	87	130	174	217	260	304	347	390	434
40	6	12	17	29	58	116	174	231	289	347	405	463	521	578
50	7	14	22	36	72	145	217	289	362	434	506	578	651	723
60	9	17	26	43	87	174	260	347	434	521	607	694	781	868
70	10	20	30	51	101	202	304	405	506	607	709	810	911	1,012
80	12	23	35	58	116	231	347	463	578	694	810	925	1,041	1,157
90	13	26	39	65	130	260	390	521	651	781	911	1,041	1,171	1,301
100	14	29	43	72	145	289	434	578	723	868	1,012	1,157	1,301	1,446

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 North 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	3	4	7	13	26	39	52	65	79	92	105	118	131
20	3	5	8	13	26	52	79	105	131	157	183	209	236	262
30	4	8	12	20	39	79	118	157	196	236	275	314	353	393
40	5	10	16	26	52	105	157	209	262	314	366	419	471	524
50	7	13	20	33	65	131	196	262	327	393	458	524	589	654
60	8	16	24	39	79	157	236	314	393	471	550	628	707	785
70	9	18	27	46	92	183	275	366	458	550	641	733	825	916
80	10	21	31	52	105	209	314	419	524	628	733	838	942	1,047
90	12	24	35	59	118	236	353	471	589	707	825	942	1,060	1,178
100	13	26	39	65	131	262	393	524	654	785	916	1,047	1,178	1,309

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 North 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	1	2	4	7	15	22	30	37	44	52	59	66	74
20	1	3	4	7	15	30	44	59	74	89	103	118	133	148
30	2	4	7	11	22	44	66	89	111	133	155	177	199	222
40	3	6	9	15	30	59	89	118	148	177	207	236	266	295
50	4	7	11	18	37	74	111	148	185	222	258	295	332	369
60	4	9	13	22	44	89	133	177	222	266	310	354	399	443
70	5	10	16	26	52	103	155	207	258	310	362	414	465	517
80	6	12	18	30	59	118	177	236	295	354	414	473	532	591
90	7	13	20	33	66	133	199	266	332	399	465	532	598	665
100	7	15	22	37	74	148	222	295	369	443	517	591	665	739

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-August) displacement matrix (Caledonia North 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	0	1	1	2	4	7	11	15	18	22	26	29	33	37
20	1	1	2	4	7	15	22	29	37	44	51	59	66	73
30	1	2	3	6	11	22	33	44	55	66	77	88	99	110
40	1	3	4	7	15	29	44	59	73	88	103	117	132	147
50	2	4	6	9	18	37	55	73	92	110	129	147	165	184
60	2	4	7	11	22	44	66	88	110	132	154	176	198	220
70	3	5	8	13	26	51	77	103	129	154	180	206	231	257
80	3	6	9	15	29	59	88	117	147	176	206	235	264	294
90	3	7	10	17	33	66	99	132	165	198	231	264	297	330
100	4	7	11	18	37	73	110	147	184	220	257	294	330	367

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. The outputs highlighted in dark blue represent the predicted upper and lower annual mortality estimates as per the Guidance Approach and the output highlighted in yellow represents 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 North 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	4	6	9	19	38	56	75	94	113	131	150	169	188
20	4	8	11	19	38	75	113	150	188	225	263	301	338	376
30	6	11	17	28	56	113	169	225	282	338	394	451	507	564
40	8	15	23	38	75	150	225	301	376	451	526	601	676	751
50	9	19	28	47	94	188	282	376	470	564	657	751	845	939
60	11	23	34	56	113	225	338	451	564	676	789	902	1,014	1,127
70	13	26	39	66	131	263	394	526	657	789	920	1,052	1,183	1,315
80	15	30	45	75	150	301	451	601	751	902	1,052	1,202	1,353	1,503
90	17	34	51	85	169	338	507	676	845	1,014	1,183	1,353	1,522	1,691
100	19	38	56	94	188	376	564	751	939	1,127	1,315	1,503	1,691	1,879

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.

2.1.6 Gannet

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

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	5	7	10	12	14	17	19	22	24
20	0	1	1	2	5	10	14	19	24	29	34	38	43	48
30	1	1	2	4	7	14	22	29	36	43	50	58	65	72
40	1	2	3	5	10	19	29	38	48	58	67	77	86	96
50	1	2	4	6	12	24	36	48	60	72	84	96	108	120
60	1	3	4	7	14	29	43	58	72	86	101	115	130	144
70	2	3	5	8	17	34	50	67	84	101	118	134	151	168
80	2	4	6	10	19	38	58	77	96	115	134	154	173	192
90	2	4	6	11	22	43	65	86	108	130	151	173	194	216
100	2	5	7	12	24	48	72	96	120	144	168	192	216	240

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 North 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	6	8	10	12	14	16	18	20
20	0	1	1	2	4	8	12	16	20	23	27	31	35	39
30	1	1	2	3	6	12	18	23	29	35	41	47	53	59
40	1	2	2	4	8	16	23	31	39	47	55	62	70	78
50	1	2	3	5	10	20	29	39	49	59	68	78	88	98
60	1	2	4	6	12	23	35	47	59	70	82	94	105	117
70	1	3	4	7	14	27	41	55	68	82	96	109	123	137
80	2	3	5	8	16	31	47	62	78	94	109	125	140	156
90	2	4	5	9	18	35	53	70	88	105	123	140	158	176
100	2	4	6	10	20	39	59	78	98	117	137	156	176	195

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 (2015¹) 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 2-15: Kittiwake autumn migration (September to December) displacement matrix (Caledonia North Site + 2km buffer) (Design-based).

Autumn Migration Displacement Rate (%)	Mortality Rate (%)													
	1	2	3	5	10	20	30	40	50	60	70	80	90	100
10	0	1	1	2	3	6	10	13	16	19	22	26	29	32
20	1	1	2	3	6	13	19	26	32	38	45	51	58	64
30	1	2	3	5	10	19	29	38	48	58	67	77	87	96
40	1	3	4	6	13	26	38	51	64	77	90	103	115	128
50	2	3	5	8	16	32	48	64	80	96	112	128	144	160
60	2	4	6	10	19	38	58	77	96	115	135	154	173	192
70	2	4	7	11	22	45	67	90	112	135	157	179	202	224
80	3	5	8	13	26	51	77	103	128	154	179	205	231	256
90	3	6	9	14	29	58	87	115	144	173	202	231	260	288
100	3	6	10	16	32	64	96	128	160	192	224	256	288	321

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 2-16: Kittiwake spring migration (January to mid-April) displacement matrix (Caledonia North 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	1	2	2	3	4	5	5	6	7	8
20	0	0	0	1	2	3	5	6	8	9	11	12	14	15
30	0	0	1	1	2	5	7	9	11	14	16	18	20	23
40	0	1	1	2	3	6	9	12	15	18	21	24	27	30
50	0	1	1	2	4	8	11	15	19	23	26	30	34	38
60	0	1	1	2	5	9	14	18	23	27	32	36	41	45
70	1	1	2	3	5	11	16	21	26	32	37	42	48	53
80	1	1	2	3	6	12	18	24	30	36	42	48	54	60
90	1	1	2	3	7	14	20	27	34	41	48	54	61	68
100	1	2	2	4	8	15	23	30	38	45	53	60	68	76

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 2-17: Razorbill autumn migration (Late-August to October) displacement matrix (Caledonia North Site + 2km buffer) (Design-based).

Autumn Migration Displacement Rate (%)	Mortality Rate (%)													
	1	2	3	5	10	20	30	40	50	60	70	80	90	100
10	1	3	4	7	13	26	39	53	66	79	92	105	118	132
20	3	5	8	13	26	53	79	105	132	158	184	210	237	263
30	4	8	12	20	39	79	118	158	197	237	276	316	355	395
40	5	11	16	26	53	105	158	210	263	316	368	421	473	526
50	7	13	20	33	66	132	197	263	329	395	460	526	592	658
60	8	16	24	39	79	158	237	316	395	473	552	631	710	789
70	9	18	28	46	92	184	276	368	460	552	644	736	828	921
80	11	21	32	53	105	210	316	421	526	631	736	842	947	1,052
90	12	24	36	59	118	237	355	473	592	710	828	947	1,065	1,184
100	13	26	39	66	132	263	395	526	658	789	921	1,052	1,184	1,315

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 2-18: Razorbill winter period (November to December) displacement matrix (Caledonia North Site + 2km buffer) (Design-based).

Winter Period Displacement Rate (%)	Mortality Rate (%)													
	1	2	3	5	10	20	30	40	50	60	70	80	90	100
10	0	0	0	1	1	3	4	5	6	8	9	10	11	13
20	0	1	1	1	3	5	8	10	13	15	18	20	23	25
30	0	1	1	2	4	8	11	15	19	23	26	30	34	38
40	1	1	2	3	5	10	15	20	25	30	35	40	45	50
50	1	1	2	3	6	13	19	25	31	38	44	50	56	63
60	1	2	2	4	8	15	23	30	38	45	53	60	68	75
70	1	2	3	4	9	18	26	35	44	53	61	70	79	88
80	1	2	3	5	10	20	30	40	50	60	70	80	90	100
90	1	2	3	6	11	23	34	45	56	68	79	90	102	113
100	1	3	4	6	13	25	38	50	63	75	88	100	113	126

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 2-19: Razorbill spring migration (January to March) displacement matrix (Caledonia North 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	1	1	2	3	7	10	14	17	21	24	28	31	35
20	1	1	2	3	7	14	21	28	35	41	48	55	62	69
30	1	2	3	5	10	21	31	41	52	62	72	83	93	104
40	1	3	4	7	14	28	41	55	69	83	97	110	124	138
50	2	3	5	9	17	35	52	69	86	104	121	138	155	173
60	2	4	6	10	21	41	62	83	104	124	145	166	186	207
70	2	5	7	12	24	48	72	97	121	145	169	193	217	242
80	3	6	8	14	28	55	83	110	138	166	193	221	248	276
90	3	6	9	16	31	62	93	124	155	186	217	248	279	311
100	3	7	10	17	35	69	104	138	173	207	242	276	311	345

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 2-20: Gannet autumn migration (October to November) displacement matrix (Caledonia North Site + 2km buffer) (Design-based).

Autumn Migration 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	6	8	10	12	14	16	18	20
20	0	1	1	2	4	8	12	16	20	23	27	31	35	39
30	1	1	2	3	6	12	18	23	29	35	41	47	53	59
40	1	2	2	4	8	16	23	31	39	47	55	62	70	78
50	1	2	3	5	10	20	29	39	49	59	68	78	88	98
60	1	2	4	6	12	23	35	47	59	70	82	94	105	117
70	1	3	4	7	14	27	41	55	68	82	96	109	123	137
80	2	3	5	8	16	31	47	62	78	94	109	125	140	156
90	2	4	5	9	18	35	53	70	88	105	123	140	158	176
100	2	4	6	10	20	39	59	78	98	117	137	156	176	195

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 2-21: Gannet spring migration (December to mid-March) displacement matrix (Caledonia North 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	1	1	1	1	1	2	2	2
20	0	0	0	0	0	1	1	2	2	2	3	3	4	4
30	0	0	0	0	1	1	2	2	3	4	4	5	5	6
40	0	0	0	0	1	2	2	3	4	5	6	6	7	8
50	0	0	0	1	1	2	3	4	5	6	7	8	9	10
60	0	0	0	1	1	2	4	5	6	7	8	10	11	12
70	0	0	0	1	1	3	4	6	7	8	10	11	13	14
80	0	0	0	1	2	3	5	6	8	10	11	13	14	16
90	0	0	1	1	2	4	5	7	9	11	13	14	16	18
100	0	0	1	1	2	4	6	8	10	12	14	16	18	20

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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