



EIAR Addendum

Appendix 10-H Kitiwake
Displacement Matrices



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APPENDIX 10-H KITTIWAKE DISPLACEMENT MATRICES

1 Introduction

1. Codling Wind Park Limited (hereafter 'the Applicant') is proposing to develop the Codling Wind Park (CWP) Project, which is located in the Irish sea approximately 13 - 22 km off the east coast of Ireland, at County Wicklow.
2. On Friday 6th September 2024 CWPL (referred to hereafter as the 'Applicant') applied for planning permission to An Coimisiún Pleanála (ACP) (referred to hereafter as the 'Commission') under Section 291 of the Planning and Development Act (PDA) 2000, as amended, for the construction, operation and decommissioning of the CWP Project.
3. On 1st August 2025, having reviewed the application documentation, including the Environmental Impact Assessment Report (EIAR) and the Natura Impact Statement (NIS), the Commission issued a Further Information Request (FIR) in relation to the CWP Project.
4. This appendix forms part of the Applicant's response to Item 7j of the Commission's FIR (see **FIR Response Document**) and supports **Section 10** of **EIAR Addendum**.
5. Specifically, this appendix presents seasonal displacement matrices which have been calculated using kittiwake (*Rissa tridactyla*) abundances during each of this species' bio-seasons, as taken from Furness (2015).

1.1 Kittiwake bio-seasonal abundance

6. The bio-seasonal abundances of kittiwake within the CWP array site, plus a 2 km buffer, are shown in **Table 1**, below. These abundances were used as a basis for the calculation of the seasonal kittiwake displacement matrices.

Table 1 Kittiwake bio-seasonal abundances within the array site plus a 2 km buffer

Bio-season	Months	Abundance
Return migration	December to March	585.804
Migration-free breeding season	April to August	543.039
Post-breeding migration	September to November	1,362.959

1.2 Bio-seasonal kittiwake displacement matrices

7. **Table 2** presents the displacement matrix for kittiwake during the return migration (December to March) bio-season. Kittiwake abundance during this period is estimated from the array site plus a 2 km buffer. The highlighted values represent displacement scenarios of 30% displacement with 1% and 3% mortality rates, which align with the values presented in NatureScot (2023) as requested within the FIR.

Table 2 Kittiwake return migration displacement matrix

Return migration		Mortality (%)														
		0.5	1	2	3	5	10	20	30	40	50	60	70	80	90	100
Displacement (%)	1	0.029	0.059	0.117	0.176	0.293	0.586	1.172	1.757	2.343	2.929	3.515	4.101	4.686	5.272	5.858
	10	0.293	0.586	1.172	1.757	2.929	5.858	11.716	17.574	23.432	29.290	35.148	41.006	46.864	52.722	58.580
	20	0.586	1.172	2.343	3.515	5.858	11.716	23.432	35.148	46.864	58.580	70.296	82.013	93.729	105.445	117.161
	30	0.879	1.757	3.515	5.272	8.787	17.574	35.148	52.722	70.296	87.871	105.445	123.019	140.593	158.167	175.741
	40	1.172	2.343	4.686	7.030	11.716	23.432	46.864	70.296	93.729	117.161	140.593	164.025	187.457	210.889	234.322
	50	1.465	2.929	5.858	8.787	14.645	29.290	58.580	87.871	117.161	146.451	175.741	205.031	234.322	263.612	292.902
	60	1.757	3.515	7.030	10.544	17.574	35.148	70.296	105.445	140.593	175.741	210.889	246.038	281.186	316.334	351.482
	70	2.050	4.101	8.201	12.302	20.503	41.006	82.013	123.019	164.025	205.031	246.038	287.044	328.050	369.057	410.063
	80	2.343	4.686	9.373	14.059	23.432	46.864	93.729	140.593	187.457	234.322	281.186	328.050	374.915	421.779	468.643
	90	2.636	5.272	10.544	15.817	26.361	52.722	105.445	158.167	210.889	263.612	316.334	369.057	421.779	474.501	527.224
100	2.929	5.858	11.716	17.574	29.290	58.580	117.161	175.741	234.322	292.902	351.482	410.063	468.643	527.224	585.804	

8. **Table 3** presents the displacement matrix for kittiwake during the migration-free breeding season (April to August) bio-season. Kittiwake abundance during this period is estimated from the array site plus a 2 km buffer. The highlighted values represent displacement scenarios of 30% displacement with 1% and 3% mortality rates, which align with the values presented in NatureScot (2023) as requested within the FIR.

Table 3 Kittiwake migration-free breeding season displacement matrix

Migration-free breeding season		Mortality (%)														
		0.5	1	2	3	5	10	20	30	40	50	60	70	80	90	100
Displacement (%)	1	0.027	0.054	0.109	0.163	0.272	0.543	1.086	1.629	2.172	2.715	3.258	3.801	4.344	4.887	5.430
	10	0.272	0.543	1.086	1.629	2.715	5.430	10.861	16.291	21.722	27.152	32.582	38.013	43.443	48.874	54.304
	20	0.543	1.086	2.172	3.258	5.430	10.861	21.722	32.582	43.443	54.304	65.165	76.025	86.886	97.747	108.608
	30	0.815	1.629	3.258	4.887	8.146	16.291	32.582	48.874	65.165	81.456	97.747	114.038	130.329	146.621	162.912
	40	1.086	2.172	4.344	6.516	10.861	21.722	43.443	65.165	86.886	108.608	130.329	152.051	173.772	195.494	217.216
	50	1.358	2.715	5.430	8.146	13.576	27.152	54.304	81.456	108.608	135.760	162.912	190.064	217.216	244.368	271.520
	60	1.629	3.258	6.516	9.775	16.291	32.582	65.165	97.747	130.329	162.912	195.494	228.076	260.659	293.241	325.823
	70	1.901	3.801	7.603	11.404	19.006	38.013	76.025	114.038	152.051	190.064	228.076	266.089	304.102	342.115	380.127
	80	2.172	4.344	8.689	13.033	21.722	43.443	86.886	130.329	173.772	217.216	260.659	304.102	347.545	390.988	434.431
	90	2.444	4.887	9.775	14.662	24.437	48.874	97.747	146.621	195.494	244.368	293.241	342.115	390.988	439.862	488.735
100	2.715	5.430	10.861	16.291	27.152	54.304	108.608	162.912	217.216	271.520	325.823	380.127	434.431	488.735	543.039	

9. **Table 4** presents the displacement matrix for kittiwake during the post-breeding migration (September to November) bio-season. Kittiwake abundance during this period is estimated from the array site plus a 2 km buffer. The highlighted values represent displacement scenarios of 30% displacement with 1% and 3% mortality rates, which align with the values presented in NatureScot (2023) as requested within the FIR.

Table 4 Kittiwake post-breeding migration displacement matrix

Post-breeding migration		Mortality (%)														
		0.5	1	2	3	5	10	20	30	40	50	60	70	80	90	100
Displacement (%)	1	0.068	0.136	0.273	0.409	0.681	1.363	2.726	4.089	5.452	6.815	8.178	9.541	10.904	12.267	13.630
	10	0.681	1.363	2.726	4.089	6.815	13.630	27.259	40.889	54.518	68.148	81.778	95.407	109.037	122.666	136.296
	20	1.363	2.726	5.452	8.178	13.630	27.259	54.518	81.778	109.037	136.296	163.555	190.814	218.073	245.333	272.592
	30	2.044	4.089	8.178	12.267	20.444	40.889	81.778	122.666	163.555	204.444	245.333	286.221	327.110	367.999	408.888
	40	2.726	5.452	10.904	16.356	27.259	54.518	109.037	163.555	218.073	272.592	327.110	381.629	436.147	490.665	545.184
	50	3.407	6.815	13.630	20.444	34.074	68.148	136.296	204.444	272.592	340.740	408.888	477.036	545.184	613.332	681.480
	60	4.089	8.178	16.356	24.533	40.889	81.778	163.555	245.333	327.110	408.888	490.665	572.443	654.220	735.998	817.775
	70	4.770	9.541	19.081	28.622	47.704	95.407	190.814	286.221	381.629	477.036	572.443	667.850	763.257	858.664	954.071
	80	5.452	10.904	21.807	32.711	54.518	109.037	218.073	327.110	436.147	545.184	654.220	763.257	872.294	981.330	1090.367
	90	6.133	12.267	24.533	36.800	61.333	122.666	245.333	367.999	490.665	613.332	735.998	858.664	981.330	1103.997	1226.663
100	6.815	13.630	27.259	40.889	68.148	136.296	272.592	408.888	545.184	681.480	817.775	954.071	1090.367	1226.663	1362.959	

1.3 Summary of matrix results

10. **Table 5** provides a summary of annual kittiwake mortality within the array site plus a 2 km buffer as derived from the bio-seasonal displacement matrices presented in **Section 1.2**, above.

Table 5 Summary of bio-seasonal displacement matrix results and estimated annual kittiwake mortality

Bio-season	Annual kittiwake mortality	
	30% displacement, 1% mortality	30% displacement, 3% mortality
Return migration	1.757	5.272
Migration-free breeding season	1.629	4.887
Post-breeding migration	4.089	12.267
Annual mortality	7.475	22.426

2 References

11. 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 Report, No. 164. Natural England, 22 January 2015
12. NatureScot (2023) Guidance Note 8: Guidance to support Offshore Wind Applications: Marine Ornithology Advice for assessing the distributional responses, displacement and barrier effects of Marine birds. Version 1.