



**Vattenfall Wind Power Ltd**

**Thanet Extension Offshore Wind Farm**

**Annex 4-3: Range of Displacement Matrices  
for Seabird Species Recorded in Thanet  
Extension**

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Thanet Extension

June, 2018

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**Thanet Extension Environmental Statement**

**Volume 4, Chapter 4, Annex 3**

**Range of Displacement Matrices for Seabird Species**

**Recorded in Thanet Extension**

**Vattenfall Wind Power Ltd**

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## 1. Introduction

This annex presents the baseline data on the four key species screened in for the assessment of potential disturbance and displacement as a result of Thanet Extension during the construction or operational phases. It provides displacement matrices using abundances and densities recorded from aerial digital surveys of the Thanet Extension site and from an area that extended 4 km around the site.

The main assessment on disturbance and displacement is found with the Environmental Statement (ES) Chapter on offshore ornithology (Volume 6, Chapter 4) and that relies on site specific data collated and analysed from the post-consent monitoring survey programme (Royal HaskoningDHV, 2013). That site specific data provided evidence that during the construction phase there was no displacement of red-throated diver outside the footprint of the Thanet offshore wind farm, that there was evidence for displacement of razorbill up to 500 m outside the footprint and for guillemot up to 1 km outside the footprint. During the operational phase there was no displacement of red-throated diver outside the footprint of the Thanet offshore wind farm, that there was evidence for displacement of razorbill up to 1 km outside the footprint and for guillemot up to 1 km outside the footprint.

The size of the potential displacement buffers applied in this report are in response to comments from Natural England and the RSPB that generic buffers of 4 km for red-throated diver and 2 km for gannet and auks should be included in the information supplied with the ES.

Following consultation with Natural England (NE) and the RSPB, the following species were identified as the 'key' species for inclusion in this Thanet Extension disturbance and displacement assessment:

- Red-throated diver;
- Gannet;
- Razorbill; and
- Guillemot.

In order to provide a more visual approach to presenting data on the species considered for disturbance and displacement within the tables of this report a colour coding has been used to represent different bio-seasons. Each species is subject to different months being considered to be part of different bio-seasons as well as the number of bio-seasons varying also.



The colours used to define the four bio-seasons are presented in Table 1.

**Table 1 Bio-season colour coding**

Bio-season
Migration-spring (Green)
Non-migratory Breeding (Yellow)
Migration-autumn (Orange)
Non-breeding (Grey/Blue)

The data used to underpin the four key species' abundance / density estimates and spatial distribution were collected through 24 months of aerial digital surveys completed for the Thanet Extension site and from an area that extended 4 km around the site (APEM, 2018). The data is presented in Table 2 split into bio-season mean peaks, with bio-seasons based upon those presented in Furness (2015).

**Table 2 Bio-season Mean Peak Abundance and Density Estimates of key bird species for Thanet Extension disturbance and displacement assessment.**

Bio-season	Survey Area	Red-throated diver		Gannet		Razorbill		Guillemot	
		Abundance estimate	Density Estimate	Abundance estimate	Density Estimate	Abundance estimate	Density Estimate	Abundance estimate	Density Estimate
Migration-Spring	Thanet Extension	44	0.60	<b>96</b>	<b>1.31</b>	<b>29</b>	<b>0.40</b>	<b>884</b>	<b>12.14</b>
	4 km Buffer	217	1.03	<b>384</b>	<b>1.81</b>	<b>215</b>	<b>1.02</b>	<b>1,713</b>	<b>8.09</b>
Non-migratory Breeding	Thanet Extension	0	0.00	0	0.00	0	0.00	88	1.12
	4 km Buffer	0	0.00	27	0.13	0	0.00	339	1.60
Migration-Autumn	Thanet Extension	0	0.00	77	1.06	4	0.05	5	0.06
	4 km Buffer	0	0.00	324	1.53	52	0.25	24	0.11
Non-breeding	Thanet Extension	<b>194</b>	<b>2.66</b>	n/a		28	0.38	9	0.12
	4 km Buffer	<b>241</b>	<b>1.14</b>			71	0.33	110	0.52

Table Note: Peak bio-season highlighted in bold.

## 2. Red-throated diver displacement matrices

**Table 3** Displacement matrix presenting the number of red-throated divers in the Thanet Extension site only, during the Migration-spring bio-season.

Displacement (%)	Mortality Rates (%)												
	0	1	5	10	20	30	40	50	60	70	80	90	100
0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	1	1	2	2	3	3	4	4	4
20	0	0	0	1	2	3	4	4	5	6	7	8	9
30	0	0	1	1	3	4	5	7	8	9	11	12	13
40	0	0	1	2	4	5	7	9	11	12	14	16	18
50	0	0	1	2	4	7	9	11	13	15	18	20	22
60	0	0	1	3	5	8	11	13	16	18	21	24	26
70	0	0	2	3	6	9	12	15	18	22	25	28	31
80	0	0	2	4	7	11	14	18	21	25	28	32	35
90	0	0	2	4	8	12	16	20	24	28	32	36	40
100	0	0	2	4	9	13	18	22	26	31	35	40	44

**Table 4** Displacement matrix presenting the number of red-throated divers in the Thanet Extension 4 km Buffer only, during the Migration-spring bio-season.

Displacement (%)	Mortality Rates (%)												
	0	1	5	10	20	30	40	50	60	70	80	90	100
0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	1	1	1	1	2	2	2	2
10	0	0	1	2	4	7	9	11	13	15	17	20	22
20	0	0	2	4	9	13	17	22	26	30	35	39	43
30	0	1	3	7	13	20	26	33	39	46	52	59	65
40	0	1	4	9	17	26	35	43	52	61	69	78	87
50	0	1	5	11	22	33	43	54	65	76	87	98	109
60	0	1	7	13	26	39	52	65	78	91	104	117	130
70	0	2	8	15	30	46	61	76	91	106	122	137	152
80	0	2	9	17	35	52	69	87	104	122	139	156	174
90	0	2	10	20	39	59	78	98	117	137	156	176	195
100	0	2	11	22	43	65	87	109	130	152	174	195	217

**Table 5 Displacement matrix presenting the number of red-throated divers in the Thanet Extension site only, during the Winter bio-season.**

Displacement (%)	Mortality Rates (%)												
	0	1	5	10	20	30	40	50	60	70	80	90	100
0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	1	1	1	1	1	2	2	2
10	0	0	1	2	4	6	8	10	12	14	16	17	19
20	0	0	2	4	8	12	16	19	23	27	31	35	39
30	0	1	3	6	12	17	23	29	35	41	47	52	58
40	0	1	4	8	16	23	31	39	47	54	62	70	78
50	0	1	5	10	19	29	39	49	58	68	78	87	97
60	0	1	6	12	23	35	47	58	70	81	93	105	116
70	0	1	7	14	27	41	54	68	81	95	109	122	136
80	0	2	8	16	31	47	62	78	93	109	124	140	155
90	0	2	9	17	35	52	70	87	105	122	140	157	175
100	0	2	10	19	39	58	78	97	116	136	155	175	194

**Table 6 Displacement matrix presenting the number of red-throated divers in the Thanet Extension 4 km Buffer only, during the Winter bio-season.**

Displacement (%)	Mortality Rates (%)												
	0	1	5	10	20	30	40	50	60	70	80	90	100
0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	1	1	1	1	2	2	2	2
10	0	0	1	2	5	7	10	12	14	17	19	22	24
20	0	0	2	5	10	14	19	24	29	34	39	43	48
30	0	1	4	7	14	22	29	36	43	51	58	65	72
40	0	1	5	10	19	29	39	48	58	67	77	87	96
50	0	1	6	12	24	36	48	60	72	84	96	108	121
60	0	1	7	14	29	43	58	72	87	101	116	130	145
70	0	2	8	17	34	51	67	84	101	118	135	152	169
80	0	2	10	19	39	58	77	96	116	135	154	174	193
90	0	2	11	22	43	65	87	108	130	152	174	195	217
100	0	2	12	24	48	72	96	121	145	169	193	217	241

### 3. Gannet displacement matrices

**Table 7** Displacement matrix presenting the number of gannets in the Thanet Extension site only, during the Migration-spring bio-season.

Displacement (%)	Mortality Rates (%)															
	0	1	2	3	4	5	10	20	30	40	50	60	70	80	90	100
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1
10	0	0	0	0	0	0	1	2	3	4	5	6	7	8	9	10
20	0	0	0	1	1	1	2	4	6	8	10	12	13	15	17	19
30	0	0	1	1	1	1	3	6	9	12	14	17	20	23	26	29
40	0	0	1	1	2	2	4	8	12	15	19	23	27	31	35	38
50	0	0	1	1	2	2	5	10	14	19	24	29	34	38	43	48
60	0	1	1	2	2	3	6	12	17	23	29	35	40	46	52	58
70	0	1	1	2	3	3	7	13	20	27	34	40	47	54	60	67
80	0	1	2	2	3	4	8	15	23	31	38	46	54	61	69	77
90	0	1	2	3	3	4	9	17	26	35	43	52	60	69	78	86
100	0	1	2	3	4	5	10	19	29	38	48	58	67	77	86	96

**Table 8** Displacement matrix presenting the number of gannets in the Thanet Extension 2 km Buffer only, during the Migration-spring bio-season.

Displacement (%)	Mortality Rates (%)															
	0	1	2	3	4	5	10	20	30	40	50	60	70	80	90	100
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	2	2
10	0	0	0	1	1	1	2	3	5	7	8	10	12	14	15	17
20	0	0	1	1	1	2	3	7	10	14	17	20	24	27	30	34
30	0	1	1	2	2	3	5	10	15	20	25	30	35	41	46	51
40	0	1	1	2	3	3	7	14	20	27	34	41	47	54	61	68
50	0	1	2	3	3	4	8	17	25	34	42	51	59	68	76	84
60	0	1	2	3	4	5	10	20	30	41	51	61	71	81	91	101
70	0	1	2	4	5	6	12	24	35	47	59	71	83	95	106	118
80	0	1	3	4	5	7	14	27	41	54	68	81	95	108	122	135
90	0	2	3	5	6	8	15	30	46	61	76	91	106	122	137	152
100	0	2	3	5	7	8	17	34	51	68	84	101	118	135	152	169

**Table 9 Displacement matrix presenting the number of gannets in the Thanet Extension 2 km Buffer only, during the Non-migratory Breeding bio-season.**

Displacement (%)	Mortality Rates (%)															
	0	1	2	3	4	5	10	20	30	40	50	60	70	80	90	100
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
20	0	0	0	0	0	0	0	0	1	1	1	1	2	2	2	2
30	0	0	0	0	0	0	0	1	1	1	2	2	3	3	3	4
40	0	0	0	0	0	0	0	1	1	2	2	3	3	4	4	5
50	0	0	0	0	0	0	1	1	2	2	3	4	4	5	5	6
60	0	0	0	0	0	0	1	1	2	3	4	4	5	6	7	7
70	0	0	0	0	0	0	1	2	3	3	4	5	6	7	8	8
80	0	0	0	0	0	0	1	2	3	4	5	6	7	8	9	10
90	0	0	0	0	0	1	1	2	3	4	5	7	8	9	10	11
100	0	0	0	0	0	1	1	2	4	5	6	7	8	10	11	12

**Table 10** Displacement matrix presenting the number of gannets in the Thanet Extension site only, during the Migration-autumn bio-season.

Displacement (%)	Mortality Rates (%)															
	0	1	2	3	4	5	10	20	30	40	50	60	70	80	90	100
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1
10	0	0	0	0	0	0	1	2	2	3	4	5	5	6	7	8
20	0	0	0	0	1	1	2	3	5	6	8	9	11	12	14	15
30	0	0	0	1	1	1	2	5	7	9	12	14	16	18	21	23
40	0	0	1	1	1	2	3	6	9	12	15	18	22	25	28	31
50	0	0	1	1	2	2	4	8	12	15	19	23	27	31	35	39
60	0	0	1	1	2	2	5	9	14	18	23	28	32	37	42	46
70	0	1	1	2	2	3	5	11	16	22	27	32	38	43	49	54
80	0	1	1	2	2	3	6	12	18	25	31	37	43	49	55	62
90	0	1	1	2	3	3	7	14	21	28	35	42	49	55	62	69
100	0	1	2	2	3	4	8	15	23	31	39	46	54	62	69	77

**Table 11** Displacement matrix presenting the number of gannets in the Thanet Extension 2 km Buffer only, during the Migration-autumn bio-season.

Displacement (%)	Mortality Rates (%)															
	0	1	2	3	4	5	10	20	30	40	50	60	70	80	90	100
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1
10	0	0	0	0	1	1	1	3	4	6	7	9	10	11	13	14
20	0	0	1	1	1	1	3	6	9	11	14	17	20	23	26	29
30	0	0	1	1	2	2	4	9	13	17	21	26	30	34	39	43
40	0	1	1	2	2	3	6	11	17	23	29	34	40	46	51	57
50	0	1	1	2	3	4	7	14	21	29	36	43	50	57	64	71
60	0	1	2	3	3	4	9	17	26	34	43	51	60	69	77	86
70	0	1	2	3	4	5	10	20	30	40	50	60	70	80	90	100
80	0	1	2	3	5	6	11	23	34	46	57	69	80	91	103	114
90	0	1	3	4	5	6	13	26	39	51	64	77	90	103	116	128
100	0	1	3	4	6	7	14	29	43	57	71	86	100	114	128	143

## 4. Razorbill displacement matrices

**Table 12** Displacement matrix presenting the number of razorbills in the Thanet Extension site only, during the Migration-spring bio-season.

Displacement (%)	Mortality Rates (%)												
	0	1	5	10	20	30	40	50	60	70	80	90	100
0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	1	1	1	1	2	2	2	3	3
20	0	0	0	1	1	2	2	3	3	4	5	5	6
30	0	0	0	1	2	3	3	4	5	6	7	8	9
40	0	0	1	1	2	3	5	6	7	8	9	10	12
50	0	0	1	1	3	4	6	7	9	10	12	13	15
60	0	0	1	2	3	5	7	9	10	12	14	16	17
70	0	0	1	2	4	6	8	10	12	14	16	18	20
80	0	0	1	2	5	7	9	12	14	16	19	21	23
90	0	0	1	3	5	8	10	13	16	18	21	23	26
100	0	0	1	3	6	9	12	15	17	20	23	26	29

**Table 13** Displacement matrix presenting the number of razorbills in the Thanet Extension 2 km Buffer only, during the Migration-spring bio-season.

Displacement (%)	Mortality Rates (%)												
	0	1	5	10	20	30	40	50	60	70	80	90	100
0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	1	1	1	1	1
10	0	0	0	1	2	3	4	5	6	7	8	9	10
20	0	0	1	2	4	6	8	10	11	13	15	17	19
25	0	0	1	2	5	7	10	12	14	17	19	21	24
30	0	0	1	3	6	9	11	14	17	20	23	26	29
40	0	0	2	4	8	11	15	19	23	27	30	34	38
50	0	0	2	5	10	14	19	24	29	33	38	43	48
60	0	1	3	6	11	17	23	29	34	40	46	51	57
70	0	1	3	7	13	20	27	33	40	47	53	60	67
80	0	1	4	8	15	23	30	38	46	53	61	69	76
90	0	1	4	9	17	26	34	43	51	60	69	77	86
100	0	1	5	10	19	29	38	48	57	67	76	86	95



**Table 14** Displacement matrix presenting the number of razorbills in the Thanet Extension site only, during the Migration-autumn bio-season.

Displacement (%)	Mortality Rates (%)												
	0	1	5	10	20	30	40	50	60	70	80	90	100
0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	1	1	1	1
30	0	0	0	0	0	0	0	1	1	1	1	1	1
40	0	0	0	0	0	0	1	1	1	1	1	1	2
50	0	0	0	0	0	1	1	1	1	1	2	2	2
60	0	0	0	0	0	1	1	1	1	2	2	2	2
70	0	0	0	0	1	1	1	1	2	2	2	3	3
80	0	0	0	0	1	1	1	2	2	2	3	3	3
90	0	0	0	0	1	1	1	2	2	3	3	3	4
100	0	0	0	0	1	1	2	2	2	3	3	4	4

**Table 15** Displacement matrix presenting the number of razorbills in the Thanet Extension 2 km Buffer only, during the Migration-autumn bio-season.

Displacement (%)	Mortality Rates (%)												
	0	1	5	10	20	30	40	50	60	70	80	90	100
0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	1	1
40	0	0	0	0	0	0	0	0	0	1	1	1	1
50	0	0	0	0	0	0	0	0	1	1	1	1	1
60	0	0	0	0	0	0	0	1	1	1	1	1	1
70	0	0	0	0	0	0	1	1	1	1	1	1	1
80	0	0	0	0	0	0	1	1	1	1	1	1	1
90	0	0	0	0	0	1	1	1	1	1	1	2	2
100	0	0	0	0	0	1	1	1	1	1	1	2	2

**Table 16** Displacement matrix presenting the number of razorbills in the Thanet Extension site only, during the Non-breeding bio-season.

Displacement (%)	Mortality Rates (%)												
	0	1	5	10	20	30	40	50	60	70	80	90	100
0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	1	1	1	1	2	2	2	3	3
20	0	0	0	1	1	2	2	3	3	4	4	5	6
30	0	0	0	1	2	3	3	4	5	6	7	8	8
40	0	0	0	1	2	3	4	6	7	8	9	10	11
50	0	0	0	1	3	4	6	7	8	10	11	13	14
60	0	0	0	2	3	5	7	8	10	12	13	15	17
70	0	0	0	2	4	6	8	10	12	14	16	18	20
80	0	0	0	2	4	7	9	11	13	16	18	20	22
90	0	0	0	3	5	8	10	13	15	18	20	23	25
100	0	0	0	3	6	8	11	14	17	20	22	25	28

**Table 17** Displacement matrix presenting the number of razorbills in the Thanet Extension 2 km Buffer only, during the Non-breeding bio-season.

Displacement (%)	Mortality Rates (%)												
	0	1	5	10	20	30	40	50	60	70	80	90	100
0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	1	1	1	1	2	2	2	3	3
20	0	0	0	1	1	2	2	3	3	4	4	5	6
30	0	0	0	1	2	3	3	4	5	6	7	8	8
40	0	0	0	1	2	3	4	6	7	8	9	10	11
50	0	0	0	1	3	4	6	7	8	10	11	13	14
60	0	0	0	2	3	5	7	8	10	12	13	15	17
70	0	0	0	2	4	6	8	10	12	14	16	18	20
80	0	0	0	2	4	7	9	11	13	16	18	20	22
90	0	0	0	3	5	8	10	13	15	18	20	23	25
100	0	0	0	3	6	8	11	14	17	20	22	25	28

## 5. Guillemot displacement matrices

**Table 18** Displacement matrix presenting the number of guillemots in the Thanet Extension site only, during the Migration-spring bio-season.

Displacement (%)	Mortality Rates (%)												
	0	1	5	10	20	30	40	50	60	70	80	90	100
0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	1	1	2	2	3	4	4	5	5	6
10	0	1	3	6	12	18	24	30	36	42	48	54	60
20	0	1	6	12	24	36	48	60	72	84	96	108	120
30	0	2	9	18	36	54	72	90	108	126	144	163	181
40	0	2	12	24	48	72	96	120	144	169	193	217	241
50	0	3	15	30	60	90	120	151	181	211	241	271	301
60	0	4	18	36	72	108	144	181	217	253	289	325	361
70	0	4	21	42	84	126	169	211	253	295	337	379	421
80	0	5	24	48	96	144	193	241	289	337	385	433	482
90	0	5	27	54	108	163	217	271	325	379	433	488	542
100	0	6	30	60	120	181	241	301	361	421	482	542	602

**Table 19** Displacement matrix presenting the number of guillemots in the Thanet Extension 2 km Buffer only, during the Migration-spring bio-season.

Displacement (%)	Mortality Rates (%)												
	0	1	5	10	20	30	40	50	60	70	80	90	100
0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	1	1	2	2	3	3	4	4	5	5
10	0	1	3	5	10	15	20	25	30	35	40	45	50
20	0	1	5	10	20	30	40	50	60	70	80	91	101
30	0	2	8	15	30	45	60	75	91	106	121	136	151
40	0	2	10	20	40	60	80	101	121	141	161	181	201
50	0	3	13	25	50	75	101	126	151	176	201	226	251
60	0	3	15	30	60	91	121	151	181	211	241	272	302
70	0	4	18	35	70	106	141	176	211	246	282	317	352
80	0	4	20	40	80	121	161	201	241	282	322	362	402
90	0	5	23	45	91	136	181	226	272	317	362	407	453
100	0	5	25	50	101	151	201	251	302	352	402	453	503

**Table 20** Displacement matrix presenting the number of guillemots in the Thanet Extension site only, during the Non-migratory Breeding.

Displacement (%)	Mortality Rates (%)												
	0	1	5	10	20	30	40	50	60	70	80	90	100
0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0	1
20	0	0	0	0	0	0	0	1	1	1	1	1	1
30	0	0	0	0	0	0	1	1	1	1	1	1	2
40	0	0	0	0	0	1	1	1	1	1	2	2	2
50	0	0	0	0	1	1	1	1	2	2	2	2	3
60	0	0	0	0	1	1	1	2	2	2	2	3	3
70	0	0	0	0	1	1	1	2	2	2	3	3	4
80	0	0	0	0	1	1	2	2	2	3	3	4	4
90	0	0	0	0	1	1	2	2	3	3	4	4	5
100	0	0	0	1	1	2	2	3	3	4	4	5	5

**Table 21** Displacement matrix presenting the number of guillemots in the Thanet Extension 2 km Buffer only, during the Non-migratory Breeding bio-season.

Displacement (%)	Mortality Rates (%)												
	0	1	5	10	20	30	40	50	60	70	80	90	100
0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	1	1	1
20	0	0	0	0	0	0	1	1	1	1	1	1	1
30	0	0	0	0	0	1	1	1	1	1	2	2	2
40	0	0	0	0	1	1	1	1	2	2	2	2	3
50	0	0	0	0	1	1	1	2	2	2	3	3	3
60	0	0	0	0	1	1	2	2	2	3	3	4	4
70	0	0	0	0	1	1	2	2	3	3	4	4	5
80	0	0	0	1	1	2	2	3	3	4	4	5	5
90	0	0	0	1	1	2	2	3	4	4	5	5	6
100	0	0	0	1	1	2	3	3	4	5	5	6	7

**Table 22 Displacement matrix presenting the number of guillemots in the Thanet Extension site only, during the Migration-autumn bio-season.**

Displacement (%)	Mortality Rates (%)												
	0	1	5	10	20	30	40	50	60	70	80	90	100
0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0	1
20	0	0	0	0	0	0	0	1	1	1	1	1	1
30	0	0	0	0	0	0	1	1	1	1	1	1	2
40	0	0	0	0	0	1	1	1	1	1	2	2	2
50	0	0	0	0	1	1	1	1	2	2	2	2	3
60	0	0	0	0	1	1	1	2	2	2	2	3	3
70	0	0	0	0	1	1	1	2	2	2	3	3	4
80	0	0	0	0	1	1	2	2	2	3	3	4	4
90	0	0	0	0	1	1	2	2	3	3	4	4	5
100	0	0	0	1	1	2	2	3	3	4	4	5	5

**Table 23 Displacement matrix presenting the number of guillemots in the Thanet Extension 2 km Buffer only, during the Migration-autumn bio-season.**

Displacement (%)	Mortality Rates (%)												
	0	1	5	10	20	30	40	50	60	70	80	90	100
0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	1	1	1	1	1	1
20	0	0	0	0	0	1	1	1	1	1	2	2	2
30	0	0	0	0	1	1	1	2	2	2	2	3	3
40	0	0	0	0	1	1	2	2	2	3	3	4	4
50	0	0	0	1	1	2	2	3	3	4	4	5	5
60	0	0	0	1	1	2	2	3	4	4	5	6	6
70	0	0	0	1	1	2	3	4	4	5	6	6	7
80	0	0	0	1	2	2	3	4	5	6	7	7	8
90	0	0	0	1	2	3	4	5	6	6	7	8	9
100	0	0	0	1	2	3	4	5	6	7	8	9	10

**Table 24 Displacement matrix presenting the number of guillemots in the Thanet Extension site only, during the Non-breeding bio-season.**

Displacement (%)	Mortality Rates (%)												
	0	1	5	10	20	30	40	50	60	70	80	90	100
0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	1	1	1	1	1
20	0	0	0	0	0	1	1	1	1	1	1	2	2
30	0	0	0	0	1	1	1	1	2	2	2	2	3
40	0	0	0	0	1	1	1	2	2	3	3	3	4
50	0	0	0	0	1	1	2	2	3	3	4	4	5
60	0	0	0	1	1	2	2	3	3	4	4	5	5
70	0	0	0	1	1	2	3	3	4	4	5	6	6
80	0	0	0	1	1	2	3	4	4	5	6	6	7
90	0	0	0	1	2	2	3	4	5	6	6	7	8
100	0	0	0	1	2	3	4	5	5	6	7	8	9

**Table 25 Displacement matrix presenting the number of guillemots in the Thanet Extension 2 km Buffer only, during the Non-breeding bio-season.**

Displacement (%)	Mortality Rates (%)												
	0	1	5	10	20	30	40	50	60	70	80	90	100
0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	1	1	2	2	3	3	4	4	5
20	0	0	0	1	2	3	4	5	6	7	8	9	10
30	0	0	0	1	3	4	6	7	9	10	12	13	15
40	0	0	0	2	4	6	8	10	12	14	16	17	19
50	0	0	0	2	5	7	10	12	15	17	19	22	24
60	0	0	0	3	6	9	12	15	17	20	23	26	29
70	0	0	0	3	7	10	14	17	20	24	27	31	34
80	0	0	0	4	8	12	16	19	23	27	31	35	39
90	0	0	0	4	9	13	17	22	26	31	35	39	44
100	0	0	0	5	10	15	19	24	29	34	39	44	49

## 6. References

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.

Royal HaskoningDHV (2013). *Thanet Offshore Wind Farm Ornithological Monitoring 2012-2013 (Post-construction Year 3)*. Royal HaskoningDHV Report for Vattenfall Wind Power Limited.

Statutory Nature Conservation Bodies (2017). Advice on how to present assessment information on the extent and potential consequences of seabird displacement from Offshore Wind Farm (OWF) developments.