

From: [Brown, Emma](#)
To: [Hornsea Project Three](#)
Subject: EN010080 Hornsea Project 3: Deadline 7 Submission from Natural England
Date: 15 March 2019 00:02:45
Attachments: [EN010080 Hornsea Project Three Deadline 7 - Natural England - ANNEX C - Cable Protection Advice Note.pdf](#)
[EN010080 Hornsea Project Three Deadline 7 - Natural England - ANNEX D - Note on Small Scale Impact.pdf](#)
[EN010080 Hornsea Project Three Deadline 7 - Natural England - ANNEX E - Ornithology Response.pdf](#)
[EN010080 Hornsea Project Three Deadline 7 - Summary of Natural England's Advice on Cromer Shoal MCZ.pdf](#)
[EN010080 Hornsea Project Three Deadline 7 - Summary of Natural England's Advice on Markham's Triangle pMCZ.pdf](#)
[EN010080 Hornsea Project Three Deadline 7 - Summary of Natural England's Advice on North Norfolk Sandbanks and Saturen Reef SAC.pdf](#)
[EN010080 Hornsea Project Three Deadline 7 Natural England's comments on the RIES .pdf](#)
[JNCC Report 598 Revised-2018 WEB - Monitoring guidance for marine benthic habitats.pdf](#)
[Natural England and JNCC joint Technical Guidance Note - Marine Buffers and Margins - Final.pdf](#)
[NECR164 Non-breeding season populations of seabirds in UK waters.pdf](#)
[SNCB response to MSS avoidance rate report FINAL 251114.pdf](#)
[EN010080 Hornsea Project Three Deadline 7 - Natural England - ANNEX A - Further Advice on PTA REP5 - 010.pdf](#)
[EN010080 Hornsea Project Three Deadline 7 - Natural England - ANNEX B - Sabellaria Spinulosa Advice Note.pdf](#)
[EN010080 Hornsea Project Three Deadline 7 - Natural England - Rule 17 Response.pdf](#)
[Natural England and JNCC joint Technical Guidance Note - Marine Buffers and Margins - Final.pdf](#)

Good Evening,

Please find attached Natural England's Deadline 7 Response.

This includes:

- Comments on the RIES
- Rule 17 Response
- ANNEX A: Further Advice on PTA REP 5 – 010
- ANNEX B: Sabellaria Spinulosa Advice Note
- ANNEX C: Cable Protection Advice Note
- ANNEX D: Note on Small Scale Impact
- ANNEX E: Ornithology Response
- Summary of Natural England's Advice on Cromer Shoal MCZ
- Summary of Natural England's Advice on Markham's Triangle pMCZ
- Summary of Natural England's Advice on The Wash and North Norfolk Coast SAC
- Summary of Natural England's Advice on North Norfolk Sandbanks SAC
- Natural England & JNCC joint Technical Guidance Note – Marine Buffers and Margins
- SNCB response to MSS Avoidance Rate Report
- NERC164
- JNCC Report 598

Please note that Natural England has reviewed the MMO's draft Response to the ExA dDCO/DML and are in agreement with their comments. Therefore we will not be providing a separate response on this occasion.

Kind regards,

Emma

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THE PLANNING ACT 2008
THE INFRASTRUCTURE PLANNING (EXAMINATION PROCEDURE)
RULES 2010

HORNSEA PROJECT THREE OFFSHORE WIND FARM

Planning Inspectorate Reference: EN010080

NATURAL ENGLAND

Written Submission for Deadline 7

Annex E: Offshore Ornithology Comments for Deadline 7, including
information requested by ExA question F2.26

14 March 2019

1. This paper presents a synthesis of the Applicant's assessment of predicted collision and displacement impacts based on parameter values that are most closely aligned with the approach advised by Natural England. The figures have been taken from those presented by the Applicant in REP6-043 for collision risk modelling, REP4-049 for displacement and REP4-092 for Population Viability Analysis.
2. Natural England have highlighted throughout our written and oral submissions that the lack of complete baseline information for the Hornsea Three Zone (i.e. the array area) means that there is not certainty beyond reasonable scientific doubt to support the Applicant's conclusions. Consequently Natural England does not consider that it is possible to rule out Adverse Effect of Integrity for multiple features across multiple sites. This position remains unchanged.
3. Recognising that Natural England is an adviser and not the decision maker in this process, we have provided detailed and consistent project specific advice to the Applicant and the Examining Authority on the parameters and analyses that should be used in order to reduce uncertainty in the assessments as far as possible.
4. The Applicant has provided several updates of their analysis, and have revised their choice of parameters in several instances, but they have not followed the advice of the Statutory Nature Conservation Body (SNCB) ie. Natural England, in their assessments of impact and AEoSI. Therefore we do not consider that the level of uncertainty (and thereby the level of risk) associated with the Applicant's conclusions has reduced.
5. At the Examiner's request, the applicant has provided collision and displacement figures that are more in line with Natural England's Advice (notably [REP6-043] and [REP4-092]), though there are outstanding issues.
6. Our assessment of these figures clearly demonstrates that the choice of parameters can make a considerable difference to the predicted impacts of the proposed development, and make a vast difference to the conclusions relation to AEoSI and significance at an EIA scale. Natural England have provided a worked example to demonstrate this for the kittiwake feature of FFC SPA.
7. Natural England would therefore highlight that whilst the incomplete baseline information represents a key consenting risk, further consenting risks are also apparent from the data that *has* been supplied.

1. Collision Data

1.1. KITTWAKE

Table 1. Summary Figures for Kittiwake Predicted Annual Collisions

Kittiwake	EIA North Sea (individuals)		FFC SPA (adults)	
	Project Alone	Cumulative	Project Alone	In-combination
East Anglia 3 ¹	n/a	3447	n/a	319
Hornsea Project Three based on Applicant's project figures closest to NE advice on methods	297 (127-503) ²	4247 (3737-5073) ³	181 (81-304) ⁴	533 (407-704) ⁵

Table 2. Percentage of baseline mortality for kittiwake impact levels predicted by Applicant in REP6-043. Baseline mortality calculated using Applicant's population size figures from APP-051 and APP-065.

¹ Figures taken from EA3 as most recently consented southern North Sea OWF as starting point for the cumulative and in-combination totals. These figures have uncertainty associated with them – Natural England do not necessary agree with all the assumptions that underpin the figure.

<https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010056/EN010056-001644-EA3%20-%20Revised%20CRM.pdf>

² See Tables below for details of figures.

³ East Anglia Three cumulative total plus 800 (290-1626) birds added from Hornsea Project Three, Norfolk Vanguard, Thanet Extension and Moray West OWFs. Moray West figures derived from <http://marine.gov.scot/sites/default/files/00538033.pdf>, Table 10.8.13. Norfolk Vanguard figures from [Vanguard CRM Link](#) Table A4.2 Appendix 3.2. Thanet Extension figures taken from Taken from: Table 3 and associated text from: Vattenfall Wind Power Ltd. Thanet Extension Offshore Wind Farm. Appendix 39 to Deadline 3 Submission: Clarification Note on Collision Risk Modelling Parameters and Thanet Extension's Contribution to Cumulative and In-Combination Totals. No mean value given so taken as central point of range.

⁴ See Tables below for details of figures.

⁵ East Anglia Three in-combination total plus 214 (88-384) birds added from Hornsea Project Three, Norfolk Vanguard, Thanet Extension and Moray West OWFs. Data sources as above.

	Impact level. Collisions per annum. Central estimate indicated in green.	% of baseline mortality using Applicant's figures for population size at FFC SPA (44,520 pairs for FFC SPA) as used in APP-051, Table 7.17, and 839,456 ⁶ individuals for largest North Sea Population scale (from Furness 2015) as used by Applicant in Table 5.27 of APP-065 for the Post-breeding season. Baseline mortality taken from survival rates in Horswill and Robinson (2015)
Project Alone	127	0.104
	297	0.242
	503	0.410
Cumulative	3737	3.05
	4247	3.47
	5073	4.14
FFC SPA Project alone	81	0.623
	181	1.38
	304	2.34
FFC in-combination	407	3.13
	533	4.10
	704	5.42

8. Details of the collision figures extracted from the Applicant's REP6-043 that are most closely aligned with Natural England's advice are set out below. Natural England notes that these figures from the Applicant do not address the issue of the incomplete baseline.
9. These figures are based on the following collision risk modelling parameters for kittiwake: Band Model (2012) Option 2, Nocturnal Activity Factor (NAF) 2-3,

⁶ Note that for the EIA population scales Natural England have used the annual total collisions and assessed these against the largest population size present in the North Sea UK waters for the population (i.e. the largest population size used in Table 5.27 in APP-065) rather than broken down into separate seasons as the Applicant has done.

Avoidance Rates (AR) 98.9% (98.7-99.1), flight speeds from Pennycuik (1987)/Alerstam et al (2007).

10. Numbers in Tables 3-6 are total annual collisions with no apportioning to colonies. Green cells indicate the central and range of values for a given set of parameters. Numbers taken from Tables 3.7 and 3.8 of Applicant's REP6-043.

Table 3. NAF2. Variability in density and AR. Maximum likelihood Flight height.

AR/density	LCL	Mean density	UCL
98.7	183	296	423
98.9	155	251	358
99.1	127	205	293

Table 4. NAF3. Variability in density and AR. Maximum likelihood Flight height.

AR/density	LCL	Mean density	UCL
98.7	217	351	503
98.9	184	297	426
99.1	150	243	348

Table 5. NAF 2. Flight height and AR variation, using mean density

AR/PCH	LCL	Mean PCH	UCL
98.7	194	296	388
98.9	164	251	328
99.1	134	205	269

Table 6. NAF 3. Flight height and AR variation, using mean density

AR/PCH	LCL	Mean PCH	UCL
98.7	230	351	460
98.9	195	297	389

99.1	159	243	318
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- The mean estimate is 297 birds per annum (NAF 3) or 251 birds per annum (NAF 2). The range of estimates is 127-503, noting that variability across all parameters cannot be estimated statistically by this approach.

HRA numbers: FFC SPA mortality estimates (adult birds) – project alone.

- Tables 7-10 are annual predicted collisions of adult kittiwake from FFC SPA using the Applicant's figures from REP6-043 taken from Tables 3.9 to 3.12.
- Apportioning assumptions: Breeding season March – August 93.1%⁷ birds apportioned to FFC SPA; Post-breeding migration season Sept- December 5.4%; Pre breeding spring migration season January - February 7.2%.

Table 7. FFC SPA predicted annual collisions (adults). NAF2. Variability in density (mean density and 95% confidence intervals) and Avoidance Rate (AR). Maximum Likelihood Flight height.

AR/density	LCL	Mean density	UCL
98.7	117	188	266
98.9	99	159	225
99.1	81	144	184

Table 8. FFC SPA predicted annual collisions NAF3 (adults). Variability in density. Maximum Likelihood Flight height.

AR/density	LCL	Mean density	UCL
98.7	133	214	304
98.9	112	181	257
99.1	92	164	210

Table 9. FFC SPA predicted annual collisions NAF2 (adults). Flight height and AR variation, using mean density.

⁷ Breeding season Apportioning rate presented is proportion of all 'adult-type' birds recorded during March – August in the digital aerial data set. This will incorporate an unknown proportion of older immatures birds and potentially non-FFC SPA adults.

AR/PCH	LCL	Mean PCH	UCL
98.7	123	188	246
98.9	104	159	208
99.1	85	144	170

Table 10. FFC SPA predicted annual collisions NAF3 (adults). Flight height and AR variation, using mean density.

AR/PCH	LCL	Mean PCH	UCL
98.7	140	214	280
98.9	118	181	237
99.1	97	164	194

Pink cells are impact levels that exceed 1% of baseline mortality for the colony.

Table 11. Predicted population impacts on the kittiwake population of FFC SPA for the range of mortality impacts predicted for Hornsea Project Three alone and in-combination with other plans and projects. PVA Impact Metrics are as provided by the Applicant in REP4-092. The range of predicted Project alone figures are indicated in pink, in-combination in purple. The darker shaded cells represent the level of impact closest to the central value of the predictions in Tables 8 and 10 above.

Kittiwake	FFC SPA		
ADDITIONAL MORTALITY	% Baseline Mortality using Applicant's population sizes ⁸	Counterfactual of Final Population Size (CPS) ⁹	Counterfactual of Growth Rate (CGR) ¹⁰
50	0.38	0.981 (0.981-0.981)	0.999

⁸ Note that Applicant uses 89040 adults as FFC SPA population estimate (44,520 pairs) in APP-051 which gives 1% BM as 130 birds. Natural note that using the mean of 2016-17 census data (102,536 adults) 1% BM is 150 birds.

⁹ Kittiwake, demographic rate set 2, counterfactuals of population size after 35 years, estimated using a matched runs method, from 1000 density independent simulations. Table A2_7.1. REP4-092.

¹⁰ Kittiwake, demographic rate set 2, counterfactuals of population growth rate after 35 years, estimated using a matched runs method, from 1000 density independent simulations. No CLs given as they are the same as the median values. Table A2_7.3. REP4-092.

100	0.78	0.962 (0.962-0.963)	0.999
150	1.15	0.944 (0.944-0.945)	0.998
200	1.54	0.926 (0.926-0.927)	0.998
250	1.92	0.909 (0.908-0.909)	0.997
300	2.31	0.892 (0.891-0.892)	0.997
350	2.69	0.875 (0.874-0.876)	0.996
400	3.08	0.858 (0.857-0.859)	0.996
450	3.46	0.842 (0.840-0.843)	0.995
500	3.85	0.826 (0.824-0.827)	0.994
550	4.23	0.810 (0.809-0.811)	0.994
600	4.62	0.794 (0.793-0.796)	0.993
650	5.0	0.779 (0.778-0.781)	0.993
700	5.38	0.765 (0.763-0.766)	0.992

14. Predicted impacts for the kittiwake feature of FFC SPA are **181 (81-304)** adults per annum for Hornsea Project Three alone and **533 (407-703)** adults per annum in combination with other plans and projects.
15. If the additional mortality from the windfarm is **550 adults per annum** (closest PVA output to 533 birds in [REP4-092]) then the population of FFC SPA after 35 years will be 19% lower than it would have been in the absence of the additional mortality. The population growth rate would be reduced by 0.6%.
16. If it is assumed that the population is stable then this would mean that the population would be 19% lower than the current population size. This would be counter to the restore conservation objective and would be AEoSI.
17. If the additional mortality from the windfarm is **200 adult birds** per annum (closest PVA output to 181 birds in [REP4-092]) then the population of FFC SPA after 35 years will be 7.4% lower than it would have been in the absence of the additional mortality. The population growth rate would be reduced by 0.2%.

18. If it is assumed that the population is stable then this would mean that the population would be 7.4% lower than the current population size. This would be counter to the restore conservation objective and would be AEOI.
19. It is not known what the growth rate of the colony will be over the next 35 years. There has been a 2.2% per annum decline in numbers for Flamborough Head and Bempton Cliffs colony between 1987 and 2017 (a growth rate of 0.979 per annum). Over the period 2000 to 2017 the population has shown a 0.37% per annum increase in numbers (a growth rate of 1.0037 per annum) based on census counts in the JNCC Seabird Monitoring Programme Database¹¹.
20. There is no evidence to suggest that the future population trend will be significantly different from the current trend, for example productivity at the colony has not been increasing in recent years (see Figure 1) (Aitken et al. 2017)

Figure 1. Flamborough/Bempton Black-legged kittiwake productivity 2009-2017, mean of plot results $\pm$ SE. From Aitken et al. (2017). Note this does not include productivity data for Filey, where productivity is lower (e.g. in 2017 mean productivity for kittiwake at Filey was 0.39 (SE $\pm$ 0.0742) chicks per AON).



21. Between the SCR Census (1985–88) and Seabird 2000 (1998–2002) for major colonies in Britain, no sites showed a per annum increase that exceeded 4.5% (see Natural England Deadline 4 submission for Hornsea Project Two). The growth rate of the colony at Bempton/Flamborough between 2008 and 2017 was 0.37% per annum, following declines from 1987. So the evidence suggests that the FFC SPA colony has a growth rate of <1% p.a.
22. If we assume a 1% per annum growth rate for the next 35 years then 150-200 additional mortalities per annum would result in the population being approximately 9,700 birds lower than without the additional mortality after 35 years and it would

¹¹ JNCC. 2016. Seabird Population Trends and Causes of Change: 1986-2015 Report (<http://jncc.defra.gov.uk/page-3201>). Joint Nature Conservation Committee. Updated September 2016. Accessed 12 March 2019. And <http://jncc.defra.gov.uk/smp/>

take an additional 12 years to reach the target population compared to the no windfarm mortality scenario (note that this additional number of years is with a reduced growth rate operating for a period exceeding 35 years).

23. If we assume a 1% per annum growth rate for the next 35 years then 550 additional mortalities per annum would result in the population being approximately 27,000 birds lower than without the additional mortality after 35 years and it would take an additional 74 years to reach the target population compared to the no windfarm mortality scenario (note that this additional number of years is with a reduced growth rate operating for a period exceeding 35 years).

1.2 GANNET

Table 12. Summary Figures for Gannet Predicted Annual Collisions

	EIA North Sea		FFC SPA	
	Project Alone	Cumulative	Project Alone	In-combination
EA3	n/a	2875	n/a	173
Hornsea Project Three based on Applicant's project figures closest to NE advice on methods	49 (10-128) ¹²	3168 (2940-3563) ¹³	18 (4-46) ¹⁴	250 (180-379) ¹⁵

Table 13. Percentage of baseline mortality for impact levels for gannet predicted by Applicant in REP6-043. Baseline mortality calculated using Applicant's population size figures.

¹² See Tables below for details of figures

¹³ East Anglia Three cumulative total plus 293 (65-688) birds added from Hornsea Project Three, Norfolk Vanguard, Thanet Extension and Moray West OWFs. Moray West figures derived from <http://marine.gov.scot/sites/default/files/00538033.pdf>, Table 10.8.10. Norfolk Vanguard figures from Vanguard CRM Link Table A4.1 Appendix 3.2. Thanet Extension figures taken from Taken from: Table 3 and associated text from: Vattenfall Wind Power Ltd. Thanet Extension Offshore Wind Farm. Appendix 39 to Deadline 3 Submission: Clarification Note on Collision Risk Modelling Parameters and Thanet Extension's Contribution to Cumulative and In-Combination Totals. No mean value given so taken as central point of range.

¹⁴ See Tables below for details of figures

¹⁵ East Anglia Three in-combination total plus 77 (7-206) birds added from Hornsea Project Three, Norfolk Vanguard, Thanet Extension and Moray West OWFs. Data sources as above.

	Impact level. Collisions per annum	% of baseline mortality using Applicant's figures for population size at FFC SPA (8,469 pairs for FFC SPA) as used in APP-051 Table 7.13, and 456,299 ¹⁶ individuals for largest North Sea Population scale (from Furness 2015) as used by Applicant in Table 5.26 of APP-065 for the Post-breeding season. Baseline mortality based on survival rates from Horswill and Robinson 2015)
Project Alone	10	0.027
	49	0.133
	128	0.346
Cumulative	2940	7.95
	3168	8.57
	3563	9.64
FFC SPA Project alone	4	0.292
	18	1.31
	46	3.35
FFC in-combination	180	13.1
	250	18.2
	379	27.6

24. Details of the collision figures extracted from the Applicant's REP6-043 that are most closely aligned with Natural England's advice are set out below. Natural England notes that these figures from the Applicant do not address the issue of the incomplete baseline.

¹⁶ Note that for the EIA population scales Natural England have used the annual total collisions and assessed these against the largest population size present in the North Sea UK waters for the population (i.e. the largest population size used in Table 5.26 in APP-065) rather than broken down into separate seasons as the Applicant has done.

25. These figures are based on the following collision risk modelling parameters for gannet: Band Model (2012) Option 2, Nocturnal Activity Factor (NAF) 1-2, Avoidance Rates (AR) 98.9% (98.7-99.1), flight speed Pennycuik (1987).
26. Numbers in Tables 14-17 show total annual collisions with no apportioning to colonies. Green cells indicate the range of values for a given set of parameters. Numbers taken from Tables 3.1 and 3.2 of Applicant's REP6-043.

Table 14. NAF1. Variability in density and Avoidance Rate. Maximum Likelihood Flight height.

AR/density	LCL	Mean density	UCL
98.7	27	45	64
98.9	23	38	54
99.1	19	31	44

Table 15. NAF2. Variability in density and Avoidance Rate. Maximum Likelihood Flight height.

AR/density	LCL	Mean density	UCL
98.7	35	58	81
98.9	29	49	69
99.1	24	40	56

Table 16. NAF 1. Flight height and Avoidance Rate variation, using mean density

AR/PCH	LCL	Mean PCH	UCL
98.7	14	45	100
98.9	12	38	85
99.1	10	31	69

Table 17. NAF 2. Flight height and Avoidance Rate variation, using mean density

AR/PCH	LCL	Mean PCH	UCL

98.7	18	58	128
98.9	15	49	108
99.1	12	40	88

27. The mean estimate is 49 birds per annum (NAF 2) or 38 birds per annum (NAF 1). The range of estimates is 10-128, noting that variability across all parameters cannot be estimated statistically by this method.

HRA numbers: FFC SPA mortality estimates (adult birds) – project alone.

28. Tables 18-21 show annual predicted collisions of adult gannet from FFC SPA using the Applicant's figures from REP6-043 taken from Tables 3.3-3.5.
29. Apportioning: Breeding season March – September 63.3%¹⁷; Post-breeding migration season October-November 4.8%; Pre breeding spring migration season December-February 6.2%.

Table 18. FFC SPA predicted annual collisions NAF1. Variability in density and Avoidance Rates. Maximum Likelihood Flight height.

AR/density	LCL	Mean density	UCL
98.7	10	18	25
98.9	9	15	22
99.1	7	12	18

Table 19. FFC SPA predicted annual collisions NAF2. Variability in density and Avoidance Rates. Maximum Likelihood Flight height.

AR/density	LCL	Mean density	UCL
98.7	12	21	30
98.9	10	18	25
99.1	8	14	21

¹⁷ Breeding season apportioning rate presented is proportion of all adult birds recorded during March – Sept from the digital aerial data set. This may incorporate an unknown proportion of non-FFC SPA adults.

Table 20. FFC SPA predicted annual collisions NAF1. Flight height and Avoidance Rate variation, using mean density.

AR/PCH	LCL	Mean PCH	UCL
98.7	5	18	39
98.9	5	15	33
99.1	4	12	27

Table 21. FFC SPA predicted annual collisions NAF2. Flight height and Avoidance Rate variation, using mean density.

AR/PCH	LCL	Mean PCH	UCL
98.7	6	21	46
98.9	5	18	39
99.1	4	14	32

Table 22. Predicted Population impacts on the gannet population of FFC SPA for the range of mortality impacts predicted for Hornsea Project Three alone and in-combination with other plans and projects. PVA Impact Metrics are as provided by the Applicant in REP4-092. The range of predicted Project alone figures are indicated in pink, in-combination in purple. The darker shaded cells represent the level of impact closest to the central value of the predictions in Tables 19 and 21 above.

GANNET	FFC SPA		
ADDITIONAL MORTALITY	%Baseline Mortality using Applicant's population sizes ¹⁸	Counterfactual of Final Population Size (CPS) ¹⁹	Counterfactual of Growth rate (CGR) ²⁰
5	0.36	No value available	No value available

¹⁸ Using Applicant's population size of 8,469 pairs (16,938 adults) from APP-051, 1% BM is 14 adults. Note that using the mean of 2012, 2015 and 2017 census counts of 24,594 adults, the 1% BM is 20 adults.

¹⁹ Gannet, demographic rate set 2, counterfactuals of population size after 35 years, estimated using a matched runs method, from 1000 density independent simulations. See Table A2_3.1 in REP4-092.

²⁰ Gannet, demographic rate set 2, counterfactuals of population growth rate after 35 years, estimated using a matched runs method, from 1000 density independent simulations. See Table A2_3.3 in REP4-092

10	0.71	No value available	No value available
20	1.43	No value available	No value available
25	1.79	0.962 (0.962-0.963)	0.999
30	2.14	No value available	No value available
40	2.86	No value available	No value available
50	3.57	0.926 (0.925-0.927)	0.998
150	10.7	0.793 (0.792-0.795)	0.993
175	12.5	0.763 (0.761-0.765)	0.992
200	14.3	0.734 (0.732-0.737)	0.991
225	16.1	0.706 (0.704-0.709)	0.990
250	17.9	0.679 (0.677-0.682)	0.989
300	21.9	0.629 (0.626-0.632)	0.987
350	25.5	0.581 (0.578-0.585)	0.984
375	23.3	0.559 (0.555-0.563)	0.983

30. Predicted impacts for the gannet feature of FFC SPA are **18 (4-46)** adults per annum for Hornsea Project Three alone and **250 (180-379)** adults per annum in combination with other plans and projects.
31. If the additional mortality from the windfarm is 25 adults per annum (closest PVA outputs available in REP4-092 to predicted 18 adult mortalities) then the population of FFC SPA after 35 years will be 3.8% lower than it would have been in the absence of the additional mortality. The population growth rate would be reduced by 0.1%.
32. If the additional mortality from the windfarm is 250 adults per annum then the population of FFC SPA after 35 years will be 32% lower than it would have been in the absence of the additional mortality. The population growth rate would be reduced by 1.1 %.

33. The gannet population of FFC SPA increased at 11.1% per annum (between 2003/4 and 2015, JNCC Seabird Monitoring Programme data²¹). Using FFC SPA census data 2002-2017 the growth rate was 9.4% per annum.
34. Note that these figures are for predicted collision mortalities only. Adding predicted displacement mortality would add 3-67 adults per annum to FFC SPA for Hornsea Project Three alone and 10-243 birds (all ages) to the cumulative total.

²¹ JNCC. 2016. Seabird Population Trends and Causes of Change: 1986-2015 Report (<http://jncc.defra.gov.uk/page-3201>). Joint Nature Conservation Committee. Updated September 2016. Accessed 12 March 2019.

2. Displacement data – general notes

2.1 Summary data:

35. Figures are annual predicted mortality (i.e. summed across seasons) from displacement. This is based on data presented by the applicant at REP4-049 (Annex C, Appendix 28), summed to get annual totals. It uses displacement presented as the 'alternative analysis' within REP4-049.

36. It should be noted that:

- 1) The seasons in the 'alternative analysis' (REP4-049) are defined in accordance with NEs advice
- 2) The calculation of seasonal mean of peaks is NOT NEs recommended approach.
 - It is a combination of 20 months of DAS and 4 months using the Upper Confidence Limits (from the DAS data) for the previous year for the missing months (Dec-March).
 - No upper or lower confidence limits have been provided for the other months, so it is not possible to explore the variability around the mean in these data. The use of the UCL of the mean from year 1 to fill the data gaps in year 2 may lead to an under or over estimation of the mean seasonal peaks.
- 3) The apportioning rates presented in the alternative analysis for the non-breeding seasons are in accordance with NE advice.
- 4) In the case of Guillemot and Razorbill no immatures have been included in the totals for FFC SPA in the breeding season.
- 5) Natural England has apportioned 50% of Puffin in the breeding season, while the applicant has apportioned 0%
- 6) Cumulative and In-combination totals are based on an incomplete data set. The following wind farm projects are missing from the assessment : Beatrice Demo, Gunfleet 2, Hywind, Inner Dowsing, Kentish flats, Kentish Flats Ext, Kincardine, Lynn, Methil, Moray west, Rampion, Scroby Sands, Seagreen A&B (non-breeding seasons).
- 7) This missing data reduces confidence in the assessment and can only result in an under-estimation of the cumulative and in-combination assessments.

2.2 GUILLEMOT

Table 23. Summary of range of potential displacement impacts at EIA North Sea Scale and FFC SPA scale for the project alone and cumulatively/in-combination.. Lower displacement mortality represents 30% displacement and 1% mortality; upper displacement mortality represents 70% displacement and 10% mortality. Data is summed from that presented in Tables 1.12 and 1.13 in REP4-049

Guillemot	EIA North Sea (all birds)	FFC SPA (adults only)
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	Project Alone	Cumulative	Project Alone	In-combination
EA3 ²²		529 - 12354		61-1425
Hornsea 3 ²³	98 - 2278	655 - 15277	3-59	64-1499

Table 24. Percentage of baseline mortality for displacement levels for guillemot calculated using Applicant's population size figures.

<u>Guillemot</u>	Impact level. Displacement per annum. Lower figure represents 30% displacement and 1% mortality and upper figure represents 70% displacement and 10% mortality	% of baseline mortality using figures for largest North Sea Population scale, 2,045,078 individuals (from Furness 2015) and the population size at FFC SPA (41,607 pairs for FFC SPA) as used in APP-051. Baseline mortality taken from Horswill and Robinson 2015)
Project Alone	98	0.07
	2278	1.82
Cumulative	655	0.52
	15277	12.25
FFC SPA Project alone	3	0.07
	59	1.31
FFC in-combination	64	1.42
	1499	33.36

²² Figures presented are from EA3 as most recently consented southern North Sea OWF as starting point for the cumulative and in-combination totals.

²³ Figures include EA3 cumulative/in-combo total and in addition – Norfolk Vanguard, Thanet ext (as presented in Norfolk Vanguard Environmental statement, Table 13.73
<https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010079/EN010079-001501-Chapter%2013%20Offshore%20Ornithology%20Norfolk%20Vanguard%20ES.pdf>

2.3 RAZORBILL

Table 25. Summary of range of potential displacement impacts at EIA North Sea Scale and FFC SPA scale for the project alone and cumulatively/in-combination. Lower displacement mortality represents 30% displacement and 1% mortality; upper displacement mortality represents 70% displacement and 10% mortality. Data is summed from that presented in Tables 1.16 and 1.17 in REP4-049

Razorbill	EIA North Sea (all birds)		FFC SPA (adults only)	
	Project Alone	Cumulative	Project Alone	In-combination
EA3 ²⁴		252		16-369
HOW3 ²⁵	26-660	289-6785	0-19	17-393

Table 26. Percentage of baseline mortality for displacement levels for razorbill calculated using Applicant's population size figures.

<u>Razorbill</u>	Impact level. Displacement per annum. Lower figure represents 30% displacement and 1% mortality and upper figure represents 70% displacement and 10% mortality	% of baseline mortality using figures for largest North Sea Population scale, 591,874 individuals (from Furness 2015) and the population size at FFC SPA (10,570 pairs for FFC SPA) as used in APP-051. Baseline mortality taken from Horswill and Robinson 2015)
Project Alone	26	0.05
	660	1.06
Cumulative	291	0.47

²⁴ Figures presented are from EA3 as most recently consented southern North Sea OWF as starting point for the cumulative and in-combination totals.

²⁵ Figures include EA3 cumulative/in-combo total and in addition – Norfolk Vanguard, Thanet ext (as presented in Norfolk Vanguard Environmental statement, Table 13.71
<https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010079/EN010079-001501-Chapter%2013%20Offshore%20Ornithology%20Norfolk%20Vanguard%20ES.pdf>

	675	10.93
FFC SPA Project alone	1	0.05
	19	0.90
FFC in-combination	17	0.80
	393	18.59

2.4 PUFFIN

Table 27. Summary of range of potential displacement impacts at EIA North Sea Scale and FFC SPA scale for the project alone and cumulatively/in-combination. Lower displacement mortality represents 30% displacement and 1% mortality; upper displacement mortality represents 70% displacement and 10% mortality. Data is summed from that presented in Tables 1.20 and 1.21 in REP4-049.

Puffin	EIA North Sea (all birds)		FFC SPA (adults only) ²⁶	
	Project Alone	Cumulative	Project Alone	In-combination
EA3 ²⁷		119-2772		3-59
HOW3 ²⁸	1-23	120-2802	0 -9	3 -67

Table 28. Percentage of baseline mortality for displacement levels for puffin calculated using Applicant's population size figures.

<u>Puffin</u>	Impact level. Displacement per annum. Lower figure represents 30% displacement and 1% mortality and upper figure represents 70%	% of baseline mortality using figures for largest North Sea Population scale, 868,689 individuals (from Furness 2015) and the population size at FFC SPA (980 pairs for FFC SPA) as used in APP-051. Baseline mortality taken from Horswill and Robinson 2015)
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²⁶ 50% of birds have been apportioned as adults in the breeding season to FFC SPA

²⁷ Figures presented are from EA3 as most recently consented southern North Sea OWF as starting point for the cumulative and in-combination totals.

²⁸ Figures include EA3 cumulative/in-combo total and in addition – Norfolk Vanguard, Thanet ext (as presented in Norfolk Vanguard Environmental statement, Table 13.69

<https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010079/EN010079-001501-Chapter%2013%20Offshore%20Ornithology%20Norfolk%20Vanguard%20ES.pdf>

	displacement and 10% mortality	
Project Alone	1	0.00
	23	0.03
Cumulative	120	0.15
	2803	3.43
FFC SPA Project alone	0	0
	9	6.56
FFC in-combination	3	2.19
	67	48.83

2.5 GANNET

Table 29. Summary of range of potential displacement impacts at EIA North Sea Scale and FFC SPA scale for the project alone. Lower displacement mortality represents 30% displacement and 1% mortality; upper displacement mortality represents 70% displacement and 10% mortality. Data is summed from that presented in Tables 1.8 and 1.9 in REP4-049

Gannet	EIA North Sea (all birds)	FFC SPA (adults only) ²⁹
	Project Alone	Project Alone
HOW3	10-243	3-67

2.6 EIA

37. Natural England have presented a summary table below (Table 30) of potential EIA impacts, based on data presented by the applicant and identified by Natural England to be the most closely aligned to our advice (see tables 1, 12, 23, 25, 27, 31, 36 and 41 for information about the source of these figures).

²⁹ 63.3% of birds have been apportioned as adults in the breeding season to FFC SPA

Table. 30. EIA Summary for all Species. Predicted collisions at North Sea Scale from Hornsea Project Three alone and cumulatively with other plans and projects in the North Sea. In the case of Guillemot, Razorbill, Puffin and Gannet (displacement) the range indicates lower displacement mortality represents 30% displacement and 1% mortality; upper displacement mortality represents 70% displacement and 10% mortality. For gannet, kittiwake, lesser black-backed gull, great black-backed gull and Herring gull (collisions) the range indicates the range associated with variability around density, avoidance rate, NAF and flight height estimates. Pink shaded cells indicate increasing level of concern regarding impact to the North Sea population.

	Population scale for assessment (North Sea) from Furness (2015)	Project Alone Impact (all individuals)		Cumulative Impact (all individuals)	
		Impact	% Baseline Mortality ³⁰	Impact	% Baseline Mortality ³¹
Gannet	456,299	49 (10-128) ³²	0.13 (0.027-0.35)	3168 (2940-3563) ³³	8.57 (7.95-9.64)
Kittiwake	839,456 ³⁴	297 (127-503)	0.242 (0.104-0.41)	4247 (3737-5073)	3.47 (3.05-4.14)
Lesser Black-backed Gull	209,007	17 (4-44)	0.071 (0.017-0.183)	540 (483-650)	2.25 (2.01-2.7)
Great Black-backed Gull	91,399	66 (12-137)	1.03 (0.188-2.14)	1069 (887-1438)	16.7 (13.86-22.5)
Herring Gull	173,299	9 (1-23)	0.031(0.003-0.08)	784 (727-927)	2.73 (2.53-3.22)
Guillemot	2,045,078	98-2278	0.07-1.82	655-15277	0.52-12.25
Razorbill	591,874	28-660	0.05 - 1.06	291-6785	0.47-10.93
Puffin	868,689	1-23	0.00-0.03	120-2803	0.15-3.43

2.7 LESSER BLACK-BACKED GULL

³⁰ Calculated from Horswill & Robinson 2015

³¹ Calculated from Horswill & Robinson 2015

³² Gannet is predicted to experience an additional impact from displacement from Hornsea 3 alone of 10 – 243 birds, this would increase the % baseline mortality range to be 0.05-1.00%

³³ Gannet is predicted to experience an additional impact from displacement from Hornsea 3 alone of 10 – 243 birds, no cumulative displacement figures have been provided to calculate the additional impact of displacement from other OWFs, this will result in an under-estimation of cumulative impact to Gannet

³⁴ Population estimate for all UK colonies within North Sea BDMPS scale (from Furness 2015)

Table 31. Summary Figures for Lesser Black-backed Gull Predicted Annual Collisions

LBBG – collisions per annum	EIA North Sea (all birds)	
	Project Alone	Cumulatively
East Anglia Three ³⁵	n/a	475
Hornsea Project Three based on Applicant's project figures closest to NE advice on methods	17 (4-44) ³⁶	540 83-650) ³⁷

38. Details of the collision figures extracted from the Applicant's REP6-043 that are most closely aligned with Natural England's advice are set out below. Natural England notes that these figures from the Applicant do not address the issue of the incomplete baseline.

39. These figures are based on the following collision risk modelling parameters for lesser black-backed gull: Band Model (2012) Option 2, Nocturnal Activity Factor (NAF) 2-3, Avoidance Rates (AR) 99.5% (99.4-99.6), flight speeds from Pennycuik1987/Alerstam et al 2007.

40. Numbers in Tables 32-35 are total annual collisions with no apportioning to colonies. Green cells indicate the central and range of values for a given set of parameters. Numbers taken from Tables 3.13 and 3.14 of Applicant's REP6-043.

Table 32. NAF2. Variability in density and AR. Maximum Likelihood Flight height.

AR/density	LCL	Mean density	UCL
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³⁵ Figures taken from EA3 as most recently consented southern North Sea OWF as starting point for the cumulative totals. These figures have uncertainty associated with them – Natural England do not necessary agree with all the assumptions that underpin the figure.
<https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010056/EN010056-001644-EA3%20-%20Revised%20CRM.pdf>

³⁶ See Tables below for details of figures

³⁷ East Anglia Three cumulative total plus 65 (6-175) birds added from Hornsea Project Three, Norfolk Vanguard, Thanet Extension. No LBBG impacted at Moray West OWFs (<http://marine.gov.scot/sites/default/files/00538033.pdf>). Norfolk Vanguard figures from [Vanguard CRM Link](#) Table A4.8 Appendix 3.2. Thanet Extension figures taken from Taken from: Table 3 and associated text from: Vattenfall Wind Power Ltd. Thanet Extension Offshore Wind Farm. Appendix 39 to Deadline 3 Submission: Clarification Note on Collision Risk Modelling Parameters and Thanet Extension's Contribution to Cumulative and In-Combination Totals. No mean value given so taken as central point of range.

99.4	6	19	32
99.5	5	16	27
99.6	4	13	22

Table 33. NAF3. Variability in density and AR. Maximum Likelihood Flight height.

AR/density	LCL	Mean density	UCL
99.4	6	21	36
99.5	5	17	30
99.6	4	14	24

Table 34. NAF 2. Flight height and AR variation, using mean density

AR/PCH	LCL	Mean PCH	UCL
99.4	10	19	40
99.5	8	16	33
99.6	6	13	27

Table 35. NAF 3. Flight height and AR variation, using mean density

AR/PCH	LCL	Mean PCH	UCL
99.4	11	21	44
99.5	9	17	37
99.6	7	14	29

2.8 GREAT BLACK-BACKED GULL

Table 36. Summary Figures for Great Black-backed Gull Predicted Annual Collisions

GBBG – collisions per annum	EIA North Sea (all birds)	
	Project Alone	Cumulatively
East Anglia Three ³⁸	n/a	840
Hornsea Project Three based on Applicant's project figures closest to NE advice on methods	66 (12-137) ³⁹	1069 7-1438) ⁴⁰

41. Details of the collision figures extracted from the Applicant's REP6-043 that are most closely aligned with Natural England's advice are set out below. Natural England notes that these figures from the Applicant do not address the issue of the incomplete baseline.
42. These figures are based on the following collision risk modelling parameters for great black-backed gull: Band Model (2012) Option 2, Nocturnal Activity Factor (NAF) 2-3, Avoidance Rates (AR) 99.5% (99.4-99.6), flight speeds from Pennycuik1987/Alerstam et al 2007.
43. Numbers in Tables 37-40 are total annual collisions with no apportioning to colonies. Green cells indicate the central and range of values for a given set of parameters. Numbers taken from Tables 3.17 and 3.18 of Applicant's REP6-043.

Table 37. NAF2. Variability in density and AR. Maximum Likelihood Flight height.

AR/density	LCL	Mean density	UCL
99.4	18	64	110

³⁸ Figures taken from EA3 as most recently consented southern North Sea OWF as starting point for the cumulative totals. These figures have uncertainty associated with them – Natural England do not necessary agree with all the assumptions that underpin the figure.
<https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010056/EN010056-001644-EA3%20-%20Revised%20CRM.pdf>

³⁹ See Tables below for details of figures

⁴⁰ East Anglia Three cumulative total plus 229 (47-598) birds added from Hornsea Project Three, Norfolk Vanguard, Thanet Extension and Moray West OWFs. Moray West figures derived from <http://marine.gov.scot/sites/default/files/00538033.pdf>, Table 10.8.19. Norfolk Vanguard figures from [Vanguard CRM Link](#) Table A4.5 Appendix 3.2. Thanet Extension figures taken from Taken from: Table 3 and associated text from: Vattenfall Wind Power Ltd. Thanet Extension Offshore Wind Farm. Appendix 39 to Deadline 3 Submission: Clarification Note on Collision Risk Modelling Parameters and Thanet Extension's Contribution to Cumulative and In-Combination Totals. No mean value given so taken as central point of range.

99.5	15	53	92
99.6	12	42	73

Table 38. NAF3. Variability in density and AR. Maximum Likelihood Flight height.

AR/density	LCL	Mean density	UCL
99.4	24	79	136
99.5	20	66	113
99.6	16	53	91

Table 39. NAF 2. Flight height and AR variation, using mean density

AR/PCH	LCL	Mean PCH	UCL
99.4	50	64	110
99.5	42	53	92
99.6	33	42	73

Table 40. NAF 3. Flight height and AR variation, using mean density

AR/PCH	LCL	Mean PCH	UCL
99.4	62	79	137
99.5	52	66	114
99.6	42	53	91

2.9 HERRING GULL

Table 41. Summary Figures for Herring Gull Predicted Annual Collisions

HG – collisions per annum	EIA North Sea (all birds)
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	Project Alone	Cumulatively
East Anglia Three ⁴¹	n/a	701
Hornsea Project Three based on Applicant's project figures closest to NE advice on methods	9 (1-23) ⁴²	784 27-927) ⁴³

44. Details of the collision figures extracted from the Applicant's REP6-043 that are most closely aligned with Natural England's advice are set out below. Natural England notes that these figures from the Applicant do not address the issue of the incomplete baseline.
45. These figures are based on the following collision risk modelling parameters for Herring gull: Band Model (2012) Option 2, Nocturnal Activity Factor (NAF) 2-3, Avoidance Rates (AR) 99.5% (99.4-99.6), flight speeds from Pennycuik1987/Alerstam et al 2007.
46. Numbers in Tables 42-45 are total annual collisions with no apportioning to colonies. Green cells indicate the central and range of values for a given set of parameters. Numbers taken from Tables 3.15 and 3.16 of Applicant's REP6-043. Natural England note that there may be errors in the Table 3.15 (indicated in brackets in the table below).

Table 42. NAF2. Variability in density and AR. Maximum Likelihood Flight height.

AR/density	LCL	Mean density	UCL
98.7	1	9	12 (19)

⁴¹ Figures taken from EA3 as most recently consented southern North Sea OWF as starting point for the cumulative totals. These figures have uncertainty associated with them – Natural England do not necessary agree with all the assumptions that underpin the figure.
<https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010056/EN010056-001644-EA3%20-%20Revised%20CRM.pdf>

⁴² See Tables below for details of figures

⁴³ East Anglia Three cumulative total plus 83 (26-226) birds added from Hornsea Project Three, Norfolk Vanguard, Thanet Extension and Moray West OWFs. Moray West figures derived from <http://marine.gov.scot/sites/default/files/00538033.pdf>, Table 10.8.16. Norfolk Vanguard figures from Vanguard CRM Link Table A4.4 Appendix 3.2. Thanet Extension figures taken from Taken from: Table 3 and associated text from: Vattenfall Wind Power Ltd. Thanet Extension Offshore Wind Farm. Appendix 39 to Deadline 3 Submission: Clarification Note on Collision Risk Modelling Parameters and Thanet Extension's Contribution to Cumulative and In-Combination Totals. No mean value given so taken as central point of range.

98.9	1	7	10 (16)
99.1	1	6	8 (13)

Table 43. NAF3. Variability in density and AR. Maximum Likelihood Flight height.

AR/density	LCL	Mean density	UCL
98.7	1	11	23
98.9	1	9	20
99.1	1	7	16

Table 44. NAF 2. Flight height and AR variation, using mean density

AR/PCH	LCL	Mean PCH	UCL
98.7	6	9	15
98.9	5	7	12
99.1	4	6	10

Table 45. NAF 3. Flight height and AR variation, using mean density

AR/PCH	LCL	Mean PCH	UCL
98.7	7	11	19
98.9	6	9	16
99.1	5	7	13

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