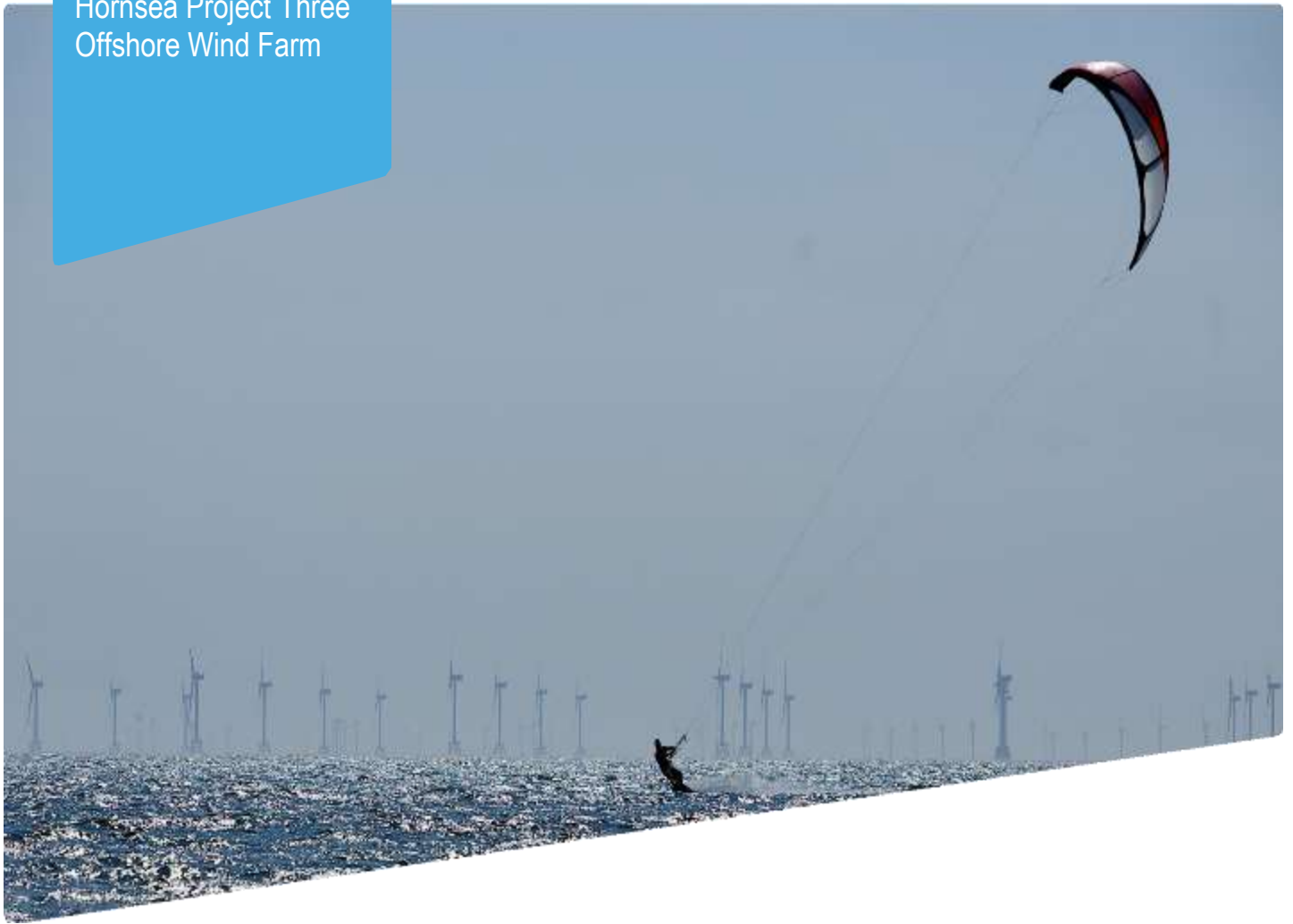


Hornsea Project Three  
Offshore Wind Farm



## Hornsea Project Three Offshore Wind Farm

Appendix 49 to Hornsea Three Deadline I Submission:  
Applicant's Response to ExA Question Q1.2.79

Date: 7<sup>th</sup> November 2018

Document Control			
<b>Document Properties</b>			
Organisation	Ørsted Hornsea Project Three		
Author	NIRAS		
Checked by	Felicity Browner		
Approved by	Andrew Guyton		
Title	Appendix 49 to Hornsea Three Deadline I Submission: Applicant's Response to ExA Question Q1.2.79		
PINS Document Number	n/a		
<b>Version History</b>			
Date	Version	Status	Description / Changes
07 <sup>th</sup> November 2018	A	Final	Updated submission at Deadline 1 (07/11/2018)

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## 1. Introduction

1.1 This clarification note presents further information in response to Question 1.2.79 of the Examining Authorities first round of Written Questions:

*"Table 5.38 of the ES [APP-065] groups projects into tiers depending on the stage that each project has reached. The Norfolk Vanguard and Thanet Extension offshore wind farms have recently been accepted for examination by the Planning Inspectorate, making them Tier 2 projects.*

*Please provide an updated CEA that takes into account the Norfolk Vanguard and Thanet Extension offshore wind farms as Tier 2 projects."*

1.2 In this response, the implications for the cumulative and in-combination assessments for offshore ornithology presented in Volume 2, Chapter 5: Offshore Ornithology (APP-065), the RIAA (APP-051) and Appendix 7 to the Applicants response to Deadline I are considered in relation to collision risk and displacement impacts from Norfolk Vanguard, Thanet Extension and Moray West offshore wind farms all of which have submitted consent applications since the submission of the Hornsea Three application. Only those assessments conducted for collision risk and operational displacement impacts are potentially affected by the inclusion of Norfolk Vanguard, Thanet Extension and Moray West as Tier 2 projects meaning that consideration has been given to the species and designated sites identified in Table 1.1

Table 1.1: Species and designated sites considered in this note

Impact	Species	Designated site
Collision risk	Gannet	Flamborough and Filey Coast (FFC) pSPA
	Kittiwake	FFC pSPA
	Lesser black-backed gull	N/A
	Great black-backed gull	N/A
Displacement	Guillemot	FFC pSPA
	Razorbill	FFC pSPA
	Puffin	FFC pSPA

1.3 This note should be read in conjunction with Appendix 4 to the Applicants response to Deadline I which considers changes to the assessed and as-built turbine scenarios proposed/constructed at other projects considered cumulatively/in-combination including for those projects which have submitted non-material amendments (Dogger Bank Creyke Beck A&B and Sofia offshore wind farms) or revised applications (Nearth na Gaoithe, Inch Cape and Seagreen Alpha and Bravo) since the submission of the Hornsea Three application

## 2. Projects to be considered

### New applications

2.1 Following review of the projects considered within the CEA for Hornsea Three the following 'new' projects were identified which have the potential to materially affect the CEA (e.g. potentially lead to a change in the significance of effect) through recent changes in their design parameters:

- Norfolk Vanguard – The Hornsea Three CEA considered Norfolk Vanguard Offshore Wind Farm based on the information available in the Norfolk Vanguard Offshore Wind Farm Preliminary Environmental Information Report (PEIR) and as such, this was considered to be a Tier 3 project (see Section 5.4 of Volume 1, Chapter 5: Environmental Impact Assessment Methodology of the Environmental Statement). This project has now submitted a DCO application and accompanying Environmental Statement to the Planning Inspectorate and can therefore be considered to be a Tier 2 project;
- Thanet Extension – As with Norfolk Vanguard, the Hornsea Three CEA considered this project based on the information available in the Thanet Extension PEIR and as such, this was considered to be a Tier 3 project. This project has also recently submitted a DCO application and accompanying Environmental Statement to the Planning Inspectorate and can therefore be considered to be a Tier 2 project;
- Moray West - The Hornsea Three CEA considered Moray West Offshore Wind Farm based on the information available in the Moray West Offshore Wind Farm Scoping Report and as such, this was considered to be a Tier 3 project (see Section 5.4 of Volume 1, Chapter 5: Environmental Impact Assessment Methodology of the Environmental Statement). This project has now submitted a Marine Licence application and accompanying Environmental Statement to Marine Scotland, which is currently in determination and can therefore be considered to be a Tier 2 project.

### Other projects

2.2 In addition to the projects identified above, a number of projects that were considered in the CEA for Hornsea Three have submitted updated project designs, either in the form of new applications or non-material amendments.

- Seagreen Alpha and Bravo (revised application);
  - Decrease in the number of turbines from 75 for each project (up to 150 in total in the original Environmental Statement) to up to 70 turbines in each project. A total of up to 120 turbines across Phase 1 in the Environmental Impact Assessment Report (EIAR);
  - Increase in the maximum rotor diameter from 167 m, in the original Environmental Statement, to 220 m in the EIAR;
  - Increase in the blade tip height from 209.7 m, in the original Environmental Statement, to 280 m in the EIAR;
  - Increase in the minimum blade tip clearance from 29.8 m, in the original Environmental Statement, to 32.5 m in the EIAR;

- Expansion of the foundation options to include monopile foundation options at up to 70 locations in the EIAR, previously the original Environmental Statement only included jacket and gravity base foundations;
- Neart na Gaoithe (revised application);
  - Decrease in the number of turbines from 75, in the original Environmental Statement, to up to 54 turbines in the EIAR;
  - Increase in the rotor tip height from 197 m, in the original Environmental Statement, to 208 m in the EIAR;
  - Increase in hub height from 115 m, in the original Environmental Statement, to 126 m in the EIAR;
  - Increase in the maximum rotor diameter from 154 m, in the original Environmental Statement, to 167 m in the EIAR;
  - Increase in the minimum spacing between turbines from 450 m, in the original Environmental Statement, to 800 m in the EIAR;
  - Increase in the minimum blade tip clearance from 30.5 m, in the original Environmental Statement, to 35 m in the EIAR;
  - Increase in the maximum number of piles per foundation for jackets from 4 piles, in the original Environmental Statement, to 6 piles in the EIAR;
  - Reduction of the foundation options to jackets only, the original Environmental Statement included both gravity base structures and jackets;
  - Increase from 6 turbines per collector circuit, in the original Environmental Statement, to 10 turbines per collector circuit in the EIAR for inter-array cables;
  - Decrease from up to 15 circuits, in the original Environmental Statement, to up to 14 circuits in the EIAR for inter-array cables;
  - An increase in the maximum level of Offshore Substation Platforms (OSPs) above Lowest Astronomical Tide (LAT) from 18 m, in the original Environmental Statement, to 21 m in the EIAR; and
  - An increase in the length of the export cable from 33 km to 43 km.
- Inch Cape (revised application);
  - Decrease in the number of turbines from 110 in the original Environmental Statement to 72 turbines in the EIAR;
  - Increase in the blade tip height from 215 m in the original Environmental Statement to 291 m in the EIAR;
  - Removal of two met masts in the ES from the development parameters in the EIAR (i.e. there will no longer be any met masts);
  - Decrease in the number of offshore substation platforms from 5 in the original Environmental Statement, to 2 in the EIAR;
  - Decrease in the inter-array cabling length from 353 km in the original Environmental Statement to 190 km in the EIAR; and

- Decrease in the number of export cables from 6 in the original Environmental Statement to 2 in the EIAR.
- Dogger Bank Creyke Beck A&B (non-material amendment); and
  - Increase in maximum wind turbine rotor diameter from 215 m, in the original Environmental Statement, to 280 m in the NMC;
  - Increase in maximum hammer energy for monopile turbine foundations from 3,000 kJ, in the original Environmental Statement, to 4,000 kJ in the NMC; and
  - Increase in maximum monopile diameter from 10 m, in the original Environmental Statement, to 12 m in the NMC.
- Sofia (non-material amendment);
  - Increase in maximum wind turbine rotor diameter from 215 m, in the original Environmental Statement, to 288 m in the NMC;
  - Increase in maximum hammer energy for monopile turbine foundations from 3,000 kJ, in the original Environmental Statement, to 5,500 kJ in the NMC;
  - Increase in foundation options for offshore platforms to include monopile foundations in the NMC, previously only included jacket and gravity base foundations in the original Environmental Statement;
  - Maximum hammer energy for monopile foundations for substations to be up to 5,500 kJ in the NMC (previously 1,900 kJ for driven piles in the original Environmental Statement) and to have a pile diameter of up to 12 m in the NMC (2.75 m for driven piles in the original Environmental Statement); and
  - Increase the maximum capacity from 1.2 GW in the original Environmental Statement to 1.4 GW in the NMC.

2.3 The potential changes to the conclusions reached in Volume 2, Chapter 5: Offshore Ornithology (APP-065) and the RIAA (APP-051) as a result of design changes for these projects are considered in Appendix 4 to the Applicants response to Deadline I alongside changes that have occurred between the assessments and construction of other offshore wind farm projects.

### 3. Assessment parameters

#### Avoidance rates and Band model Options

- 3.1 Two approaches are used to calculate cumulative and in-combination collision totals. In Volume 2, Chapter 5: Offshore Ornithology (APP-065) and the RIAA (APP-051) the cumulative and in-combination assessments used collision risk estimates calculated using the Extended model (Options 3 or 4) where available. If collision risk estimates calculated using the Extended model were unavailable then estimates calculated using the Basic model (Options 1 or 2) were used. Appendix 7 to the Applicants response to Deadline I presents cumulative and in-combination assessments using collision risk estimates calculated using the Basic model only. In order to provide updates to both of these assessment approaches, this document presents cumulative and in-combination totals incorporating the three new applications (Norfolk Vanguard, Thanet Extension and Moray West) using the Extended model (where available) and the Basic model.
- 3.2 For each of the three new applications collision risk estimates applying the avoidance rates and Band model Options presented in Table 3.1 have been used. The avoidance rates used are consistent with those applied in Volume 2, Chapter 5: Offshore Ornithology (APP-065) and the RIAA (APP-051) for the Extended model and in Appendix 7 to the Applicants response to Deadline I for the Basic model.
- 3.3 Norfolk Vanguard and Thanet Extension only present collision risk estimates in their Environmental Statements calculated using the Basic model (Option 2) and therefore these collision risk estimates are used for both of the cumulative/in-combination approaches presented in the species-specific sections (i.e. Extended model, where available and the Basic model). Moray West presents collision risk estimates calculated using both the Basic and Extended models and as such the estimates used are those relevant to the cumulative/in-combination approaches presented below.

Table 3.1: Avoidance rates and Band model Options used for collision risk estimates from Norfolk Vanguard, Thanet Extension and Moray West

Project	Cumulative/in-combination approach	Gannet		Kittiwake		Lesser black-backed gull		Great black-backed gull	
		Option	Avoidance rate (%)	Option	Avoidance rate (%)	Option	Avoidance rate (%)	Option	Avoidance rate (%)
Norfolk Vanguard	Basic	2	98.9	2	98.9	2	99.5	2	99.5
	Extended (where available)	2	98.9	2	99.2	2	99.5	2	99.5
Thanet Extension	Basic	2	98.9	2	98.9	2	99.5	2	99.5
	Extended (where available)	2	98.9	2	99.2	2	99.5	2	99.5
Moray	Basic	2	98.9	2	98.9	No collision risk		2	99.5



Project	Cumulative/in-combination approach	Gannet		Kittiwake		Lesser black-backed gull	Great black-backed gull	
West	Extended (where available)	3	98	3	98	estimates presented	3	98.9

### **Displacement and mortality rates**

3.4 The displacement and mortality rates applied in the following sections for relevant species are presented in Table 3.2 and are consistent with those used in the assessments presented in Volume 2, Chapter 5: Offshore Ornithology (APP-065) and the RIAA (APP-051).

Table 3.2: Displacement and mortality rates applied for relevant species

Species	Season	Displacement rate (%)	Mortality rate (%)
Guillemot	Breeding	50	2-10
	Non-breeding		1
Razorbill	Breeding	40	2-10
	Post-breeding		2
	Non-breeding		1
	Pre-breeding		2
Puffin	Breeding	50	2-10
	Non-breeding		1

## **4. Revised cumulative/in-combination totals**

### **Gannet**

#### **Overview**

4.1 Seasonal collision risk estimates for Norfolk Vanguard, Thanet Extension and Moray West are presented in Table 4.1 and Table 4.2 with these tables presenting the respective cumulative and in-combination totals when using the Extended model, where available, and the Basic model for other projects considered.

4.2 Of the three new applications, the largest contribution to both the cumulative and in-combination impacts for gannet comes from Norfolk Vanguard with this project being one of the largest contributors of all projects considered. Moray West and Thanet Extension both contribute a negligible number of collisions, especially from an in-combination perspective (only one collision when both projects are combined).

### Implications for Hornsea Three CEA

- 4.3 Norfolk Vanguard, Thanet Extension and Moray West do not contribute to the cumulative and in-combination assessments conducted for Hornsea Three for breeding adult birds in the breeding season due to a lack of connectivity between these projects and regional breeding populations.
- 4.4 The cumulative collision risk assessment for gannet presented in Volume 2, Chapter 5: Offshore Ornithology (APP-065) (using the Extended model where available) predicted collision risk totals of 626 and 321 collisions in the post- and pre-breeding seasons respectively. The inclusion of Norfolk Vanguard, Thanet Extension and Moray West increases the post-breeding and pre-breeding season totals to 696 and 360 collisions respectively due predominantly to the contribution of Norfolk Vanguard (Table 4.1). This represents an increase in the baseline mortality of the regional post-breeding population from 1.7% to 1.9% and in regional pre-breeding population of 1.6% to 1.8%.
- 4.5 When using the Basic model, the analysis presented in Appendix 7 to the Applicants response to Deadline I predicted cumulative totals of 684 and 292 collisions in the post- and pre-breeding seasons respectively. These totals increase to 757 and 331 collisions respectively when collisions from Norfolk Vanguard, Thanet Extension and Moray West are included with these increases again due predominantly to the contribution of Norfolk Vanguard. This represents an increase in the baseline mortality of the regional post-breeding population from 1.9% to 2.0% and in regional pre-breeding population of 1.5% to 1.6%.
- 4.6 Despite these increases it is considered that the conclusions in Volume 2, Chapter 5: Offshore Ornithology (APP-065) remain valid as the change to the increase in baseline mortality is not considered to be of a magnitude that may suggest a considerable increase in the associated impact. In addition, there are considerable areas of over-estimation inherent in the cumulative totals presented (see paragraphs 5.13.3.119 and 5.13.3.137) and there remains a degree of uncertainty as to the turbine scenarios to be applied at all three of these projects as well as a number of other projects that are in Tier 2 (see Appendix 4 to the Applicants response to Deadline I).
- 4.7 For the in-combination assessment the total collision risk attributable to FFC pSPA estimated in the RIAA (APP-051) (when using the Extended model where available) was 193 collisions/annum. This increases to 198 collisions/annum when collisions from Norfolk Vanguard, Thanet Extension and Moray West are included (Table 4.1). This represents a change in the increase in baseline mortality of the FFC pSPA population from 14.1% to 14.4%. When using the Basic model, the total in-combination collision impact on FFC pSPA was estimated as 161 collisions/annum, increasing to 168 when collisions from Norfolk Vanguard, Thanet Extension and Moray West are included. This represents a change in the increase in baseline mortality of the FFC pSPA population from 11.7% to 12.2%. These increases do not change the PVA metrics considered as part of the conclusions presented in the RIAA and are not considered to represent a change in magnitude sufficient to alter the conclusions reached in the RIAA (APP-051).

Table 4.1: Cumulative and in-combination collision risk for gannet using the Extended model where available<sup>1</sup>

Project	Breeding season			Post-breeding season			Pre-breeding season		
	No. of collisions	Apportioning (%)	pSPA collisions	No. of collisions	Apportioning (%)	pSPA collisions	No. of collisions	Apportioning (%)	pSPA collisions
Hornsea Project Three	7	40	3	5	4.8	0	3	6.2	0
Other Tier 1 projects	93	72-100	91	304	4.8	15	159	6.2	10
<b>Tier 1 total</b>	<b>100</b>		<b>94</b>	<b>309</b>		<b>15</b>	<b>163</b>		<b>10</b>
Tier 2									
Moray West				3	4.8	0	0	6.2	0
Norfolk Vanguard				62	4.8	3	30	6.2	2
Thanet Extension				4	4.8	0	9	6.2	1
Other Tier 2 projects	97	50	48	317	4.8	15	158	6.2	10
<b>Tier 2 total</b>	<b>97</b>		<b>48</b>	<b>387</b>		<b>19</b>	<b>198</b>		<b>12</b>
<b>Overall total</b>	<b>197</b>		<b>142</b>	<b>696</b>		<b>34</b>	<b>360</b>		<b>22</b>

<sup>1</sup> All figures in all tables are calculated using exact numbers (i.e. with all decimals) and therefore summing constituent numbers may not equal the totals presented

Table 4.2: Cumulative and in-combination collision risk for gannet using the Basic model

Project	Breeding season			Post-breeding season			Pre-breeding season		
	No. of collisions	Apportioning (%)	pSPA collisions	No. of collisions	Apportioning (%)	pSPA collisions	No. of collisions	Apportioning (%)	pSPA collisions
Hornsea Project Three	18	40	7	12	4.8	1	8	6.2	0
Tier 1 projects	96	72-100	93	409	4.8	20	175	6.2	11
<b>Tier 1 total</b>	<b>113</b>		<b>100</b>	<b>420</b>		<b>20</b>	<b>183</b>		<b>11</b>
Tier 2									
Moray West				6	4.8	0	1	6.2	0
Norfolk Vanguard				62	4.8	3	30	6.2	2
Thanet Extension				4	4.8	0	9	6.2	1
Other Tier 2 projects	20	50	10	264	4.8	13	109	6.2	7
<b>Tier 2 total</b>	<b>20</b>		<b>10</b>	<b>336</b>		<b>16</b>	<b>149</b>		<b>9</b>
<b>Overall total</b>	<b>134</b>		<b>110</b>	<b>757</b>		<b>37</b>	<b>331</b>		<b>21</b>

## **Kittiwake**

### **Overview**

- 4.8 Seasonal collision risk estimates for Norfolk Vanguard, Thanet Extension and Moray West are presented in Table 4.3 and Table 4.4 with these tables presenting the respective cumulative and in-combination totals when using the Extended model, where available and the Basic model for other projects considered cumulatively/in-combination.
- 4.9 Of the three new applications, the largest contribution to both the cumulative and in-combination impacts for kittiwake comes from Norfolk Vanguard. Moray West also contributes to some extent, especially in an EIA context however, when considered in a HRA context (i.e. the number of collision attributable to FFC pSPA), the contribution of Moray West and Thanet Extension can be considered to be negligible (only one collision when both projects are combined).

### **Implications for Hornsea Three CEA**

- 4.10 Norfolk Vanguard, Thanet Extension and Moray West do not contribute to the cumulative and in-combination assessments conducted for Hornsea Three for breeding adult birds in the breeding season due to a lack of connectivity between these projects and regional breeding populations.
- 4.11 The cumulative collision risk assessment for kittiwake presented in Volume 2, Chapter 5: Offshore Ornithology (APP-065) (using the Extended model where available) predicted collision risk totals of 673 and 446 collisions in the post- and pre-breeding seasons respectively. The inclusion of Norfolk Vanguard, Thanet Extension and Moray West increases the post-breeding and pre-breeding season totals to 738 and 508 collisions respectively due predominantly to the contribution of Norfolk Vanguard (Table 4.3). This represents an increase in the baseline mortality of the regional post-breeding population from 0.56% to 0.61% and in regional pre-breeding population of 0.49% to 0.55%.
- 4.12 When using the Basic model, the analysis presented in Appendix 7 to the Applicants response to Deadline I predicted cumulative totals of 1,418 and 1,076 collisions in the post- and pre-breeding seasons respectively. These totals increase to 1,518 and 1,162 collisions respectively when collisions from Norfolk Vanguard, Thanet Extension and Moray West are included with these increases again due predominantly to the contribution of Norfolk Vanguard (Table 4.4). This represents an increase in the baseline mortality of the regional post-breeding population from 1.2% to 1.3% and in regional pre-breeding population of 1.2% to 1.3%.
- 4.13 Despite these increases it is considered that the conclusions in Volume 2, Chapter 5: Offshore Ornithology (APP-065) remain valid as the change to the increase in baseline mortality is not considered to be of a magnitude that may suggest a considerable increase in the associated impact. In addition, there are considerable areas of over-estimation inherent in the cumulative totals presented (see paragraphs 5.13.3.119 and 5.13.3.137) and there remains a degree of uncertainty as to the turbine scenarios to be applied at all three of these projects as well as a number of other projects that are in Tier 2 (see Appendix 4 to the Applicants response to Deadline I).

- 4.14 For the in-combination assessment the total collision risk attributable to FFC pSPA estimated in the RIAA (Document 5.2) (APP-051) (when using the Extended model where available) was 119 collisions/annum. This increases to 126 collisions/annum when collisions from Norfolk Vanguard, Thanet Extension and Moray West are included (Table 4.1). This represents a change in the increase in baseline mortality of the FFC pSPA population from 0.92% to 0.97%. When using the Basic model, the total in-combination collision impact on FFC pSPA was estimated as 249 collisions/annum, increasing to 262 when collisions from Norfolk Vanguard, Thanet Extension and Moray West are included. This represents a change in the increase in baseline mortality of the FFC pSPA population from 1.92% to 2.02%. These increases do not change the PVA metrics considered as part of the conclusions presented in the RIAA and are not considered to represent a change in magnitude sufficient to alter the conclusions reached in the RIAA (APP-051).

Table 4.3: Cumulative and in-combination collision risk for kittiwake using the Extended model where available

Project	Breeding season			Post-breeding season			Pre-breeding season		
	No. of collisions	Apportioning (%)	pSPA collisions	No. of collisions	Apportioning (%)	pSPA collisions	No. of collisions	Apportioning (%)	pSPA collisions
Hornsea Project Three	42	40.4	18	26	5.4	1	14	7.1	1
Tier 1 projects	18	83-100	18	206	5.4	11	120	7.1	9
<b>Tier 1 total</b>	<b>60</b>		<b>35</b>	<b>232</b>		<b>13</b>	<b>134</b>		<b>10</b>
Tier 2									
Moray West				18	5.4	1	3	7.1	0
Norfolk Vanguard				45	5.4	2	52	7.1	4
Thanet Extension				2	5.4	0	7	7.1	0
Other Tier 2 projects	87	16.8	15	441	5.4	24	312	7.1	22
<b>Tier 2 total</b>	<b>87</b>		<b>15</b>	<b>506</b>		<b>28</b>	<b>373</b>		<b>27</b>
<b>Overall total</b>	<b>148</b>		<b>50</b>	<b>738</b>		<b>40</b>	<b>508</b>		<b>36</b>

Table 4.4: Cumulative and in-combination collision risk for kittiwake using the Basic model

Project	Breeding season			Post-breeding season			Pre-breeding season		
	No. of collisions	Apportioning (%)	pSPA collisions	No. of collisions	Apportioning (%)	pSPA collisions	No. of collisions	Apportioning (%)	pSPA collisions
Hornsea Project Three	23	40.4	10	14	5.4	1	8	7.1	1
Tier 1 projects	41	83-100	37	567	5.4	31	264	7.1	19
Tier 1 total	64		47	581		32	272		20
Tier 2									
Moray West				36	5.4	2	7	7.1	0
Norfolk Vanguard				61	5.4	3	71	7.1	5
Thanet Extension				3	5.4	0	9	7.1	1
Other Tier 2 projects	288	16.8	48	837	5.4	46	804	7.1	58
Tier 2 total	288		48	937		51	891		64
Overall total	352		95	1518		83	1162		84



## **Lesser black-backed gull**

### **Overview**

- 4.15 Seasonal collision risk estimates for Norfolk Vanguard, Thanet Extension and Moray West are presented in Table 4.5 and Table 4.6 with these tables presenting the respective cumulative and in-combination totals when using the Extended model, where available and the Basic model for other projects considered cumulatively/in-combination.
- 4.16 Norfolk Vanguard is the largest contributor to the Tier 2 cumulative total providing approximately 50% of the total Tier 2 impact in both the breeding and post-breeding seasons. Thanet Extension provides no collisions to the overall cumulative total. Moray West has not conducted collision risk modelling for lesser black-backed gull most likely due to low numbers of the species recorded during site-specific surveys.

### **Implications for Hornsea Three CEA**

- 4.17 The cumulative collision risk assessment for lesser black-backed gull presented in Volume 2, Chapter 5: Offshore Ornithology (Document 6.2.5) (APP-065) (using the Extended model where available) predicted collision risk totals of 153, 89, 140 and 57 collisions in the breeding, post-breeding, non-breeding and pre-breeding seasons respectively. Norfolk Vanguard contributes collisions in the breeding and post-breeding seasons with Thanet Extension contributing to the cumulative total in the post-breeding season (Table 4.5). The cumulative totals for the breeding and post-breeding seasons therefore increase to 165 and 103 collisions respectively. This represents an increase in the baseline mortality of the breeding and post-breeding regional populations from 29.3% and 0.37% to 31.5% and 0.43% respectively.
- 4.18 When using the Basic model, the analysis presented in Appendix 7 to the Applicants response to Deadline I predicted cumulative totals of 169, 99, 161 and 55 collisions in the breeding, post-breeding, non-breeding and pre-breeding seasons respectively. As with the totals for the Extended model, only those for the breeding and post-breeding seasons increase to 181 and 114 collisions respectively Table 4.4. This represents an increase in the baseline mortality of the breeding and post-breeding regional populations from 32.3% and 0.41% to 34.6% and 0.43% respectively.
- 4.19 Despite these increases it is considered that the conclusions in Volume 2, Chapter 5: Offshore Ornithology (Document 6.2.5) (APP-065) remain valid as the change to the increase in baseline mortality is not considered to be of a magnitude that may suggest a considerable increase in the associated impact. In addition, there are considerable areas of over-estimation inherent in the cumulative totals presented (see paragraphs 5.13.3.119 and 5.13.3.137 in Volume 2, Chapter 5: Offshore Ornithology (Document 6.2.5) (APP-065) and there remains a degree of uncertainty as to the turbine scenarios to be applied at all three of these projects as well as a number of other projects that are in Tier 2 (see Appendix 4 to the Applicants response to Deadline I).

Table 4.5: Cumulative collision risk for lesser black-backed gull using the Extended model where available

Project	Breeding	Post-breeding	Non-breeding	Pre-breeding
Hornsea Three	10	1	0	1
Tier 1 projects	129	72	131	46
<b>Tier 1 total</b>	<b>139</b>	<b>73</b>	<b>131</b>	<b>47</b>
<b><i>Tier 2</i></b>				
Norfolk Vanguard	13	15	0	0
Thanet Extension		0	0	0
Other Tier 2 projects	14	16	9	10
<b>Tier 2 total</b>	<b>27</b>	<b>31</b>	<b>9</b>	<b>10</b>
<b>Total</b>	<b>165</b>	<b>103</b>	<b>140</b>	<b>57</b>

Table 4.6: Cumulative collision risk for lesser black-backed gull using the Basic model

Project	Breeding	Post-breeding	Non-breeding	Pre-breeding
Hornsea Three	15	2	0	1
Tier 1 projects	142	79	153	48
<b>Tier 1 total</b>	<b>157</b>	<b>81</b>	<b>153</b>	<b>49</b>
<b><i>Tier 2</i></b>				
Norfolk Vanguard	13	15	0	0
Thanet Extension		0	0	0
Other Tier 2 projects	12	18	8	6
<b>Tier 2 total</b>	<b>25</b>	<b>33</b>	<b>8</b>	<b>6</b>
<b>Total</b>	<b>181</b>	<b>114</b>	<b>161</b>	<b>55</b>

## **Great black-backed gull**

### **Overview**

- 4.20 Seasonal collision risk estimates for Norfolk Vanguard, Thanet Extension and Moray West are presented in Table 4.7 and Table 4.8 with these tables presenting the respective cumulative and in-combination totals when using the Extended model, where available and the Basic model for other projects considered cumulatively.
- 4.21 Norfolk Vanguard and Thanet Extension both contribute a similar number of collisions to the overall cumulative total, representing nearly 10% of the Tier 2 total in non-breeding season. In contrast, Moray West only contributes approximately 3% of the Tier 2 total. All three projects contribute a negligible number of collisions in the breeding season.

### **Implications for Hornsea Three CEA**

- 4.22 The cumulative collision risk assessment for great black-backed gull presented in Volume 2, Chapter 5: Offshore Ornithology (APP-065) (using the Extended model where available) predicted collision risk totals of 60 and 606 collisions in the breeding and non-breeding seasons respectively. The inclusion of Norfolk Vanguard, Thanet Extension and Moray West increases the breeding and non-breeding season totals to 64 and 657 collisions (Table 4.7). This represents an increase in the baseline mortality of the regional breeding population from 2.5% to 2.7% and in regional non-breeding population of 9.5% to 10.3%.
- 4.23 When using the Basic model, the analysis presented in Appendix 7 to the Applicants response to Deadline I predicted cumulative totals of 68 and 709 collisions in the breeding and non-breeding seasons respectively. These totals increase to 72 and 761 collisions respectively when collisions from Norfolk Vanguard, Thanet Extension and Moray West are included (Table 4.8). This represents an increase in the baseline mortality of the regional breeding population from 2.9% to 3.0% and in regional non-breeding population of 11.1% to 11.9%.
- 4.24 Despite these increases it is considered that the conclusions in Volume 2, Chapter 5: Offshore Ornithology (APP-065) remain valid as the change to the increase in baseline mortality is not considered to be of a magnitude that may suggest a considerable increase in the associated impact. In addition, there are considerable areas of over-estimation inherent in the cumulative totals presented (see paragraphs 5.13.3.119 and 5.13.3.137) and there remains a degree of uncertainty as to the turbine scenarios to be applied at all three of these projects as well as a number of other projects that are in Tier 2 (see Appendix 4 to the Applicants response to Deadline I).

Table 4.7: Cumulative collision risk for great black-backed gull using the Extended model where available

Project	Breeding	Non-breeding
Hornsea Three	12	40
Tier 1 projects	37	367
<b>Tier 1 total</b>	<b>49</b>	<b>407</b>
<b><i>Tier 2</i></b>		
Moray West	1	8
Norfolk Vanguard	0	22
Thanet Extension	2	21
Other Tier 2 projects	11	198
<b>Tier 2 total</b>	<b>14</b>	<b>250</b>
<b>Total</b>	<b>64</b>	<b>657</b>

Table 4.8: Cumulative collision risk for great black-backed gull using the Basic model

Project	Breeding	Non-breeding
Hornsea Three	16	50
Tier 1 projects	40	444
<b>Tier 1 total</b>	<b>56</b>	<b>495</b>
<b><i>Tier 2</i></b>		
Moray West	1	8
Norfolk Vanguard	0	22
Thanet Extension	2	21
Other Tier 2 projects	13	215
<b>Tier 2 total</b>	<b>16</b>	<b>266</b>
<b>Total</b>	<b>72</b>	<b>761</b>

## **Guillemot**

### **Norfolk Vanguard**

- 4.25 The assessment of displacement of guillemot at Norfolk Vanguard in the breeding season predicts a displacement mortality of 216 guillemot when applying the displacement and mortality rates used in the cumulative assessment for Hornsea Three (50% displacement and 10% mortality). However, as there is no connectivity between any breeding colonies and Norfolk Vanguard in the breeding season, birds present at Norfolk Vanguard in the breeding season are likely to be immature and non-breeding birds and therefore a lower mortality rate is considered to be more appropriate. The displacement mortality at Norfolk Vanguard is therefore considered to be 43-216 (50% displacement and 2-10% mortality). In the non-breeding season, when applying the displacement and mortality rates used in the cumulative assessment for Hornsea Three (50% displacement and 1% mortality) a total displacement mortality of 24 guillemot is predicted for Norfolk Vanguard.
- 4.26 There is considered to be no connectivity between Norfolk Vanguard and FFC pSPA in the breeding season and therefore no displacement mortality associated with Norfolk Vanguard in the breeding season is attributable to the breeding adult population at FFC pSPA. A proportion of the impact at Norfolk Vanguard may be attributable to the immature population associated with FFC pSPA. The level of mortality predicted however, is not considered to represent a significant increase on the total displacement mortality for immature birds at FFC pSPA (as estimated in the RIAA (APP-051)). The apportioning value used for guillemot at FFC pSPA in the non-breeding season is 4.4%. This would therefore lead to one bird being apportioned to FFC pSPA from Norfolk Vanguard in the non-breeding season.

### **Thanet Extension**

- 4.27 Displacement analyses in the breeding season at Thanet Extension predicted no displacement mortality of guillemot when applying the displacement and mortality rates used in the cumulative assessment for Hornsea Three (50% displacement and 10% mortality).
- 4.28 The displacement analysis for Thanet Extension uses three non-breeding seasons (spring, winter and autumn) for guillemot. Of these the highest impact occurs during spring migration, with a total displacement mortality of three birds when applying the displacement and mortality rates used in the cumulative assessment for Hornsea Three (50% displacement and 1% mortality).
- 4.29 The apportioning value used for guillemot at FFC pSPA in the non-breeding season is 4.4%. This would therefore lead to less than one bird being apportioned to FFC pSPA from Thanet Extension in the non-breeding season.

### **Moray West**

- 4.30 Due to the methodology used to calculate baseline populations for use in the assessments for Moray West, it is not possible to calculate displacement mortality using the seasonal definitions for guillemot applied at Hornsea Three. Therefore the seasonal displacement mortality as reported in the consent application documents for Moray West are assumed to provide a representative assessment.

- 4.31 In the breeding season, a displacement mortality of 1,221 guillemot is predicted when applying the displacement and mortality rates used in the cumulative assessment for Hornsea Three (50% displacement and 10% mortality) with the majority of these likely to be associated with local breeding colonies due to the proximity of Moray West to the Caithness coast. There is no connectivity between breeding guillemot from FFC pSPA and Moray West in the breeding season although some of the guillemot present at Moray West may be immature birds associated with FFC pSPA. However, this is not likely to represent a significant increase on the total displacement mortality for immature birds at FFC pSPA (as discussed in the RIAA (APP-051)).
- 4.32 Displacement analyses for Moray West use a post-breeding and non-breeding season for guillemot. A post-breeding season was defined due increases in the population of guillemot recorded towards the end of the breeding season with such populations considered to be birds dispersing from breeding colonies. For the Hornsea Three cumulative assessment it is therefore considered more appropriate to use the predicted displacement mortality from the non-breeding season for which a displacement mortality of 41 birds was predicted when applying the displacement and mortality rates used in the cumulative assessment for Hornsea Three (50% displacement and 1% mortality). The apportioning value used for guillemot at FFC pSPA in the non-breeding season is 4.4%. This would therefore lead to two birds being apportioned to FFC pSPA from Moray West in the non-breeding season.

#### **Implications for Hornsea Three CEA**

- 4.33 Volume 2, Chapter 5: Offshore Ornithology (APP-065) predicted an overall cumulative displacement mortality of 5,660-6,195 guillemot in the breeding season and 411 guillemot in the non-breeding season. Displacement mortality of guillemot from Norfolk Vanguard, Thanet Extension and Moray West therefore increases the total cumulative impact to 6,924—7,637 in the breeding season and 481 in the non-breeding season. In the breeding season, impacts from different projects will impact different populations due to the constraints on breeding birds at this time (provisioning of young) and the distribution of immature birds. However, the impact presented here is likely to be significantly lower as many projects, especially those south of Hornsea Three, will be impacting a population composed primarily of immature and non-breeding birds which are considered to less susceptible to displacement impacts due to an increased habitat flexibility suggesting a lower mortality rate should be applied. As such, although the increase in the breeding season appears to be considerable, the population affected by the cumulative breeding season is substantial likely representing all breeding birds on the east coast of the UK (952,646 breeding birds), a significant proportion of the 704,957 immature birds estimated to be associated with these breeding colonies and a proportion of immature birds associated with colonies on the west coast of the UK and birds from foreign colonies. This is discussed in paragraphs 5.13.3.59 to 5.13.3.62 in Volume 2, Chapter 5: Offshore Ornithology (APP-065).
- 4.34 The level of increase predicted is therefore not considered to change the conclusions reached in Volume 2, Chapter 5: Offshore Ornithology (APP-065) especially as it is considered unlikely that all projects included in Tier 2 will be brought forward or, if constructed, they are unlikely to be built out to the maximum design scenario assumptions made in the respective impact assessments.



- 4.35 Norfolk Vanguard, Thanet Extension and Moray West are not considered to contribute to any impact on breeding adult guillemot from FFC pSPA in the breeding season due to a lack of connectivity between these projects and the breeding colony. However, these projects may contribute to impacts on immature birds associated with FFC pSPA although based on the magnitude of the impacts predicted in the breeding season for each project it is considered unlikely that any contribution would be significant.
- 4.36 In the non-breeding season the total in-combination impact on FFC pSPA was estimated as 18 birds from Tier 1 and 2 projects (APP-051). When the contribution from Norfolk Vanguard, Thanet Extension and Moray West are incorporated this increases to 21 birds.
- 4.37 The displacement mortality attributable from Norfolk Vanguard, Thanet Extension and Moray West to FFC pSPA is not considered to be significant. The conclusions reached in the RIAA (APP-051) in relation to in-combination displacement impacts on guillemot are therefore considered to remain valid when these projects are included in the in-combination assessment.

### **Razorbill**

#### **Norfolk Vanguard**

- 4.38 The assessment of displacement of razorbill at Norfolk Vanguard in the breeding season predicts a displacement mortality of 35 razorbill when applying the displacement and mortality rates used in the cumulative assessment for Hornsea Three (40% displacement and 10% mortality). However, as there is no connectivity between any breeding colonies and Norfolk Vanguard, birds present at Norfolk Vanguard in the breeding season are likely to be immature and non-breeding birds and therefore a lower mortality rate is considered to be more appropriate. The displacement mortality at Norfolk Vanguard is therefore considered to be 7-35 (40% displacement and 2-10% mortality).
- 4.39 In the post-breeding, non-breeding and pre-breeding seasons, when applying the displacement and mortality rates used in the cumulative assessment for Hornsea Three (40% displacement and 2% mortality (post-breeding and pre-breeding) 1% mortality (non-breeding season)) a total displacement mortality of seven, two and seven razorbill is predicted in each season respectively for Norfolk Vanguard.

#### **Thanet Extension**

- 4.40 No razorbill were recorded in the breeding season at Thanet Extension and as such no displacement analysis was conducted.
- 4.41 In the post-breeding, non-breeding and pre-breeding seasons, when applying the displacement and mortality rates used in the cumulative assessment for Hornsea Three (40% displacement and 2% mortality (post-breeding and pre-breeding) 1% mortality (non-breeding season)) a total displacement mortality no razorbill is predicted in each of the three seasons for Thanet Extension.

### **Moray West**

- 4.42 Due to the methodology used to calculate baseline populations for use in the assessments for Moray West, it is not possible to calculate displacement mortality using the seasonal definitions for guillemot applied at Hornsea Three. Therefore the seasonal displacement mortality as reported in the consent application documents for Moray West are assumed to provide a representative assessment.
- 4.43 In the breeding season, a displacement mortality of 112 razorbill is predicted when applying the displacement and mortality rates used in the cumulative assessment for Hornsea Three (40% displacement and 10% mortality) with the majority of these likely to be associated with local breeding colonies due to the proximity of Moray West to the Caithness coast. There is no connectivity between breeding razorbill from FFC pSPA and Moray West in the breeding season although some of the razorbill present at Moray West may be immature birds associated with FFC pSPA. However, this is not likely to represent a significant increase on the total displacement mortality for immature birds at FFC pSPA (as discussed in the RIAA (APP-051)).
- 4.44 In the post-, non- and pre-breeding seasons for razorbill displacement mortalities of 28, 1 and 29 razorbill were predicted respectively when applying the displacement and mortality rates used in the cumulative assessment for Hornsea Three (40% displacement and 2% mortality (post-breeding and pre-breeding) 1% mortality (non-breeding season)). Apportioning rates of 3.4%, 2.7% and 3.4% are applied in each season respectively providing apportioned displacement mortalities of one bird in both the post- and pre-breeding seasons and no birds in the non-breeding season.

### **Implications for Hornsea Three CEA**

- 4.45 Volume 2, Chapter 5: Offshore Ornithology (APP-065) predicted an overall cumulative displacement mortality of 776-796, 232, 71 and 185 razorbill in the breeding, post-breeding, non-breeding and pre-breeding seasons respectively. Displacement mortality of razorbill from Norfolk Vanguard, Thanet Extension and Moray West therefore increases the total cumulative impact to 924-944, 267, 75 and 221 in the four defined seasons respectively. As discussed for guillemot above (see paragraph 4.33), the population of razorbill potentially affected by displacement impacts in the breeding season will differ depending on the location of a project. The cumulative impact predicted will therefore likely affect breeding birds associated with UK east coast breeding colonies (approximately 86,624 breeding birds), immature birds associated with these colonies (approximately 64,968 immature birds) and a proportion of immature birds associated with colonies outside of the UK North Sea. This is discussed in paragraphs 5.13.3.28 to 5.13.3.30 in Volume 2, Chapter 5: Offshore Ornithology (APP-065).
- 4.46 The level of increase predicted is therefore not considered to change the conclusions reached in Volume 2, Chapter 5: Offshore Ornithology (APP-065) especially as it is considered unlikely that all projects included in Tier 2 will be brought forward or, if constructed, they are unlikely to be built out to the maximum design scenario assumptions made in the respective impact assessments.

- 4.47 Norfolk Vanguard, Thanet Extension and Moray West are not considered to contribute to any impact on breeding adult razorbill from FFC pSPA in the breeding season due to a lack of connectivity between these projects and the breeding colony. However, these projects may contribute to impacts on immature birds associated with FFC pSPA although based on the magnitude of the impacts predicted in the breeding season for each project it is considered unlikely that any contribution would be significant.
- 4.48 The predicted displacement mortality from Hornsea Three was not considered to materially alter the current in-combination impact on FFC pSPA in the post-, non- and pre-breeding seasons. As a result any increase in the in-combination impact as a result of displacement of razorbill from Norfolk Vanguard, Thanet Extension and Moray West is not considered to alter the conclusion reached in the RIAA (APP-051).
- 4.49 The conclusions reached in the RIAA (APP-051) in relation to in-combination displacement impacts on razorbill are therefore considered to remain valid when these projects are included in the in-combination assessment.

## **Puffin**

### **Norfolk Vanguard**

- 4.50 The assessment of displacement of puffin at Norfolk Vanguard in the breeding season predicts a displacement mortality of three puffin when applying the displacement and mortality rates used in the cumulative assessment for Hornsea Three (50% displacement and 10% mortality). However, as there is no connectivity between any breeding colonies and Norfolk Vanguard, birds present at Norfolk Vanguard in the breeding season are likely to be immature and non-breeding birds and therefore a lower mortality rate is considered to be more appropriate. The displacement mortality at Norfolk Vanguard is therefore considered to be 1-3 birds (50% displacement and 2-10% mortality). In the non-breeding season, when applying the displacement and mortality rates used in the cumulative assessment for Hornsea Three (50% displacement and 1% mortality) a total displacement mortality of one puffin is predicted for Norfolk Vanguard.
- 4.51 There is considered to be no connectivity between Norfolk Vanguard and FFC pSPA in the breeding season and therefore no displacement mortality associated with Norfolk Vanguard in the breeding season is attributable to the breeding adult population at FFC pSPA. A proportion of the impact at Norfolk Vanguard may be attributable to the immature population associated with FFC pSPA. The level of mortality predicted however, is not considered to represent a significant increase on the total displacement mortality for immature birds at FFC pSPA (as estimated in the RIAA (APP-051)).

### **Thanet Extension**

- 4.52 Displacement analyses were not conducted for puffin at Thanet Extension. This appears to be due to no sightings of puffin during the site-specific surveys undertaken for the project.

### **Moray West**

- 4.53 Due to the methodology used to calculate baseline populations for use in the assessments for Moray West, it is not possible to calculate displacement mortality using the seasonal definitions for guillemot applied at Hornsea Three. Therefore the seasonal displacement mortality as reported in the consent application documents for Moray West are assumed to provide a representative assessment.
- 4.54 In the breeding season, a displacement mortality of 56 puffins is predicted when applying the displacement and mortality rates used in the cumulative assessment for Hornsea Three (50% displacement and 10% mortality) with the majority of these likely to be associated with local breeding colonies due to the proximity of Moray West to the Caithness coast. There is no connectivity between breeding puffin from FFC pSPA and Moray West in the breeding season although some of the puffin present at Moray West may be immature birds associated with FFC pSPA. However, this is not likely to represent a significant increase on the total displacement mortality for immature birds at FFC pSPA (as discussed in the RIAA (APP-051)).
- 4.55 Displacement analyses for Moray West use a post-breeding and non-breeding season for puffin. A post-breeding season was defined due increases in the population of puffin recorded towards the end of the breeding season with such populations considered to be birds dispersing from breeding colonies. For the Hornsea Three cumulative assessment it is therefore considered more appropriate to use the predicted displacement mortality from the non-breeding season during which time the displacement mortality is zero when applying the displacement and mortality rates used in the cumulative assessment for Hornsea Three (50% displacement and 1% mortality).

### **Implications for Hornsea Three CEA**

- 4.56 Volume 2, Chapter 5: Offshore Ornithology (APP-065) predicted an overall cumulative displacement mortality of 116-119 and 68 puffin in the breeding and non-breeding seasons respectively. Displacement mortality of puffin from Norfolk Vanguard, Thanet Extension and Moray West therefore increases the total cumulative impact to 168-178 and 68 in each season respectively. As discussed for guillemot above (see paragraph 4.33), the population of puffin potentially affected by displacement impacts in the breeding season will differ depending on the location of a project. The cumulative impact predicted will therefore likely affect breeding birds associated with UK east coast breeding colonies (approximately 310,490 breeding birds), immature birds associated with these colonies (approximately 322,910 immature birds) and a proportion of immature birds associated with colonies outside of the UK North Sea.
- 4.57 The level of increase predicted is therefore not considered to change the conclusions reached in Volume 2, Chapter 5: Offshore Ornithology (APP-065) especially as it is considered unlikely that all projects included in Tier 2 will be brought forward or, if constructed, they are unlikely to be built out to the maximum design scenario assumptions made in the respective impact assessments.

- 4.58 Norfolk Vanguard, Thanet Extension and Moray West are not considered to contribute to any impact on breeding adult puffin from FFC pSPA in the breeding season due to a lack of connectivity between these projects and the breeding colony. However, these projects may contribute to impacts on immature birds associated with FFC pSPA although it is considered unlikely that any contribution would be significant.
- 4.59 The predicted displacement mortality from Hornsea Three was not considered to materially alter the current in-combination impact on FFC pSPA in the post-, non- and pre-breeding seasons. As a result any increase in the in-combination impact as a result of displacement of puffin from Norfolk Vanguard, Thanet Extension and Moray West is not considered to alter the conclusion reached in the RIAA (APP-051).
- 4.60 The conclusions reached in the RIAA (APP-051) in relation to in-combination displacement impacts on puffin are therefore considered to remain valid when these projects are included in the in-combination assessment.