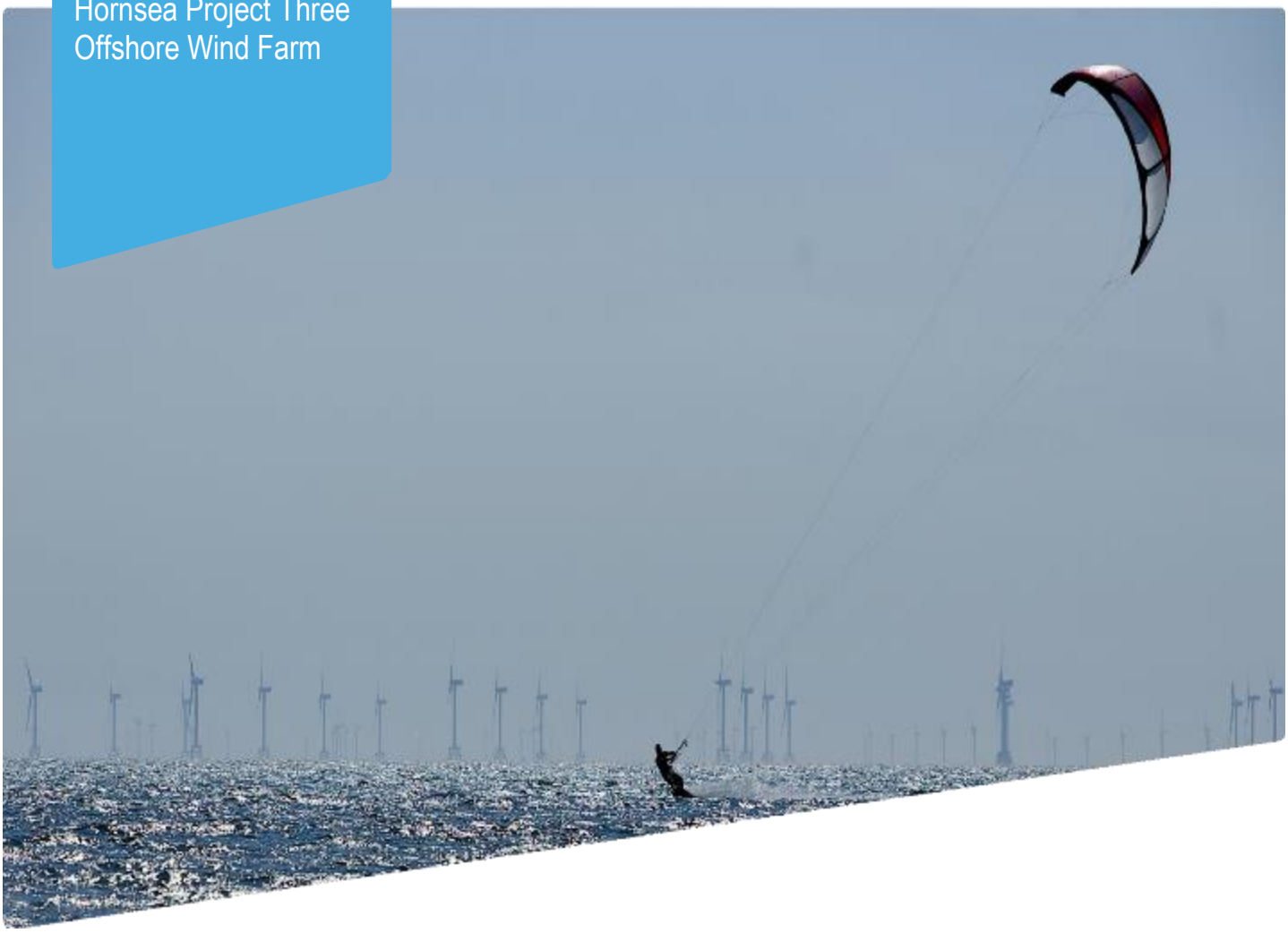
Hornsea Project Three
Offshore Wind Farm



Hornsea Project Three

Offshore Wind Farm

Appendix 13 to Deadline 7 submission - Collision Risk Estimates for Mitigation Scenarios

Date: 14th March 2019

Hornsea 3
Offshore Wind Farm

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Front cover picture: Kite surfer near a UK offshore wind farm © Ørsted Hornsea Project Three (UK) Ltd., 2019.

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1. Introduction

1.1 This note presents collision risk estimates assuming different mitigation scenarios for Hornsea Three. Collision risk estimates for each scenario are considered in stages utilising six different parameter assumptions (see Table 2.1) ranging from Natural England's position (as interpreted by the Applicant from Natural England's submissions during the Examination) through to the Applicant's position. This is conducted for three turbine scenarios with each representing a lower rotor tip height:

1. current lower rotor tip height of 33.17 m (MSL) (i.e. base case);
2. increase to 37.5 m (MSL); and
3. increase to 40 m (MSL)

1.2 Collision risk estimates are presented on EIA and RIAA scales with comparisons made against the baseline mortality for relevant populations (e.g. BDMPS or FFC SPA) and against PVA metrics where applicable.

2. Collision risk scenarios

Project alone

2.1 A number of scenarios have been used to calculate collision risk modelling with these representing steps between the Applicant's and Natural England's positions. The six parameters used for each refined scenario are presented in Table 2.1.

Table 2.1: References for parameters used in the refined scenarios for collision risk modelling

Parameter	Species	Application (APP-051, APP-065, REP1-189)		Natural England (REP6-043)		Applicant (REP6-042)	
1. Flight speed (m/s)	Gannet	14.9	Pennycuick (1987)	14.9	Pennycuick (1987)	13.33	Skov *et al.* (2018)
	Kittiwake	13.1	Alerstam *et al.* (2007)	13.1	Alerstam *et al.* (2007)	8.71	
	Lesser black-backed gull	13.1		13.1		9.8	
	Herring gull	12.8		12.8			
	Great black-backed gull	13.7		13.7			
2. Avoidance rate (%)	Gannet	98.9	Cook *et al.* (2014)	98.9	JNCC *et al.* (2014)	99.5	Bowgen and Cook (2018)
	Kittiwake	99.2		98.9		99.0	
	Large gulls	99.5		99.5		99.5	
3. Band Model Option	Gannet	1/3		2		1/3	
	Kittiwake						
	Large gulls						
4. Breeding season	Gannet	40.4	APP-054	Unknown –	REP1-211	40.4	APP-054

Parameter	Species	Application (APP-051,		Natural England (REP6-		Applicant (REP6-042)	
apportioning (%)	Kittiwake	41.7		range applied		41.7	
	Large gulls	N/A					
5. Seasonality	Gannet	APP-054		REP1-211		APP-054	
	Kittiwake	APP-054		REP1-211		APP-054	
	Large gulls	Furness (2015)					
6. Nocturnal activity factors	Gannet	1	APP-109	1-2	REP1-211	Breeding = 8% Non-breeding = 3%	Furness *et al.* (2018)
	Kittiwake	2		2-3		Breeding = 20% Non-breeding = 17%	MacArthur Green (2018)/Furness (unpub)
	Large gulls	3		2-3		3	Garthe and Hüppop (2004)

2.2 Based on advice provided by Natural England, it is considered that there is no disagreement between Natural England and the Applicant for the parameter values used for lesser black-backed gull, herring gull or great black-backed gull in collision risk modelling for avoidance rate (99.5%) or seasonality (Furness, 2015). Breeding season apportioning is used only to calculate impacts in relation to SPA colonies and as such is not applicable to lesser black-backed gull, herring gull and great black-backed gull as these species are considered in relation to EIA impacts only.

2.3 For each of the refined scenarios one of the six identified parameters is changed with each parameter change retained in the following refined scenario. All other parameters required for collision risk modelling and not identified in Table 2.1 above (e.g. wind farm and turbine parameters and remaining bird parameters) remain identical between all scenarios and are not an area of disagreement between the Applicant and Natural England.

2.4 Due to the uncertainty in relation to the detail of the position advocated by Natural England in relation to those parameters for which they suggest a range should be used (e.g. in relation to nocturnal activity factors and apportioning) a worst case scenario approach has been applied where relevant. As a result collision risk estimates are presented using the highest nocturnal activity factor and the highest breeding season apportioning rate (i.e. the highest values that could be applied for these parameters based on the Applicant's interpretation of Natural England's advice). It should be noted that it is not known if Natural England would apply these values for these parameters when formulating conclusions in relation to the magnitude of an effect.

2.5 In the application (APP-051 and APP-065) the Applicant presented collision risk modelling results calculated using all Band (2012) CRM Options with conclusions in relation to the significance of impacts based on the results calculated from Options 1 and 3. For comparative purposes the collision risk estimates calculated using Option 1 are presented in relevant tables, with these calculated using site-specific flight height information.

2.6 The variability associated with collision risk estimates is considered for all five species. Collision risk estimates are calculated for each species using the variability associated with density (i.e. the upper and lower 95% confidence intervals).

2.7 Throughout all tables presenting collision risk estimates for the Project alone, document references have been provided to indicate where collision risk estimates have been previously provided.

Cumulative and in-combination

2.8 The parameter scenarios outlined in Table 2.1 are also applied as part of the tables presenting cumulative and in-combination collision risk estimates.

2.9 The Applicant has not calculated a cumulative collision rate for herring gull as the species was not identified as a Valued Ornithological Receptor as part of the application and was therefore scoped out of assessment. Subsequent to this the collision risk for hering gull was calculated following a consultation request from the RSPB (REP1-189) with this analysis accepted by the RSPB (REP2-012). As the cumulative collision rate was not calculated for herring gull in the application (APP-065), in the following sections consideration is given to the cumulative impact on herring gull using the most recent appraisal of cumulative collision risk as estimated in the application for the Moray West offshore wind farm.

2.10 In the cumulative and in-combination assessments presented in APP-065 and APP-051, respectively the Applicant presented collision risk estimates calculated using the Extended model, where available. The position of Natural England in relation to the use of the Extended model in cumulative assessments for lesser black-backed gull, herring gull and great black-backed gull is not known and consequently, in the following section, tables providing cumulative collision risk estimates are now presented using both the Basic and Extended models where predictions are available. This approach has also been applied for gannet and kittiwake using an appropriate avoidance rate for each species for collision risk estimates calculated using the Extended model. Where the Extended model is applied in cumulative and in-combination assessments, collision risk estimates calculated using Option 3 are used for Hornsea Three.

2.11 The cumulative or in-combination impact for all projects considered cumulatively or in-combination is added to the relevant collision risk estimate calculated for Hornsea Three. In each of the relevant cumulative and in-combination table the number of collisions from projects other than Hornsea Three is clearly identified.

2.12 Refinements to cumulative and in-combination collision risk estimates at other projects have also been considered for relevant species. These include as-built scenarios (i.e. differences between assessed, consented and as-built turbine scenarios) (REP1-148), nocturnal activity factors and flight speeds with these combined and applied across all parameter scenarios for the Project alone.

2.13 Throughout all tables presenting collision risk estimates on cumulative or in-combination bases, document references have been provided to indicate where collision risk estimates have been previously provided.

Impact magnitude

2.14 Impacts for all five species are presented on both an EIA scale (i.e. for the relevant biological population scale considered in EIA) and RIAA scale (i.e. in relation to the relevant qualifying populations of those European sites that are screened into HRA).

2.15 Impacts on an EIA scale, which are presented for all five species, are considered against relevant regional or Biologically Defined Minimum Population Scale (BDMPS) populations. Natural England recommend that the annual impact predicted for a species is considered against the largest of the BDMPS population for a species (REP1-211). In this report the annual impact predicted for a species, both for the Project alone and cumulatively has been considered against 1% of the largest BDMPS population.

2.16 Only impacts on gannet and kittiwake are considered in relation to the RIAA as these are the only two species, in terms of collision risk, that have connectivity with an SPA colony. The collision risk estimates presented for gannet and kittiwake in the following species-specific sections, both for the Project alone and in-combination, are considered in relation to the 1% baseline mortality of the FFC SPA and the counterfactual of population growth rate and final population size metrics from PVA modelling for the FFC SPA populations.

3. Mitigation

3.1 Using the same parameter scenarios as presented in Table 2.1 this report also considers the implications for assessments when mitigation, in the form of an increase in lower rotor tip height, is applied. The two mitigation options considered here are:

- Increase lower rotor tip height to 37.5 m (MSL); and
- Increase lower rotor tip height to 40 m (MSL).

3.2 A lower rotor tip height of 33.17 m was assumed for collision risk modelling in the Hornsea Three application.

3.3 The collision risk predicted to arise under these two mitigation scenarios has been calculated for all five species considered in this report, alone and cumulatively/in-combination.

4. Summary of collision risk estimates

Gannet

4.1 Collision risk estimates for gannet using the original turbine design scenario (i.e. a lower rotor tip height of 33.17 m) range from 8-49 collisions/annum when applying the Applicant's position and the Applicant's interpretation of Natural England's position (Table 5.1). This represents an increase in baseline mortality of between 0.02-0.13% of the largest BDMPS population. In comparison, collision risk estimates for a turbine with a 37.5 m lower tip height range between 8-31 collisions/annum representing an increase in baseline mortality of between 0.02-0.08% (Table 6.1). When a 40 m lower tip height is used, collision risk estimates range from 8-24 collisions/annum representing a 0.02-0.06% increase in baseline mortality (Table 7.1).

4.2 The additional cumulative mortality for gannet is 1184 or 1238 collisions/annum depending on the model Option used to calculate collision risk estimates at other projects (Table 5.2, Table 5.3, Table 6.2, Table 6.3, Table 7.2 and Table 7.3). When possible refinements are considered (as-built scenarios, nocturnal activity factors and flight speed) this reduces to 844 or 837 (Table 5.4, Table 5.5, Table 6.4, Table 6.5, Table 7.4 and Table 7.5). When these impacts are considered cumulatively with Hornsea Three, the increase in baseline mortality of the largest BDMPS population is approximately 3.2-3.5% when applying any of the three lower rotor tip heights at Hornsea Three or approximately 2.3-2.4% when cumulative collision risk estimates are refined.

4.3 At an RIAA scale, collision risk estimates for gannet for the original turbine design range from 2-18 collisions/annum representing 0.15-1.31% of the FFC SPA population of gannet (Table 5.6). This reduces to 2-10 collisions/annum (Table 6.6) and 2-8 collisions/annum (Table 7.6) when considering lower rotor tip heights of 37.5 m and 40 m respectively. These collision risk estimates provide counterfactuals of final population size of between 0.986 and 0.998 and counterfactuals of population growth rate of 0.999 to 1.000.

4.4 The additional in-combination mortality for gannet is 160-195 collisions/annum depending on the model Option used to calculate collision risk estimates at other projects (Table 5.7, Table 5.8, Table 6.7, Table 6.8, Table 7.7 and Table 7.8). When possible refinements are considered (as-built scenarios, nocturnal activity factors and flight speed) this reduces to 106 or 125 (Table 5.9, Table 5.10, Table 6.9, Table 6.10, Table 7.9 and Table 7.10). When these impacts are considered in-combination with Hornsea Three, the increase in baseline mortality of the FFC SPA population is approximately 12-16% when applying any of the three lower rotor tip heights at Hornsea Three or approximately 8-10% when in-combination collision risk estimates are refined. The unrefined in-combination collision risk estimates provide counterfactuals of final population size of between 0.719 and 0.779 (0.805-0.847 when collision risk estimates are refined) and counterfactuals of population growth rate of 0.990 to 0.993 (0.993-0.995 when collision risk estimates are refined).

Kittiwake

4.5 Collision risk estimates for kittiwake using the original turbine design scenario (i.e. a lower rotor tip height of 33.17 m) range from 30-297 collisions/annum when applying the Applicant's position and the Applicant's interpretation of Natural England's position (Table 5.11). This represents an increase in baseline mortality of between 0.02-0.25% of the largest BDMPS population. In comparison, collision risk estimates for a turbine with a 37.5 m lower tip height range between 23-196 collisions/annum representing an increase in baseline mortality of between 0.02-0.16% (Table 6.11). When a 40 m lower tip height is used, collision risk estimates range from 23-154 collisions/annum representing a 0.02-0.13% increase in baseline mortality (Table 7.11).

4.6 The additional cumulative mortality for kittiwake is 2988 or 1312 collisions/annum depending on the model Option used to calculate collision risk estimates at other projects (Table 5.12, Table 5.13, Table 6.12, Table 6.13, Table 7.12 and Table 7.13). When possible refinements are considered (as-built scenarios, nocturnal activity factors and flight speed) this reduces to 2058 or 722 (Table 5.14, Table 5.15, Table 6.14, Table 6.15, Table 7.14 and Table 7.15). When these impacts are considered cumulatively with Hornsea Three, the increase in baseline mortality of the largest BDMPS population is approximately 1.1-2.7% when applying any of the three lower rotor tip heights at Hornsea Three or approximately 0.6-1.8% when cumulative collision risk estimates are refined.

4.7 At an RIAA scale, collision risk estimates for kittiwake for the original turbine design range from 7-181 collisions/annum representing 0.05-1.39% of the FFC SPA population of kittiwake (Table 5.16). This reduces to 5-119 collisions/annum (Table 6.16) and 5-94 collisions/annum (Table 7.16) when considering lower rotor tip heights of 37.5 m and 40 m respectively. These collision risk estimates provide counterfactuals of final population size of between 0.933 and 0.998 and counterfactuals of population growth rate of 0.998 to 1.000.

4.8 The additional in-combination mortality for kittiwake is 107-250 collisions/annum depending on the model Option used to calculate collision risk estimates at other projects (Table 5.17, Table 5.18, Table 6.17, Table 6.18, Table 7.17 and Table 7.18). When possible refinements are considered (as-built scenarios, nocturnal activity factors and flight speed) this reduces to 58 to 170 (Table 5.19, Table 5.20, Table 6.19, Table 6.20, Table 7.19 and Table 7.20). When these impacts are considered in-combination with Hornsea Three, the increase in baseline mortality of the FFC SPA population is approximately 0.9-3.3% when applying any of the three lower rotor tip heights at Hornsea Three or approximately 0.5-2.7% when in-combination collision risk estimates are refined. The unrefined in-combination collision risk estimates provide counterfactuals of final population size of between 0.848 and 0.956 (0.891-0.974 when collision risk estimates are refined) and counterfactuals of population growth rate of 0.995 to 0.999 (0.997 to 0.999 when collision risk estimates are refined).

Lesser black-backed gull

4.9 Collision risk estimates for lesser black-backed gull using the original turbine design scenario (i.e. a lower rotor tip height of 33.17 m) range from 12-17 collisions/annum when applying the Applicant's position and the Applicant's interpretation of Natural England's position (Table 5.21). This represents an increase in baseline mortality of between 0.05-0.07% of the largest BDMPS population. In comparison, collision risk estimates for a turbine with a 37.5 m lower tip height range between 12-13 collisions/annum representing an increase in baseline mortality of 0.05% (Table 6.21). When a 40 m lower tip height is used, collision risk estimates range from 11-12 collisions/annum representing a 0.05% increase in baseline mortality (Table 7.21).

4.10 The additional cumulative mortality for lesser black-backed gull is 494 or 454 collisions/annum depending on the model Option used to calculate collision risk estimates at other projects (Table 5.22, Table 5.23, Table 6.22, Table 6.23, Table 7.22 and Table 7.23). When possible refinements are considered (as-built scenarios, nocturnal activity factors and flight speed) this reduces to 376 or 312 (Table 5.24, Table 5.25, Table 6.24, Table 6.25, Table 7.24 and Table 7.25). When these impacts are considered cumulatively with Hornsea Three, the increase in baseline mortality of the largest BDMPS population is approximately 1.9-2.1% when applying any of the three lower rotor tip heights at Hornsea Three or approximately 1.3-1.6% when cumulative collision risk estimates are refined.

Herring gull

4.11 Collision risk estimates for herring gull using the original turbine design scenario (i.e. a lower rotor tip height of 33.17 m) range from 6-9 collisions/annum when applying the Applicant's position and the Applicant's interpretation of Natural England's position (Table 5.26). This represents an increase in baseline mortality of 0.01% of the largest BDMPS population. In comparison, collision risk estimates for a turbine with a 37.5 m lower tip height range between 5-7 collisions/annum representing an increase in baseline mortality of 0.01% (Table 6.21). When a 40 m lower tip height is used, collision risk estimates range from 5-6 collisions/annum representing a 0.01% increase in baseline mortality (Table 7.26).

4.12 The most recent appraisal of cumulative collision risk impacts on herring gull is presented as part of the consent application for the Moray West offshore wind farm (Moray Offshore Windfarm (West) Limited, 2018). This provides a total cumulative mortality of 406 collisions/annum. An impact of 406 collisions/annum represents a 0.52% increase in the baseline mortality of the largest BDMPS population. The impact of Hornsea Three represents 1.5-2.2% of this total when using collision risk estimates associated with a 33.17 m lower rotor tip height or 1.2-1.7% and 1.2-1.5% when using collision risk estimates calculated using a 37.5 and 40 m lower rotor tip height, respectively. Hornsea Three is therefore not considered to materially alter the current level of cumulative mortality on herring gull.

Great black-backed gull

4.13 Collision risk estimates for great black-backed gull using the original turbine design scenario (i.e. a lower rotor tip height of 33.17 m) range from 26-66 collisions/annum when applying the Applicant's position and the Applicant's interpretation of Natural England's position (Table 5.27). This represents an increase in baseline mortality of 0.40-1.03% of the largest BDMPS population. In comparison, collision risk estimates for a turbine with a 37.5 m lower tip height range between 20-52 collisions/annum representing an increase in baseline mortality of 0.31-0.81% (Table 6.27). When a 40 m lower tip height is used, collision risk estimates range from 20-45 collisions/annum representing a 0.31-0.70% increase in baseline mortality (Table 7.27).

4.14 The additional cumulative mortality for great black-backed gull is 766 or 669 collisions/annum depending on the model Option used to calculate collision risk estimates at other projects (Table 5.28, Table 5.29, Table 6.28, Table 6.29, Table 7.28 and Table 7.29). When possible refinements are considered (as-built scenarios, nocturnal activity factors and flight speed) this reduces to 590 or 427 (Table 5.30, Table 5.31, Table 6.30, Table 6.31, Table 7.30 and Table 7.31). When these impacts are considered cumulatively with Hornsea Three, the increase in baseline mortality of the largest BDMPS population is approximately 11-13% when applying any of the three lower rotor tip heights at Hornsea Three or approximately 7-10% when cumulative collision risk estimates are refined.

5. Collision risk estimates – 33.17 m lower tip height (i.e. base case)

Gannet

EIA scale

Project alone

Table 5.1: Collision risk estimates for gannet calculated using a 33.17 m lower rotor tip height and different parameter scenarios compared against baseline mortality of the largest BDMPS population

Collision risk estimates	Application (APP-065 and APP-109)	Natural England (REP6-043)	1	2	3	6 (Applicant) (REP6-042)
Flight speed (m/s)	14.9	14.9	13.33	13.33	13.33	13.33
Avoidance rate (%)	98.9	98.9	98.9	99.5	99.5	99.5
Model option	1/3	2	2	2	1	1
Breeding season apportioning (%)	N/A					
Biological seasons	N/A					
Nocturnal activity factor	2	2	2	2	2	Furness
Annual collision rate						
LCL	9-10	29	27	12	6	5
Mean	**15-17**	**49**	**45**	**21**	**9**	**8**
UCL	22-24	69	64	29	13	11
Increase in baseline mortality (%)						
LCL	0.02-0.03	0.08	0.07	0.03	0.02	0.01
Mean	**0.04-0.05**	**0.13**	**0.12**	**0.06**	**0.03**	**0.02**
UCL	0.06-0.07	0.19	0.17	0.08	0.04	0.03

Cumulative impact

Table 5.2: Cumulative collision risk estimates for gannet using the Basic model for all projects compared against baseline mortality of the largest BDMPS population

Collision risk estimates	**Application (APP-065 and APP-109)**	**Parameter scenarios**				
		Natural England	1	2	3	6 (Applicant)
Model Option used for Hornsea Three collision risk estimates	3	2	2	2	1	1
Model Option used for other projects	Extended, where available	Basic	Basic	Basic	Basic	Basic
Cumulative impact from other projects (APP-065 and REP1-005)	1129	1184	1184	1184	1184	1184
Mean Hornsea Three collision risk estimate (Table 5.1)	15	49	45	21	9	8
Annual cumulative collision rate						
LCL	1138	1213	1211	1196	1190	1189
Mean	**1145**	**1233**	**1229**	**1205**	**1193**	**1192**
UCL	1151	1253	1248	1213	1197	1195
Increase in baseline mortality (%)						
LCL	3.08	3.28	3.28	3.24	3.22	3.22
Mean	**3.10**	**3.34**	**3.33**	**3.26**	**3.23**	**3.23**
UCL	3.11	3.39	3.38	3.28	3.24	3.23

Table 5.3: Cumulative collision risk estimates for gannet using collision risk estimates calculated using the Extended model, where available compared against baseline mortality of the largest BDMPS population

Collision risk estimates	**Application (APP-065 and APP-109)**	**Parameter scenarios**				
		Natural England	1	2	3	6 (Applicant)
Model Option used for Hornsea Three collision risk estimates	3	2	2	2	3	3
Model Option used for other projects	Extended, where available	Extended, where available	Extended, where available	Extended, where available	Extended, where available	Extended, where available
Cumulative impact from other projects (APP-065 and REP1-005)	1129	1238	1238	1238	1238	1238
Mean Hornsea Three collision risk estimate	15	49	45	21	20	16
Annual cumulative collision rate						
LCL	1138	1267	1265	1250	1250	1248
Mean	**1145**	**1287**	**1283**	**1259**	**1258**	**1254**
UCL	1151	1307	1302	1267	1266	1261
Increase in baseline mortality (%)						
LCL	3.08	3.43	3.42	3.38	3.38	3.38
Mean	**3.10**	**3.48**	**3.47**	**3.41**	**3.40**	**3.39**
UCL	3.11	3.54	3.52	3.43	3.43	3.41

Table 5.4: Refined cumulative collision risk estimates for gannet using the Basic model for all projects compared against baseline mortality of the largest BDMPS population

Collision risk estimates	Natural England	1	2	3	6 (Applicant)
Model Option used for Hornsea Three collision risk estimates	2	2	2	1	1
Model Option used for other projects	Basic	Basic	Basic	Basic	Basic
Refined cumulative impact from other projects	844	844	844	844	844
Mean Hornsea Three collision risk estimate (Table 5.1)	49	45	21	9	8
Annual refined cumulative collision rate					
LCL	873	871	856	850	849
Mean	**893**	**889**	**865**	**853**	**852**
UCL	913	908	873	857	855
Increase in baseline mortality (%)					
LCL	2.36	2.36	2.32	2.30	2.30
Mean	**2.42**	**2.41**	**2.34**	**2.31**	**2.31**
UCL	2.47	2.46	2.36	2.32	2.31

Table 5.5: Refined cumulative collision risk estimates for gannet using collision risk estimates calculated using the Extended model, where available compared against baseline mortality of the largest BDMPS population

Collision risk estimates	Natural England	1	2	3	6 (Applicant)
Model Option used for Hornsea Three collision risk estimates	2	2	2	3	3
Model Option used for other projects	Extended, where available	Extended, where available	Extended, where available	Extended, where available	Extended, where available
Refined cumulative impact from other projects	837	837	837	837	837
Mean Hornsea Three collision risk estimate	49	45	21	20	16
Annual refiuned cumulative collision rate					
LCL	866	864	849	849	847
Mean	**886**	**882**	**858**	**857**	**853**
UCL	906	901	866	865	860
Increase in baseline mortality (%)					
LCL	2.34	2.34	2.30	2.30	2.29
Mean	**2.40**	**2.39**	**2.32**	**2.32**	**2.31**
UCL	2.45	2.44	2.34	2.34	2.33

RIAA scale

Project alone

Table 5.6: Collision risk estimates for gannet calculated using a 33.17 m lower rotor tip height and different parameter scenarios compared against baseline mortality and PVA metrics for the FFC SPA population

Collision risk estimates	**Application (APP-051)**	**Natural England (REP6-043)**	**1**	**2**	**3**	**4**	**5**	**Applicant (REP6-042)**
Flight speed (m/s)	14.9	14.9	13.33	13.33	13.33	13.33	13.33	13.33
Avoidance rate (%)	98.9	98.9	98.9	99.5	99.5	99.5	99.5	99.5
Model option	1/3	2	2	2	1	1	1	1
Breeding season apportioning (%)	40.4	63.3	63.3	63.3	63.3	40.4	40.4	40.4
Biological seasons	Applicant	Natural England	Natural England	Natural England	Natural England	Natural England	Applicant	Applicant
Nocturnal activity factor	2	2	2	2	2	2	2	Furness
Annual collision rate								
LCL	2	10	9	4	2	1	1	1
Mean	**3-4**	**18**	**16**	**7**	**3**	**2**	**2**	**2**
UCL	5	25	24	11	5	3	3	2
Increase in baseline mortality (%)								
LCL	0.14-0.15	0.73	0.66	0.29	0.15	0.07	0.07	0.07
Mean	**0.25-0.29**	**1.31**	**1.17**	**0.51**	**0.22**	**0.15**	**0.15**	**0.15**
UCL	0.36	1.82	1.75	0.80	0.36	0.22	0.22	0.15
PVA (Counterfactual of final population size (35 years))								
LCL	0.998	0.992	0.993	0.997	0.998	0.999	0.999	0.999
Mean	**0.997-0.998**	**0.986**	**0.988**	**0.995**	**0.998**	**0.998**	**0.998**	**0.998**
UCL	0.996	0.962	0.982	0.992	0.996	0.998	0.998	0.998
PVA (Counterfactual of growth rate)								
LCL	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Mean	**1.000**	**0.999**	**0.999**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**
UCL	1.000	0.999	0.999	1.000	1.000	1.000	1.000	1.000

In-combination impact

Table 5.7: In-combination collision risk estimates for gannet at FFC SPA using the Basic model for all projects compared against baseline mortality and PVA metrics for the FFC SPA population

Collision risk estimates	Application (APP-051)	Natural England	1	2	3	4	5	Applicant
Model Option used for Hornsea Three collision risk estimates	3	2	2	2	1	1	1	1
Model Option used for other projects	Extended, where available	Basic	Basic	Basic	Basic	Basic	Basic	Basic
In-combination impact from other projects (APP-065 and REP1-005)	189	160	160	160	160	160	160	160
Mean Hornsea Three collision risk estimate (Table 5.6)	3	18	16	7	3	2	2	2
Annual in-combination collision rate								
LCL	191	170	169	164	162	161	161	161
Mean	**193**	**178**	**176**	**167**	**163**	**162**	**162**	**162**
UCL	194	185	184	171	165	163	163	162
Increase in baseline mortality (%)								
LCL	13.92	12.39	12.32	11.95	11.81	11.73	11.73	11.73
Mean	**14.07**	**12.97**	**12.83**	**12.17**	**11.88**	**11.81**	**11.81**	**11.81**
UCL	14.14	13.48	13.41	12.46	12.03	11.88	11.88	11.81
PVA (Counterfactual of final population size (35 years))								
LCL	0.744	0.769	0.770	0.776	0.779	0.780	0.780	0.780
Mean	**0.742**	**0.760**	**0.762**	**0.773**	**0.777**	**0.779**	**0.779**	**0.779**
UCL	0.741	0.751	0.753	0.768	0.775	0.777	0.777	0.779
PVA (Counterfactual of growth rate)								
LCL	0.991	0.992	0.992	0.992	0.993	0.993	0.993	0.993

Collision risk estimates	Application (APP-051)	Natural England	1	2	3	4	5	Applicant
Mean	**0.991**	**0.992**	**0.992**	**0.992**	**0.992**	**0.993**	**0.993**	**0.993**
UCL	0.991	0.992	0.992	0.992	0.992	0.992	0.992	0.993

Table 5.8: In-combination collision risk estimates for gannet at FFC SPA using collision risk estimates calculated using the Extended model, where available compared against baseline mortality and PVA metrics for the FFC SPA population

Collision risk estimates	Application (APP-051)	Natural England	1	2	3	4	5	Applicant
Model Option used for Hornsea Three collision risk estimates	3	2	2	2	3	3	3	3
Model Option used for other projects	Extended, where available	Extended, where available	Extended, where available	Extended, where available	Extended, where available	Extended, where available	Extended, where available	Extended, where available
In-combination impact from other projects (APP-065 and REP1-005)	189	195	195	195	195	195	195	195
Mean Hornsea Three collision risk estimate	3	18	16	7	7	5	4	4
Annual in-combination collision rate								
LCL	191	205	204	199	199	198	197	197
Mean	**193**	**213**	**211**	**202**	**202**	**200**	**199**	**199**
UCL	194	220	219	206	205	202	201	200
Increase in baseline mortality (%)								
LCL	13.92	14.94	14.87	14.50	14.50	14.43	14.36	14.36
Mean	**14.07**	**15.53**	**15.38**	**14.72**	**14.72**	**14.58**	**14.50**	**14.50**
UCL	14.14	16.04	15.96	15.01	14.94	14.72	14.65	14.58
PVA (Counterfactual of final population size (35 years))								
LCL	0.744	0.728	0.730	0.735	0.735	0.736	0.737	0.737
Mean	**0.742**	**0.719**	**0.722**	**0.732**	**0.732**	**0.734**	**0.735**	**0.735**
UCL	0.741	0.712	0.713	0.727	0.728	0.732	0.733	0.734
PVA (Counterfactual of growth rate)								
LCL	0.991	0.991	0.991	0.991	0.991	0.991	0.991	0.991
Mean	**0.991**	**0.990**	**0.991**	**0.991**	**0.991**	**0.991**	**0.991**	**0.991**

Collision risk estimates	Application (APP-051)	Natural England	1	2	3	4	5	Applicant
UCL	0.991	0.990	0.990	0.991	0.991	0.991	0.991	0.991

Table 5.9: Refined in-combination collision risk estimates for gannet at FFC SPA using the Basic model for all projects compared against baseline mortality and PVA metrics for the FFC SPA population

Collision risk estimates	Natural England	1	2	3	4	5	Applicant
Model Option used for Hornsea Three collision risk estimates	2	2	2	1	1	1	1
Model Option used for other projects	Basic	Basic	Basic	Basic	Basic	Basic	Basic
Refined in-combination impact from other projects (REP4-049)	106	106	106	106	106	106	106
Mean Hornsea Three collision risk estimate (Table 5.6)	18	16	7	3	2	2	2
Annual refined in-combination collision rate							
LCL	116	115	110	108	107	107	107
Mean	**124**	**122**	**113**	**109**	**108**	**108**	**108**
UCL	131	130	117	111	109	109	108
Increase in baseline mortality (%)							
LCL	8.45	8.38	8.02	7.87	7.80	7.80	7.80
Mean	**9.04**	**8.89**	**8.24**	**7.94**	**7.87**	**7.87**	**7.87**
UCL	9.55	9.48	8.53	8.09	7.94	7.94	7.87
PVA (CPS35)							
LCL	0.837	0.838	0.844	0.847	0.848	0.848	0.848
Mean	**0.826**	**0.829**	**0.840**	**0.845**	**0.847**	**0.847**	**0.847**
UCL	0.817	0.819	0.835	0.843	0.845	0.845	0.847
PVA (Counterfactual of growth rate)							
LCL	0.994	0.994	0.995	0.995	0.995	0.995	0.995
Mean	**0.994**	**0.994**	**0.994**	**0.995**	**0.995**	**0.995**	**0.995**
UCL	0.994	0.994	0.994	0.995	0.995	0.995	0.995

Table 5.10: Refined in-combination collision risk estimates for gannet at FFC SPA using collision risk estimates calculated using the Extended model, where available compared against baseline mortality and PVA metrics for the FFC SPA population

Collision risk estimates	Natural England	1	2	3	4	5	Applicant
Model Option used for Hornsea Three collision risk estimates	2	2	2	3	3	3	3
Model Option used for other projects	Extended, where available	Extended, where available	Extended, where available	Extended, where available	Extended, where available	Extended, where available	Extended, where available
Refined in-combination impact from other projects (REP4-049)	125	125	125	125	125	125	125
Mean Hornsea Three collision risk estimate	18	16	7	7	5	4	4
Annual refined in-combination collision rate							
LCL	135	134	129	129	128	127	127
Mean	**143**	**141**	**132**	**132**	**130**	**129**	**129**
UCL	150	149	136	135	132	131	130
Increase in baseline mortality (%)							
LCL	9.84	9.77	9.40	9.40	9.33	9.26	9.26
Mean	**10.42**	**10.28**	**9.62**	**9.62**	**9.48**	**9.40**	**9.40**
UCL	10.93	10.86	9.91	9.84	9.62	9.55	9.48
PVA (Counterfactual of final population size (35 years))							
LCL	0.812	0.813	0.820	0.820	0.821	0.822	0.822
Mean	**0.802**	**0.805**	**0.816**	**0.816**	**0.819**	**0.820**	**0.820**
UCL	0.793	0.794	0.811	0.812	0.816	0.817	0.819
PVA (Counterfactual of growth rate)							
LCL	0.994	0.994	0.994	0.994	0.994	0.994	0.994
Mean	**0.993**	**0.993**	**0.994**	**0.994**	**0.994**	**0.994**	**0.994**
UCL	0.993	0.993	0.994	0.994	0.994	0.994	0.994

Kittiwake

EIA scale

Project alone

Table 5.11: Collision risk estimates for kittiwake calculated using a 33.17 m lower rotor tip height and different parameter scenarios compared against baseline mortality of the largest BDMPS population

Collision risk estimates	Application (APP-065)	Natural England (REP6-043)	1	2	3	6 (Applicant) (REP6-042)
Flight speed (m/s)	13.1	13.1	8.71	8.71	8.71	8.71
Avoidance rate (%)	99.2	98.9	98.9	99.0	99.0	99.0
Model option	1/3	2	2	2	1	1
Breeding season apportioning (%)	N/A					
Biological seasons	N/A					
Nocturnal activity factor	2	3	3	3	3	Furness
Annual collision rate						
LCL	21-52	184	135	122	23	19
Mean	**33-83**	**297**	**218**	**198**	**38**	**30**
UCL	46-116	426	312	284	54	43
Increase in baseline mortality (%)						
LCL	0.02-0.04	0.15	0.11	0.10	0.02	0.02
Mean	**0.03-0.07**	**0.25**	**0.18**	**0.16**	**0.03**	**0.02**
UCL	0.04-0.10	0.35	0.26	0.23	0.04	0.04

Cumulative impact

Table 5.12: Cumulative collision risk estimates for kittiwake using the Basic model for all projects compared against baseline mortality of the largest BDMPS population

Collision risk estimates	**Application (APP-065 and APP-109)**	**Parameter scenarios**				
		Natural England	1	2	3	6 (Applicant)
Model Option used for Hornsea Three collision risk estimates	3	2	2	2	1	1
Model Option used for other projects	Extended model, where available	Basic	Basic	Basic	Basic	Basic
Cumulative impact from other projects (APP-065 and REP1-005)	1184	2988	2988	2988	2988	2988
Mean Hornsea Three collision risk estimate (Table 5.11)	83	297	218	198	38	30
Annual cumulative collision rate						
LCL	1236	3172	3123	3110	3011	3007
Mean	**1267**	**3285**	**3206**	**3186**	**3026**	**3018**
UCL	1300	3414	3300	3272	3042	3031
Increase in baseline mortality (%)						
LCL	1.02	2.62	2.58	2.57	2.48	2.48
Mean	**1.05**	**2.71**	**2.65**	**2.63**	**2.50**	**2.49**
UCL	1.07	2.82	2.72	2.70	2.51	2.50

Table 5.13: Cumulative collision risk estimates for kittiwake using collision risk estimates calculated using the Extended model, where available compared against baseline mortality of the largest BDMPS population

Collision risk estimates	**Application (APP-065 and APP-109)**	**Parameter scenarios**				
		Natural England	1	2	3	6 (Applicant)
Model Option used for Hornsea Three collision risk estimates	3	2	2	2	3	3
Model Option used for other projects	Extended model, where available	Extended model, where available	Extended model, where available	Extended model, where available	Extended model, where available	Extended model, where available
Cumulative impact from other projects (APP-065 and REP1-005)	1184	1312	1312	1312	1312	1312
Mean Hornsea Three collision risk estimate	83	297	218	198	88	70
Annual cumulative collision rate						
LCL	1236	1496	1447	1434	1366	1355
Mean	**1267**	**1609**	**1530**	**1510**	**1400**	**1382**
UCL	1300	1738	1624	1596	1438	1412
Increase in baseline mortality (%)						
LCL	1.02	1.23	1.19	1.18	1.13	1.12
Mean	**1.05**	**1.33**	**1.26**	**1.25**	**1.16**	**1.14**
UCL	1.07	1.43	1.34	1.32	1.19	1.17

Table 5.14: Refined cumulative collision risk estimates for kittiwake using the Basic model for all projects compared against baseline mortality of the largest BDMPS population

Collision risk estimates	Parameter scenarios				
	Natural England	1	2	3	6 (Applicant)
Model Option used for Hornsea Three collision risk estimates	2	2	2	1	1
Model Option used for other projects	Basic	Basic	Basic	Basic	Basic
Refined cumulative impact from other projects	2058	2058	2058	2058	2058
Mean Hornsea Three collision risk estimate (Table 5.11)	297	218	198	38	30
Annual refined cumulative collision rate					
LCL	2242	2193	2180	2081	2077
Mean	**2355**	**2276**	**2256**	**2096**	**2088**
UCL	2484	2370	2342	2112	2101
Increase in baseline mortality (%)					
LCL	1.85	1.81	1.80	1.72	1.71
Mean	**1.94**	**1.88**	**1.86**	**1.73**	**1.72**
UCL	2.05	1.96	1.93	1.74	1.73

Table 5.15: Refined cumulative collision risk estimates for kittiwake using collision risk estimates calculated using the Extended model, where available compared against baseline mortality of the largest BDMPS population

Collision risk estimates	Parameter scenarios				
	Natural England	1	2	3	6 (Applicant)
Model Option used for Hornsea Three collision risk estimates	2	2	2	3	3
Model Option used for other projects	Extended model, where available	Extended model, where available	Extended model, where available	Extended model, where available	Extended model, where available
Refined cumulative impact from other projects	722	722	722	722	722
Mean Hornsea Three collision risk estimate	297	218	198	88	70
Annual refined cumulative collision rate					
LCL	906	857	844	776	765
Mean	**1019**	**940**	**920**	**810**	**792**
UCL	1148	1034	1006	848	822
Increase in baseline mortality (%)					
LCL	0.75	0.71	0.70	0.64	0.63
Mean	**0.84**	**0.78**	**0.76**	**0.67**	**0.65**
UCL	0.95	0.85	0.83	0.70	0.68

RIAA scale

Project alone

Table 5.16: Collision risk estimates for kittiwake calculated using a 33.17 m lower rotor tip height and different parameter scenarios compared against baseline mortality and PVA metrics for the FFC SPA population

Collision risk estimates	Application (APP-051)	Natural England (REP6-043)	1	2	3	4	5	6 (Applicant) (REP6-042)
Flight speed (m/s)	13.1	13.1	8.71	8.71	8.71	8.71	8.71	8.71
Avoidance rate (%)	99.2	98.9	98.9	99.0	99.0	99.0	99.0	99.0
Model option	1/3	2	2	2	1	1	1	1
Breeding season apportioning (%)	41.70%	93.10%	93.10%	93.10%	93.10%	41.70%	41.70%	41.70%
Biological seasons	Applicant	Natural England	Natural England	Natural England	Natural England	Natural England	Applicant	Applicant
Nocturnal activity factor	2	3	3	3	3	3	3	Furness
Annual collision rate								
LCL	5-13	112	82	75	14	7	5	4
Mean	**8-20**	**181**	**132**	**120**	**23**	**11**	**8**	**7**
UCL	11-28	257	188	171	33	15	12	10
Increase in baseline mortality (%)								
LCL	0.04-0.10	0.86	0.63	0.58	0.11	0.05	0.04	0.03
Mean	**0.06-0.15**	**1.39**	**1.02**	**0.92**	**0.18**	**0.08**	**0.06**	**0.05**
UCL	0.08-0.21	1.98	1.45	1.32	0.25	0.12	0.09	0.08
PVA (Counterfactual of final population size (35 years))								
LCL	0.995-0.998	0.958	0.969	0.972	0.995	0.997	0.998	0.998
Mean	**0.992-0.997**	**0.933**	**0.950**	**0.955**	**0.991**	**0.996**	**0.997**	**0.997**
UCL	0.989-0.996	0.907	0.930	0.936	0.987	0.994	0.995	0.996
PVA (Counterfactual of growth rate)								
LCL	1.000	0.999	0.999	0.999	1.000	1.000	1.000	1.000
Mean	**1.000**	**0.998**	**0.998**	**0.999**	**1.000**	**1.000**	**1.000**	**1.000**
UCL	0.999-1.000	0.997	0.998	0.998	0.999	1.000	1.000	1.000

In-combination impact

Table 5.17: In-combination collision risk estimates for kittiwake at FFC SPA using the Basic model for all projects compared against baseline mortality and PVA metrics for the FFC SPA population

Collision risk estimates	Application	Natural England	1	2	3	4	5	Applicant
Model Option used for Hornsea Three collision risk estimates	3	2	2	2	1	1	1	1
Model Option used for other projects	Extended, where available	Basic	Basic	Basic	Basic	Basic	Basic	Basic
In-combination impact from other projects (APP-065 and REP1-005)	99	250	250	250	250	250	250	250
Mean Hornsea Three collision risk estimate (Table 5.16)	20	181	132	120	23	11	8	7
Annual in-combination collision rate								
LCL	111	362	332	325	264	257	255	254
Mean	**119**	**431**	**382**	**370**	**273**	**261**	**258**	**257**
UCL	128	507	438	421	283	265	262	260
Increase in baseline mortality (%)								
LCL	0.85	2.78	2.55	2.50	2.03	1.98	1.96	1.95
Mean	**0.92**	**3.32**	**2.94**	**2.85**	**2.10**	**2.01**	**1.98**	**1.98**
UCL	0.98	3.90	3.37	3.24	2.18	2.04	2.02	2.00
PVA (Counterfactual of final population size (35 years))								
LCL	0.958	0.871	0.881	0.884	0.904	0.907	0.907	0.908
Mean	**0.955**	**0.848**	**0.864**	**0.868**	**0.901**	**0.905**	**0.906**	**0.907**
UCL	0.952	0.824	0.846	0.851	0.898	0.904	0.905	0.906
PVA (Counterfactual of growth rate)								
LCL	0.999	0.996	0.996	0.997	0.997	0.997	0.997	0.997

Collision risk estimates	Application	Natural England	1	2	3	4	5	Applicant
Mean	**0.999**	**0.995**	**0.996**	**0.996**	**0.997**	**0.997**	**0.997**	**0.997**
UCL	0.998	0.994	0.995	0.996	0.997	0.997	0.997	0.997

Table 5.18: In-combination collision risk estimates for kittiwake at FFC SPA using collision risk estimates calculated using the Extended model, where available compared against baseline mortality and PVA metrics for the FFC SPA population

Collision risk estimates	Application	Natural England	1	2	3	4	5	Applicant
Model Option used for Hornsea Three collision risk estimates	3	2	2	2	3	3	3	3
Model Option used for other projects	Extended, where available	Extended, where available	Extended, where available	Extended, where available	Extended, where available	Extended, where available	Extended, where available	Extended, where available
In-combination impact from other projects (APP-065 and REP1-005)	99	107	107	107	107	107	107	107
Mean Hornsea Three collision risk estimate	20	181	132	120	53	25	20	17
Annual in-combination collision rate								
LCL	111	219	189	182	140	122	119	118
Mean	**119**	**288**	**239**	**227**	**160**	**132**	**127**	**124**
UCL	128	364	295	278	183	142	134	130
Increase in baseline mortality (%)								
LCL	0.85	1.68	1.45	1.40	1.08	0.94	0.92	0.91
Mean	**0.92**	**2.22**	**1.84**	**1.75**	**1.23**	**1.02**	**0.98**	**0.95**
UCL	0.98	2.80	2.27	2.14	1.41	1.09	1.03	1.00
PVA (Counterfactual of final population size (35 years))								
LCL	0.958	0.920	0.930	0.932	0.948	0.954	0.955	0.956
Mean	**0.955**	**0.896**	**0.913**	**0.917**	**0.940**	**0.950**	**0.952**	**0.953**
UCL	0.952	0.870	0.894	0.899	0.932	0.947	0.950	0.951
PVA (Counterfactual of growth rate)								
LCL	0.999	0.998	0.998	0.998	0.998	0.999	0.999	0.999
Mean	**0.999**	**0.997**	**0.997**	**0.997**	**0.998**	**0.998**	**0.998**	**0.999**

Collision risk estimates	Application	Natural England	1	2	3	4	5	Applicant
UCL	0.998	0.996	0.997	0.997	0.998	0.998	0.998	0.998

Table 5.19: Refined in-combination collision risk estimates for kittiwake at FFC SPA using the Basic model for all projects compared against baseline mortality and PVA metrics for the FFC SPA population

Collision risk estimates	Natural England	1	2	3	4	5	Applicant
Model Option used for Hornsea Three collision risk estimates	2	2	2	1	1	1	1
Model Option used for other projects	Basic	Basic	Basic	Basic	Basic	Basic	Basic
Refined in-combination impact from other projects (REP4-049)	170	170	170	170	170	170	170
Mean Hornsea Three collision risk estimate (Table 5.16)	181	132	120	23	11	8	7
Annual refined in-combination collision rate							
LCL	282	252	245	184	177	175	174
Mean	**351**	**302**	**290**	**193**	**181**	**178**	**177**
UCL	427	358	341	203	185	182	180
Increase in baseline mortality (%)							
LCL	2.17	1.94	1.88	1.42	1.36	1.35	1.34
Mean	**2.70**	**2.32**	**2.23**	**1.48**	**1.39**	**1.37**	**1.36**
UCL	3.28	2.75	2.62	1.56	1.42	1.40	1.38
PVA (Counterfactual of final population size (35 years))							
LCL	0.898	0.908	0.911	0.932	0.934	0.935	0.935
Mean	**0.875**	**0.891**	**0.895**	**0.929**	**0.933**	**0.934**	**0.934**
UCL	0.849	0.872	0.878	0.925	0.931	0.932	0.933
PVA (Counterfactual of growth rate)							
LCL	0.997	0.997	0.997	0.998	0.998	0.998	0.998
Mean	**0.996**	**0.997**	**0.997**	**0.998**	**0.998**	**0.998**	**0.998**
UCL	0.995	0.996	0.996	0.998	0.998	0.998	0.998

Table 5.20: Refined in-combination collision risk estimates for kittiwake at FFC SPA using collision risk estimates calculated using the Extended model, where available compared against baseline mortality and PVA metrics for the FFC SPA population

Collision risk estimates	Natural England	1	2	3	4	5	Applicant
Model Option used for Hornsea Three collision risk estimates	2	2	2	3	3	3	3
Model Option used for other projects	Extended, where available	Extended, where available	Extended, where available	Extended, where available	Extended, where available	Extended, where available	Extended, where available
Refined in-combination impact from other projects (REP4-049)	58	58	58	58	58	58	58
Mean Hornsea Three collision risk estimate	181	132	120	53	25	20	17
Annual refined in-combination collision rate							
LCL	170	140	133	91	73	70	69
Mean	**239**	**190**	**178**	**111**	**83**	**78**	**75**
UCL	315	246	229	134	93	85	81
Increase in baseline mortality (%)							
LCL	1.31	1.08	1.02	0.70	0.56	0.54	0.53
Mean	**1.84**	**1.46**	**1.37**	**0.85**	**0.64**	**0.60**	**0.58**
UCL	2.42	1.89	1.76	1.03	0.72	0.65	0.62
PVA (Counterfactual of final population size (35 years))							
LCL	0.937	0.948	0.950	0.965	0.972	0.973	0.974
Mean	**0.913**	**0.930**	**0.934**	**0.958**	**0.968**	**0.970**	**0.972**
UCL	0.887	0.910	0.916	0.950	0.965	0.968	0.969
PVA (Counterfactual of growth rate)							
LCL	0.998	0.998	0.998	0.999	0.999	0.999	0.999
Mean	**0.997**	**0.998**	**0.998**	**0.999**	**0.999**	**0.999**	**0.999**
UCL	0.997	0.997	0.997	0.998	0.999	0.999	0.999

Lesser black-backed gull

EIA scale

Project alone

Table 5.21: Collision risk estimates for lesser black-backed gull calculated using a 33.17 m lower rotor tip height and different parameter scenarios compared against baseline mortality of the largest BDMPS population

Collision risk estimates	Application (APP-065 and APP-109)	Natural England (REP6-043)	1	3	6 (Applicant) (REP6-042)
Flight speed (m/s)	13.1	13.1	9.8	9.8	9.8
Model option	1/3	2	2	1	1
Nocturnal activity factor	3	3	3	3	3
Annual collision rate					
LCL	3-4	5	4	3	3
Mean	**12-14**	**17**	**14**	**12**	**12**
UCL	20-24	30	24	20	20
Increase in baseline mortality (%)					
LCL	0.01-0.02	0.02	0.02	0.01	0.01
Mean	**0.05-0.06**	**0.07**	**0.06**	**0.05**	**0.05**
UCL	0.08-0.10	0.12	0.10	0.08	0.08

Cumulative impact

Table 5.22: Cumulative collision risk estimates for lesser black-backed gull using the Basic model for all projects compared against baseline mortality of the largest BDMPS population

Collision risk estimates	**Application (APP-065 and APP-109)**	**Natural England**	**1**	**3**	**Applicant**
Model Option used for Hornsea Three collision risk estimates	3	2	2	1	1
Model Option used for other projects	Extended, where available	Basic	Basic	Basic	Basic
Cumulative impact from other projects (APP-065 and REP1-005)	427	494	494	494	494
Mean Hornsea Three collision risk estimate (Table 5.21)	12	17	14	12	12
Annual cumulative collision rate					
LCL	431	499	498	497	497
Mean	**439**	**511**	**508**	**506**	**506**
UCL	451	524	518	514	514
Increase in baseline mortality (%)					
LCL	1.79	2.08	2.07	2.07	2.07
Mean	**1.83**	**2.13**	**2.11**	**2.11**	**2.11**
UCL	1.88	2.18	2.16	2.14	2.14

Table 5.23: Cumulative collision risk estimates for lesser black-backed gull using collision risk estimates calculated using the Extended model, where available compared against baseline mortality of the largest BDMPS population

Collision risk estimates	Application	Natural England	1	3	Applicant
Model Option used for Hornsea Three collision risk estimates	3	2	2	3	3
Model Option used for other projects	Extended, where available	Extended, where available	Extended, where available	Extended, where available	Extended, where available
Cumulative impact from other projects (APP-065 and REP1-005)	427	454	454	454	454
Mean Hornsea Three collision risk estimate	12	17	14	10	10
Annual cumulative collision rate					
LCL	431	459	458	457	457
Mean	**439**	**471**	**468**	**464**	**464**
UCL	451	484	478	472	472
Increase in baseline mortality (%)					
LCL	1.79	1.91	1.91	1.90	1.90
Mean	**1.83**	**1.96**	**1.95**	**1.93**	**1.93**
UCL	1.88	2.01	1.99	1.96	1.96

Table 5.24: Refined cumulative collision risk estimates for lesser black-backed gull using the Basic model for all projects compared against baseline mortality of the largest BDMPS population

Collision risk estimates	Natural England	1	3	Applicant
Model Option used for Hornsea Three collision risk estimates	2	2	1	1
Model Option used for other projects	Basic	Basic	Basic	Basic
Refined cumulative impact from other projects	376	376	376	376
Mean Hornsea Three collision risk estimate (Table 5.21)	17	14	12	12
Annual refined cumulative collision rate				
LCL	381	380	379	379
Mean	**393**	**390**	**388**	**388**
UCL	406	400	396	396
Increase in baseline mortality (%)				
LCL	1.59	1.58	1.58	1.58
Mean	**1.64**	**1.62**	**1.61**	**1.61**
UCL	1.69	1.66	1.65	1.65

Table 5.25: Refined cumulative collision risk estimates for lesser black-backed gull using collision risk estimates calculated using the Extended model, where available compared against baseline mortality of the largest BDMPS population

Collision risk estimates	Natural England	1	3	Applicant
Model Option used for Hornsea Three collision risk estimates	2	2	3	3
Model Option used for other projects	Extended, where available	Extended, where available	Extended, where available	Extended, where available
Refined cumulative impact from other projects	312	312	312	312
Mean Hornsea Three collision risk estimate (Table 5.21)	17	14	10	10
Annual refined cumulative collision rate				
LCL	317	316	315	315
Mean	**329**	**326**	**322**	**322**
UCL	342	336	330	330
Increase in baseline mortality (%)				
LCL	1.32	1.31	1.31	1.31
Mean	**1.37**	**1.36**	**1.34**	**1.34**
UCL	1.42	1.40	1.37	1.37

Herring gull

Project alone

Table 5.26: Collision risk estimates for herring gull calculated using a 33.17 m lower rotor tip height and different parameter scenarios compared against baseline mortality of the largest BDMPS population

Collision risk estimates	Application (APP-065 and APP-109)	Natural England (REP6-043)	1	3	6 (Applicant) (REP6-042)
Flight speed (m/s)	9.8	12.8	9.8	9.8	9.8
Model option	1	2	2	1	1
Nocturnal activity factor	3	3	3	3	3
Annual collision rate					
LCL	1	1	1	1	1
Mean	**6**	**9**	**8**	**6**	**6**
UCL	12	20	16	12	12
Increase in baseline mortality (%)					
LCL	<0.01	<0.01	<0.01	<0.01	<0.01
Mean	**0.01**	**0.01**	**0.01**	**0.01**	**0.01**
UCL	0.02	0.03	0.02	0.02	0.02

Great black-backed gull

Project alone

Table 5.27: Collision risk estimates for great black-backed gull calculated using a 33.17 m lower rotor tip height and different parameter scenarios compared against baseline mortality of the largest BDMPS population

Collision risk estimates	Application (APP-065 and APP-109)	Natural England (REP6-043)	1	3	6 (Applicant) (REP6-042)
Flight speed (m/s)	13.7	13.7	9.8	9.8	9.8
Model option	1/3	2	2	1	1
Nocturnal activity factor	3	3	3	3	3
Annual collision rate					
LCL	10-16	20	16	8	8
Mean	**32-52**	**66**	**53**	**26**	**26**
UCL	54-90	113	91	44	44
Increase in baseline mortality (%)					
LCL	0.15-0.25	0.32	0.26	0.12	0.12
Mean	**0.50-0.82**	**1.03**	**0.83**	**0.40**	**0.40**
UCL	0.85-1.40	1.77	1.42	0.68	0.68

Cumulative impact

Table 5.28: Cumulative collision risk estimates for great black-backed gull using the Basic model for all projects compared against baseline mortality of the largest BDMPS population

Collision risk estimates	Application	Natural England	1	3	Applicant
Model Option used for Hornsea Three collision risk estimates	3	2	2	1	1
Model Option used for other projects	Extended, where available	Basic	Basic	Basic	Basic
Cumulative impact from other projects (APP-065 and REP1-005)	614	766	766	766	766
Mean Hornsea Three collision risk estimate (Table 5.21)	52	66	53	26	26
Annual cumulative collision rate					
LCL	630	786	782	774	774
Mean	**666**	**832**	**819**	**792**	**792**
UCL	704	879	857	810	810
Increase in baseline mortality (%)					
LCL	9.85	12.29	12.22	12.10	12.10
Mean	**10.41**	**13.00**	**12.80**	**12.38**	**12.38**
UCL	11.00	13.74	13.39	12.66	12.66

Table 5.29: Cumulative collision risk estimates for great black-backed gull using collision risk estimates calculated using the Extended model, where available compared against baseline mortality of the largest BDMPS population

Collision risk estimates	Application	Natural England	1	3	Applicant
Model Option used for Hornsea Three collision risk estimates	3	2	2	3	3
Model Option used for other projects	Extended, where available	Extended, where available	Extended, where available	Extended, where available	Extended, where available
Cumulative impact from other projects (APP-065 and REP1-005)	614	669	669	669	669
Mean Hornsea Three collision risk estimate	52	66	53	46	46
Annual cumulative collision rate					
LCL	630	689	685	683	683
Mean	**666**	**735**	**722**	**715**	**715**
UCL	704	782	760	748	748
Increase in baseline mortality (%)					
LCL	9.85	10.77	10.71	10.68	10.68
Mean	**10.41**	**11.49**	**11.28**	**11.18**	**11.18**
UCL	11.00	12.22	11.88	11.69	11.69

Table 5.30: Refined cumulative collision risk estimates for great black-backed gull using the Basic model for all projects compared against baseline mortality of the largest BDMPS population

Collision risk estimates	Natural England	1	3	Applicant
Model Option used for Hornsea Three collision risk estimates	2	2	1	1
Model Option used for other projects	Basic	Basic	Basic	Basic
Refined cumulative impact from other projects	590	590	590	590
Mean Hornsea Three collision risk estimate	66	53	26	26
Annual refined cumulative collision rate				
LCL	610	606	598	598
Mean	**656**	**643**	**616**	**616**
UCL	703	681	634	634
Increase in baseline mortality (%)				
LCL	9.53	9.47	9.35	9.35
Mean	**10.25**	**10.05**	**9.63**	**9.63**
UCL	10.99	10.64	9.91	9.91

Table 5.31: Refined cumulative collision risk estimates for great black-backed gull using collision risk estimates calculated using the Extended model, where available compared against baseline mortality of the largest BDMPS population

Collision risk estimates	Natural England	1	3	Applicant
Model Option used for Hornsea Three collision risk estimates	2	2	3	3
Model Option used for other projects	Extended, where available	Extended, where available	Extended, where available	Extended, where available
Refined cumulative impact from other projects	427	427	427	427
Mean Hornsea Three collision risk estimate	66	53	46	46
Annual refined cumulative collision rate				
LCL	447	443	441	441
Mean	**493**	**480**	**473**	**473**
UCL	540	518	506	506
Increase in baseline mortality (%)				
LCL	6.99	6.92	6.89	6.89
Mean	**7.71**	**7.50**	**7.39**	**7.39**
UCL	8.44	8.10	7.91	7.91

6. Collision risk estimates – mitigation 37.5 m lower rotor tip height

Gannet

EIA scale

Project alone

Table 6.1: Collision risk estimates for gannet calculated using a 37.5 m lower rotor tip height and different parameter scenarios compared against baseline mortality of the largest BDMPS population

Collision risk estimates	Parameter scenario				
	Natural England	1	2	3	6 (Applicant)
Annual collision rate					
LCL	19	17	8	6	5
Mean	**31**	**29**	**13**	**9**	**8**
UCL	44	41	18	13	11
Increase in baseline mortality (%)					
LCL	0.05	0.05	0.02	0.02	0.01
Mean	**0.08**	**0.08**	**0.04**	**0.03**	**0.02**
UCL	0.12	0.11	0.05	0.04	0.03

Cumulative

Table 6.2: Cumulative collision risk estimates for gannet using the Basic model for all projects compared against baseline mortality of the largest BDMPS population

Collision risk estimates	Parameter scenarios				
	Natural England	1	2	3	6 (Applicant)
Model Option used for Hornsea Three collision risk estimates	2	2	2	1	1
Model Option used for other projects	Basic	Basic	Basic	Basic	Basic
Cumulative impact from other projects (APP-065 and REP1-005)	1184	1184	1184	1184	1184
Mean Hornsea Three collision risk estimate (Table 6.1)	31	29	13	9	8
Annual cumulative collision rate					
LCL	1203	1201	1192	1190	1189
Mean	**1215**	**1213**	**1197**	**1193**	**1192**
UCL	1228	1225	1202	1197	1195
Increase in baseline mortality (%)					
LCL	3.25	3.25	3.23	3.22	3.22
Mean	**3.29**	**3.28**	**3.24**	**3.23**	**3.23**
UCL	3.32	3.31	3.25	3.24	3.23

Table 6.3: Cumulative collision risk estimates for gannet using collision risk estimates calculated using the Extended model, where available compared against baseline mortality of the largest BDMPS population

Collision risk estimates	Parameter scenarios				
	Natural England	1	2	3	6 (Applicant)
Model Option used for Hornsea Three collision risk estimates	3	2	2	3	3
Model Option used for other projects	Extended, where available	Extended, where available	Extended, where available	Extended, where available	Extended, where available
Cumulative impact from other projects (APP-065 and REP1-005)	1238	1238	1238	1238	1238
Mean Hornsea Three collision risk estimate	31	29	13	12	10
Annual cumulative collision rate					
LCL	1257	1255	1246	1245	1244
Mean	**1269**	**1267**	**1251**	**1250**	**1248**
UCL	1282	1279	1256	1256	1252
Increase in baseline mortality (%)					
LCL	3.40	3.40	3.37	3.37	3.37
Mean	**3.43**	**3.43**	**3.38**	**3.38**	**3.38**
UCL	3.47	3.46	3.40	3.40	3.39

Table 6.4: Refined cumulative collision risk estimates for gannet using the Basic model for all projects compared against baseline mortality of the largest BDMPS population

Collision risk estimates	Parameter scenarios				
	Natural England	1	2	3	6 (Applicant)
Model Option used for Hornsea Three collision risk estimates	2	2	2	1	1
Model Option used for other projects	Basic	Basic	Basic	Basic	Basic
Refined cumulative impact from other projects	844	844	844	844	844
Mean Hornsea Three collision risk estimate (Table 6.1)	31	29	13	9	8
Annual refined cumulative collision rate					
LCL	863	861	852	850	849
Mean	**875**	**873**	**857**	**853**	**852**
UCL	888	885	862	857	855
Increase in baseline mortality (%)					
LCL	2.33	2.33	2.31	2.30	2.30
Mean	**2.37**	**2.36**	**2.32**	**2.31**	**2.31**
UCL	2.40	2.39	2.33	2.32	2.31

Table 6.5: Refined cumulative collision risk estimates for gannet using collision risk estimates calculated using the Extended model, where available compared against baseline mortality of the largest BDMPS population

Collision risk estimates	Parameter scenarios				
	Natural England	1	2	3	6 (Applicant)
Model Option used for Hornsea Three collision risk estimates	2	2	2	3	3
Model Option used for other projects	Extended, where available	Extended, where available	Extended, where available	Extended, where available	Extended, where available
Refined cumulative impact from other projects	837	837	837	837	837
Mean Hornsea Three collision risk estimate	31	29	13	12	10
Annual refined cumulative collision rate					
LCL	856	854	845	844	843
Mean	**868**	**866**	**850**	**849**	**847**
UCL	881	878	855	855	851
Increase in baseline mortality (%)					
LCL	2.32	2.31	2.29	2.28	2.28
Mean	**2.35**	**2.34**	**2.30**	**2.30**	**2.29**
UCL	2.38	2.38	2.31	2.31	2.30

RIAA scale

Project alone

Table 6.6: Collision risk estimates for gannet calculated using a 37.5 m lower rotor tip height and different parameter scenarios compared against baseline mortality and PVA metrics for the FFC SPA population

Collision risk estimates	Parameter scenario						
	Natural England	1	2	3	4	5	Applicant
Annual collision rate							
LCL	6	6	3	2	1	1	1
Mean	**11**	**10**	**5**	**3**	**2**	**2**	**2**
UCL	16	15	7	5	3	3	2
Increase in baseline mortality (%)							
LCL	0.47	0.44	0.20	0.14	0.10	0.08	0.07
Mean	**0.82**	**0.76**	**0.35**	**0.25**	**0.17**	**0.14**	**0.12**
UCL	1.17	1.09	0.50	0.36	0.24	0.19	0.17
PVA (Counterfactual of final population size (35 years))							
LCL	0.995	0.995	0.998	0.998	0.999	0.999	0.999
Mean	**0.992**	**0.992**	**0.996**	**0.998**	**0.998**	**0.998**	**0.998**
UCL	0.988	0.989	0.995	0.996	0.998	0.998	0.998
PVA (Counterfactual of growth rate)							
LCL	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Mean	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**
UCL	0.999	0.999	1.000	1.000	1.000	1.000	1.000

In-combination impact

Table 6.7: In-combination collision risk estimates for gannet at FFC SPA using the Basic model for all projects compared against baseline mortality and PVA metrics for the FFC SPA population

Collision risk estimates	**Parameter scenarios**						
	Natural England	1	2	3	4	5	Applicant
Model Option used for Hornsea Three collision risk estimates	2	2	2	1	1	1	1
Model Option used for other projects	Basic	Basic	Basic	Basic	Basic	Basic	Basic
In-combination impact from other projects (APP-065 and REP1-005)	160	160	160	160	160	160	160
Mean Hornsea Three collision risk estimate (Table 6.6)	11	10	5	3	2	2	2
Annual in-combination collision rate							
LCL	166	166	163	162	161	161	161
Mean	**171**	**170**	**165**	**163**	**162**	**162**	**162**
UCL	176	175	167	165	163	163	162
Increase in baseline mortality (%)							
LCL	12.10	12.10	11.88	11.81	11.73	11.73	11.73
Mean	**12.46**	**12.39**	**12.03**	**11.88**	**11.81**	**11.81**	**11.81**
UCL	12.83	12.76	12.17	12.03	11.88	11.88	11.81
PVA (Counterfactual of final population size (35 years))							
LCL	0.774	0.774	0.777	0.779	0.780	0.780	0.780
Mean	**0.768**	**0.769**	**0.775**	**0.777**	**0.779**	**0.779**	**0.779**
UCL	0.762	0.763	0.773	0.775	0.777	0.777	0.779
PVA (Counterfactual of growth rate)							
LCL	0.992	0.992	0.992	0.993	0.993	0.993	0.993
Mean	**0.992**	**0.992**	**0.992**	**0.992**	**0.993**	**0.993**	**0.993**
UCL	0.992	0.992	0.992	0.992	0.992	0.992	0.993

Table 6.8: In-combination collision risk estimates for gannet at FFC SPA using collision risk estimates calculated using the Extended model, where available compared against baseline mortality and PVA metrics for the FFC SPA population

Collision risk estimates	Parameter scenarios						
	Natural England	1	2	3	4	5	Applicant
Model Option used for Hornsea Three collision risk estimates	2	2	2	3	3	3	3
Model Option used for other projects	Extended, where available	Extended, where available	Extended, where available	Extended, where available	Extended, where available	Extended, where available	Extended, where available
In-combination impact from other projects (APP-065 and REP1-005)	195	195	195	195	195	195	195
Mean Hornsea Three collision risk estimate	11	10	5	5	3	2	2
Annual in-combination collision rate							
LCL	201	201	198	198	197	196	196
Mean	**206**	**205**	**200**	**200**	**198**	**197**	**197**
UCL	211	210	202	201	199	199	198
Increase in baseline mortality (%)							
LCL	14.65	14.65	14.43	14.43	14.36	14.29	14.29
Mean	**15.01**	**14.94**	**14.58**	**14.58**	**14.43**	**14.36**	**14.36**
UCL	15.38	15.31	14.72	14.65	14.50	14.50	14.43
PVA (Counterfactual of final population size (35 years))							
LCL	0.733	0.733	0.736	0.736	0.737	0.739	0.739
Mean	**0.727**	**0.728**	**0.734**	**0.734**	**0.736**	**0.737**	**0.737**
UCL	0.722	0.723	0.732	0.733	0.735	0.735	0.736
PVA (Counterfactual of growth rate)							
LCL	0.991	0.991	0.991	0.991	0.991	0.991	0.991
Mean	**0.991**	**0.991**	**0.991**	**0.991**	**0.991**	**0.991**	**0.991**
UCL	0.991	0.991	0.991	0.991	0.991	0.991	0.991

Table 6.9: Refined in-combination collision risk estimates for gannet at FFC SPA using the Basic model for all projects compared against baseline mortality and PVA metrics for the FFC SPA population

Collision risk estimates	Parameter scenarios						
	Natural England	1	2	3	4	5	Applicant
Model Option used for Hornsea Three collision risk estimates	2	2	2	1	1	1	1
Model Option used for other projects	Basic	Basic	Basic	Basic	Basic	Basic	Basic
Refined in-combination impact from other projects (REP4-049)	106	106	106	106	106	106	106
Mean Hornsea Three collision risk estimate (Table 6.6)	11	10	5	3	2	2	2
Annual refined in-combination collision rate							
LCL	112	112	109	108	107	107	107
Mean	**117**	**116**	**111**	**109**	**108**	**108**	**108**
UCL	122	121	113	111	109	109	108
Increase in baseline mortality (%)							
LCL	8.16	8.16	7.94	7.87	7.80	7.80	7.80
Mean	**8.53**	**8.45**	**8.09**	**7.94**	**7.87**	**7.87**	**7.87**
UCL	8.89	8.82	8.24	8.09	7.94	7.94	7.87
PVA (Counterfactual of final population size (35 years))							
LCL	0.842	0.842	0.845	0.847	0.848	0.848	0.848
Mean	**0.835**	**0.837**	**0.843**	**0.845**	**0.847**	**0.847**	**0.847**
UCL	0.829	0.830	0.840	0.843	0.845	0.845	0.847
PVA (Counterfactual of growth rate)							
LCL	0.995	0.995	0.995	0.995	0.995	0.995	0.995
Mean	**0.994**	**0.994**	**0.995**	**0.995**	**0.995**	**0.995**	**0.995**
UCL	0.994	0.994	0.994	0.995	0.995	0.995	0.995

Table 6.10: Refined in-combination collision risk estimates for gannet at FFC SPA using collision risk estimates calculated using the Extended model, where available compared against baseline mortality and PVA metrics for the FFC SPA population

Collision risk estimates	Parameter scenarios						
	Natural England	1	2	3	4	5	Applicant
Model Option used for Hornsea Three collision risk estimates	2	2	2	3	3	3	3
Model Option used for other projects	Extended, where available	Extended, where available	Extended, where available	Extended, where available	Extended, where available	Extended, where available	Extended, where available
Refined in-combination impact from other projects (REP4-049)	125	125	125	125	125	125	125
Mean Hornsea Three collision risk estimate	11	10	5	5	3	2	2
Annual refined in-combination collision rate							
LCL	131	131	128	128	127	126	126
Mean	**136**	**135**	**130**	**130**	**128**	**127**	**127**
UCL	141	140	132	131	129	129	128
Increase in baseline mortality (%)							
LCL	9.55	9.55	9.33	9.33	9.26	9.18	9.18
Mean	**9.91**	**9.84**	**9.48**	**9.48**	**9.33**	**9.26**	**9.26**
UCL	10.28	10.20	9.62	9.55	9.40	9.40	9.33
PVA (Counterfactual of final population size (35 years))							
LCL	0.817	0.817	0.821	0.821	0.822	0.824	0.824
Mean	**0.811**	**0.812**	**0.819**	**0.819**	**0.821**	**0.822**	**0.822**
UCL	0.805	0.806	0.816	0.817	0.820	0.820	0.821
PVA (Counterfactual of growth rate)							
LCL	0.994	0.994	0.994	0.994	0.994	0.994	0.994
Mean	**0.994**	**0.994**	**0.994**	**0.994**	**0.994**	**0.994**	**0.994**
UCL	0.993	0.993	0.994	0.994	0.994	0.994	0.994

Kittiwake

EIA scale

Project alone

Table 6.11: Collision risk estimates for kittiwake calculated using a 37.5 m lower rotor tip height and different parameter scenarios compared against baseline mortality of the largest BDMPS population

Collision risk estimates	**Parameter scenario**				
	Natural England	1	2	3	6 (Applicant)
Annual collision rate					
LCL	121	89	81	17	14
Mean	**196**	**144**	**131**	**28**	**23**
UCL	281	206	187	40	32
Increase in baseline mortality (%)					
LCL	0.10	0.07	0.07	0.01	0.01
Mean	**0.16**	**0.12**	**0.11**	**0.02**	**0.02**
UCL	0.23	0.17	0.15	0.03	0.03

Cumulative

Table 6.12: Cumulative collision risk estimates for kittiwake using the Basic model for all projects compared against baseline mortality of the largest BDMPS population

Collision risk estimates	Parameter scenario				
	Natural England	1	2	3	6 (Applicant)
Model Option used for Hornsea Three collision risk estimates	2	2	2	1	1
Model Option used for other projects	Basic	Basic	Basic	Basic	Basic
Cumulative impact from other projects (APP-065 and REP1-005)	2988	2988	2988	2988	2988
Mean Hornsea Three collision risk estimate (Table 6.11)	196	144	131	28	23
Annual cumulative collision rate					
LCL	3109	3077	3069	3005	3002
Mean	**3184**	**3132**	**3119**	**3016**	**3011**
UCL	3269	3194	3175	3028	3020
Increase in baseline mortality (%)					
LCL	2.57	2.54	2.53	2.48	2.48
Mean	**2.63**	**2.58**	**2.57**	**2.49**	**2.48**
UCL	2.70	2.64	2.62	2.50	2.49

Table 6.13: Cumulative collision risk estimates for kittiwake using collision risk estimates calculated using the Extended model, where available compared against baseline mortality of the largest BDMPS population

Collision risk estimates	Parameter scenario				
	Natural England	1	2	3	6 (Applicant)
Model Option used for Hornsea Three collision risk estimates	2	2	2	3	3
Model Option used for other projects	Extended model, where available	Extended model, where available	Extended model, where available	Extended model, where available	Extended model, where available
Cumulative impact from other projects (APP-065 and REP1-005)	1312	1312	1312	1312	1312
Mean Hornsea Three collision risk estimate	196	144	131	58	46
Annual cumulative collision rate					
LCL	1433	1401	1393	1348	1341
Mean	**1508**	**1456**	**1443**	**1370**	**1358**
UCL	1593	1518	1499	1395	1378
Increase in baseline mortality (%)					
LCL	1.18	1.16	1.15	1.11	1.11
Mean	**1.24**	**1.20**	**1.19**	**1.13**	**1.12**
UCL	1.31	1.25	1.24	1.15	1.14

Table 6.14: Refined cumulative collision risk estimates for kittiwake using the Basic model for all projects compared against baseline mortality of the largest BDMPS population

Collision risk estimates	Parameter scenario				
	Natural England	1	2	3	6 (Applicant)
Model Option used for Hornsea Three collision risk estimates	2	2	2	1	1
Model Option used for other projects	Basic	Basic	Basic	Basic	Basic
Refined cumulative impact from other projects	2058	2058	2058	2058	2058
Mean Hornsea Three collision risk estimate (Table 6.11)	196	144	131	28	23
Annual refined cumulative collision rate					
LCL	2179	2147	2139	2075	2072
Mean	**2254**	**2202**	**2189**	**2086**	**2081**
UCL	2339	2264	2245	2098	2090
Increase in baseline mortality (%)					
LCL	1.80	1.77	1.77	1.71	1.71
Mean	**1.86**	**1.82**	**1.81**	**1.72**	**1.72**
UCL	1.93	1.87	1.85	1.73	1.72

Table 6.15: Refined cumulative collision risk estimates for kittiwake using collision risk estimates calculated using the Extended model, where available compared against baseline mortality of the largest BDMPS population

Collision risk estimates	Parameter scenario				
	Natural England	1	2	3	6 (Applicant)
Model Option used for Hornsea Three collision risk estimates	2	2	2	3	3
Model Option used for other projects	Extended model, where available	Extended model, where available	Extended model, where available	Extended model, where available	Extended model, where available
Refined cumulative impact from other projects	722	722	722	722	722
Mean Hornsea Three collision risk estimate	196	144	131	58	46
Annual refined cumulative collision rate					
LCL	843	811	803	758	751
Mean	**918**	**866**	**853**	**780**	**768**
UCL	1003	928	909	805	788
Increase in baseline mortality (%)					
LCL	0.70	0.67	0.66	0.63	0.62
Mean	**0.76**	**0.71**	**0.70**	**0.64**	**0.63**
UCL	0.83	0.77	0.75	0.66	0.65

RIAA scale

Project alone

Table 6.16: Collision risk estimates for kittiwake calculated using a 37.5 m lower rotor tip height and different parameter scenarios compared against baseline mortality and PVA metrics for the FFC SPA population

Collision risk estimates	Parameter scenario						
	Natural England	1	2	3	4	5	Applicant
Annual collision rate							
LCL	74	54	49	11	5	4	3
Mean	**119**	**87**	**79**	**17**	**8**	**6**	**5**
UCL	169	124	113	24	11	9	7
Increase in baseline mortality (%)							
LCL	0.57	0.42	0.38	0.08	0.04	0.03	0.03
Mean	**0.92**	**0.67**	**0.61**	**0.13**	**0.06**	**0.05**	**0.04**
UCL	1.30	0.96	0.87	0.19	0.09	0.07	0.06
PVA (Counterfactual of final population size (35 years))							
LCL	0.972	0.979	0.981	0.996	0.998	0.998	0.999
Mean	**0.955**	**0.967**	**0.970**	**0.994**	**0.997**	**0.998**	**0.998**
UCL	0.937	0.953	0.957	0.991	0.996	0.997	0.997
PVA (Counterfactual of growth rate)							
LCL	0.999	0.999	0.999	1.000	1.000	1.000	1.000
Mean	**0.999**	**0.999**	**0.999**	**1.000**	**1.000**	**1.000**	**1.000**
UCL	0.998	0.999	0.999	1.000	1.000	1.000	1.000

In-combination impact

Table 6.17: In-combination collision risk estimates for kittiwake at FFC SPA using the Basic model for all projects compared against baseline mortality and PVA metrics for the FFC SPA population

Collision risk estimates	**Parameter scenario**						
	Natural England	1	2	3	4	5	Applicant
Model Option used for Hornsea Three collision risk estimates	2	2	2	1	1	1	1
Model Option used for other projects	Basic	Basic	Basic	Basic	Basic	Basic	Basic
In-combination impact from other projects (APP-065 and REP1-005)	250	250	250	250	250	250	250
Mean Hornsea Three collision risk estimate (Table 6.16)	119	87	79	17	8	6	5
Annual in-combination collision rate							
LCL	324	304	299	261	255	254	253
Mean	**369**	**337**	**329**	**267**	**258**	**256**	**255**
UCL	419	374	363	274	261	259	257
Increase in baseline mortality (%)							
LCL	2.49	2.34	2.30	2.01	1.96	1.95	1.95
Mean	**2.84**	**2.59**	**2.53**	**2.05**	**1.98**	**1.97**	**1.96**
UCL	3.22	2.88	2.79	2.11	2.01	1.99	1.98
PVA (Counterfactual of final population size (35 years))							
LCL	0.884	0.891	0.892	0.905	0.907	0.908	0.908
Mean	**0.869**	**0.879**	**0.882**	**0.903**	**0.906**	**0.907**	**0.907**
UCL	0.852	0.867	0.871	0.901	0.905	0.906	0.907
PVA (Counterfactual of growth rate)							
LCL	0.997	0.997	0.997	0.997	0.997	0.997	0.997
Mean	**0.996**	**0.996**	**0.996**	**0.997**	**0.997**	**0.997**	**0.997**
UCL	0.996	0.996	0.996	0.997	0.997	0.997	0.997

Table 6.18: In-combination collision risk estimates for kittiwake at FFC SPA using collision risk estimates calculated using the Extended model, where available compared against baseline mortality and PVA metrics for the FFC SPA population

Collision risk estimates	Parameter scenario						
	Natural England	1	2	3	4	5	Applicant
Model Option used for Hornsea Three collision risk estimates	2	2	2	3	3	3	3
Model Option used for other projects	Extended, where available	Extended, where available	Extended, where available	Extended, where available	Extended, where available	Extended, where available	Extended, where available
In-combination impact from other projects (APP-065 and REP1-005)	107	107	107	107	107	107	107
Mean Hornsea Three collision risk estimate	119	87	79	35	16	13	11
Annual in-combination collision rate							
LCL	181	161	156	129	117	115	114
Mean	**226**	**194**	**186**	**142**	**123**	**120**	**118**
UCL	276	231	220	157	130	125	122
Increase in baseline mortality (%)							
LCL	1.39	1.24	1.20	0.99	0.90	0.88	0.88
Mean	**1.74**	**1.49**	**1.43**	**1.09**	**0.95**	**0.92**	**0.91**
UCL	2.12	1.78	1.69	1.21	1.00	0.96	0.94
PVA (Counterfactual of final population size (35 years))							
LCL	0.933	0.940	0.942	0.952	0.956	0.957	0.957
Mean	**0.917**	**0.928**	**0.931**	**0.947**	**0.954**	**0.955**	**0.956**
UCL	0.900	0.915	0.919	0.941	0.951	0.953	0.954
PVA (Counterfactual of growth rate)							
LCL	0.998	0.998	0.998	0.998	0.999	0.999	0.999
Mean	**0.997**	**0.998**	**0.998**	**0.998**	**0.999**	**0.999**	**0.999**
UCL	0.997	0.997	0.998	0.998	0.998	0.999	0.999

Table 6.19: Refined in-combination collision risk estimates for kittiwake at FFC SPA using the Basic model for all projects compared against baseline mortality and PVA metrics for the FFC SPA population

Collision risk estimates	Parameter scenario						
	Natural England	1	2	3	4	5	Applicant
Model Option used for Hornsea Three collision risk estimates	2	2	2	1	1	1	1
Model Option used for other projects	Basic	Basic	Basic	Basic	Basic	Basic	Basic
Refined in-combination impact from other projects	170	170	170	170	170	170	170
Mean Hornsea Three collision risk estimate (Table 6.16)	119	87	79	17	8	6	5
Annual refined in-combination collision rate							
LCL	244	224	219	181	175	174	173
Mean	**289**	**257**	**249**	**187**	**178**	**176**	**175**
UCL	339	294	283	194	181	179	177
Increase in baseline mortality (%)							
LCL	1.88	1.72	1.68	1.39	1.35	1.34	1.33
Mean	**2.22**	**1.98**	**1.92**	**1.44**	**1.37**	**1.35**	**1.35**
UCL	2.61	2.26	2.18	1.49	1.39	1.38	1.36
PVA (Counterfactual of final population size (35 years))							
LCL	0.911	0.918	0.920	0.933	0.935	0.935	0.936
Mean	**0.896**	**0.907**	**0.909**	**0.931**	**0.934**	**0.935**	**0.935**
UCL	0.879	0.894	0.898	0.928	0.933	0.934	0.934
PVA (Counterfactual of growth rate)							
LCL	0.997	0.998	0.998	0.998	0.998	0.998	0.998
Mean	**0.997**	**0.997**	**0.997**	**0.998**	**0.998**	**0.998**	**0.998**
UCL	0.996	0.997	0.997	0.998	0.998	0.998	0.998

Table 6.20: Refined in-combination collision risk estimates for kittiwake at FFC SPA using collision risk estimates calculated using the Extended model, where available compared against baseline mortality and PVA metrics for the FFC SPA population

Collision risk estimates	Parameter scenario						
	Natural England	1	2	3	4	5	Applicant
Model Option used for Hornsea Three collision risk estimates	2	2	2	3	3	3	3
Model Option used for other projects	Extended, where available	Extended, where available	Extended, where available	Extended, where available	Extended, where available	Extended, where available	Extended, where available
Refined in-combination impact from other projects	58	58	58	58	58	58	58
Mean Hornsea Three collision risk estimate	119	87	79	35	16	13	11
Annual refined in-combination collision rate							
LCL	132	112	107	80	68	66	65
Mean	**177**	**145**	**137**	**93**	**74**	**71**	**69**
UCL	227	182	171	108	81	76	73
Increase in baseline mortality (%)							
LCL	1.02	0.86	0.82	0.62	0.52	0.51	0.50
Mean	**1.36**	**1.12**	**1.05**	**0.72**	**0.57**	**0.55**	**0.53**
UCL	1.75	1.40	1.32	0.83	0.62	0.58	0.56
PVA (Counterfactual of final population size (35 years))							
LCL	0.972	0.979	0.981	0.992	0.996	0.997	0.997
Mean	**0.955**	**0.967**	**0.970**	**0.987**	**0.994**	**0.995**	**0.996**
UCL	0.937	0.953	0.957	0.981	0.991	0.993	0.994
PVA (Counterfactual of growth rate)							
LCL	0.999	0.999	0.999	1.000	1.000	1.000	1.000
Mean	**0.999**	**0.999**	**0.999**	**0.999**	**1.000**	**1.000**	**1.000**
UCL	0.998	0.999	0.999	0.999	1.000	1.000	1.000

Lesser black-backed gull

EIA scale

Project alone

Table 6.21: Collision risk estimates for lesser black-backed gull calculated using a 37.5 m lower rotor tip height and different parameter scenarios compared against baseline mortality of the largest BDMPS population

Collision risk estimates	Parameter scenario			
	Natural England	1	3	Applicant
Annual collision rate				
LCL	4	3	3	3
Mean	**13**	**11**	**12**	**12**
UCL	22	18	20	20
Increase in baseline mortality (%)				
LCL	0.02	0.01	0.01	0.01
Mean	**0.05**	**0.04**	**0.05**	**0.05**
UCL	0.09	0.08	0.08	0.08

Cumulative

Table 6.22: Cumulative collision risk estimates for lesser black-backed gull using the Basic model for all projects compared against baseline mortality of the largest BDMPS population

Collision risk estimates	**Parameter scenarios**			
	Natural England	1	3	Applicant
Model Option used for Hornsea Three collision risk estimates	2	2	1	1
Model Option used for other projects	Basic	Basic	Basic	Basic
Cumulative impact from other projects (APP-065 and REP1-005)	494	494	494	494
Mean Hornsea Three collision risk estimate (Table 6.21)	13	11	12	12
Annual cumulative collision rate				
LCL	498	497	497	497
Mean	**507**	**505**	**506**	**506**
UCL	516	512	514	514
Increase in baseline mortality (%)				
LCL	2.07	2.07	2.07	2.07
Mean	**2.11**	**2.10**	**2.11**	**2.11**
UCL	2.15	2.13	2.14	2.14

Table 6.23: Cumulative collision risk estimates for lesser black-backed gull using collision risk estimates calculated using the Extended model, where available compared against baseline mortality of the largest BDMPS population

Collision risk estimates	**Parameter scenarios**			
	Natural England	1	3	Applicant
Model Option used for Hornsea Three collision risk estimates	2	2	3	3
Model Option used for other projects	Extended, where available	Extended, where available	Extended, where available	Extended, where available
Cumulative impact from other projects (APP-065 and REP1-005)	454	454	454	454
Mean Hornsea Three collision risk estimate	13	11	8	8
Annual cumulative collision rate				
LCL	458	457	456	456
Mean	**467**	**465**	**462**	**462**
UCL	476	472	467	467
Increase in baseline mortality (%)				
LCL	1.91	1.90	1.90	1.90
Mean	**1.94**	**1.93**	**1.92**	**1.92**
UCL	1.98	1.96	1.94	1.94

Table 6.24: Refined cumulative collision risk estimates for lesser black-backed gull using the Basic model for all projects compared against baseline mortality of the largest BDMPS population

Collision risk estimates	Parameter scenarios			
	Natural England	1	3	Applicant
Model Option used for Hornsea Three collision risk estimates	2	2	1	1
Model Option used for other projects	Basic	Basic	Basic	Basic
Refined cumulative impact from other projects	376	376	376	376
Mean Hornsea Three collision risk estimate (Table 6.21)	13	11	12	12
Annual refined cumulative collision rate				
LCL	380	379	379	379
Mean	**389**	**387**	**388**	**388**
UCL	398	394	396	396
Increase in baseline mortality (%)				
LCL	1.58	1.58	1.58	1.58
Mean	**1.62**	**1.61**	**1.61**	**1.61**
UCL	1.66	1.64	1.65	1.65

Table 6.25: Refined cumulative collision risk estimates for lesser black-backed gull using collision risk estimates calculated using the Extended model, where available compared against baseline mortality of the largest BDMPS population

Collision risk estimates	**Parameter scenarios**			
	Natural England	1	3	Applicant
Model Option used for Hornsea Three collision risk estimates	2	2	3	3
Model Option used for other projects	Extended, where available	Extended, where available	Extended, where available	Extended, where available
Refined cumulative impact from other projects	312	312	312	312
Mean Hornsea Three collision risk estimate	13	11	8	8
Annual refined cumulative collision rate				
LCL	316	315	314	314
Mean	**325**	**323**	**320**	**320**
UCL	334	330	325	325
Increase in baseline mortality (%)				
LCL	1.31	1.31	1.31	1.31
Mean	**1.35**	**1.34**	**1.33**	**1.33**
UCL	1.39	1.37	1.35	1.35

Herring gull

EIA scale

Project alone

Table 6.26: Collision risk estimates for herring gull calculated using a 37.5 m lower rotor tip height and different parameter scenarios compared against baseline mortality of the largest BDMPS population

Collision risk estimates	Parameter scenario			
	Natural England	1	3	Applicant
Annual collision rate				
LCL	1	1	1	1
Mean	**7**	**6**	**5**	**5**
UCL	15	13	11	11
Increase in baseline mortality (%)				
LCL	<0.01	<0.01	<0.01	<0.01
Mean	**0.01**	**0.01**	**0.01**	**0.01**
UCL	0.02	0.02	0.01	0.01

Great black-backed gull

EIA scale

Project alone

Table 6.27: Collision risk estimates for great black-backed gull calculated using a 37.5 m lower rotor tip height and different parameter scenarios compared against baseline mortality of the largest BDMPS population

Collision risk estimates	Parameter scenario			
	Natural England	1	3	Applicant
Annual collision rate				
LCL	16	13	6	6
Mean	**52**	**42**	**20**	**20**
UCL	89	71	34	34
Increase in baseline mortality (%)				
LCL	0.25	0.20	0.09	0.09
Mean	**0.81**	**0.65**	**0.31**	**0.31**
UCL	1.39	1.12	0.53	0.53

Cumulative

Table 6.28: Cumulative collision risk estimates for great black-backed gull using the Basic model for all projects compared against baseline mortality of the largest BDMPS population

Collision risk estimates	**Parameter scenarios**			
	Natural England	1	3	Applicant
Model Option used for Hornsea Three collision risk estimates	2	2	1	1
Model Option used for other projects	Basic	Basic	Basic	Basic
Cumulative impact from other projects (APP-065 and REP1-005)	766	766	766	766
Mean Hornsea Three collision risk estimate (Table 6.27)	52	42	20	20
Annual cumulative collision rate				
LCL	782	779	772	772
Mean	**818**	**808**	**786**	**786**
UCL	855	837	800	800
Increase in baseline mortality (%)				
LCL	12.22	12.18	12.07	12.07
Mean	**12.79**	**12.63**	**12.29**	**12.29**
UCL	13.36	13.08	12.50	12.50

Table 6.29: Cumulative collision risk estimates for great black-backed gull using collision risk estimates calculated using the Extended model, where available compared against baseline mortality of the largest BDMPS population

Collision risk estimates	**Parameter scenarios**			
	Natural England	1	3	Applicant
Model Option used for Hornsea Three collision risk estimates	2	2	3	3
Model Option used for other projects	Extended, where available	Extended, where available	Extended, where available	Extended, where available
Cumulative impact from other projects (APP-065 and REP1-005)	669	669	669	669
Mean Hornsea Three collision risk estimate	52	42	36	36
Annual cumulative collision rate				
LCL	685	682	680	680
Mean	**721**	**711**	**705**	**705**
UCL	758	740	731	731
Increase in baseline mortality (%)				
LCL	10.71	10.66	10.63	10.63
Mean	**11.27**	**11.11**	**11.02**	**11.02**
UCL	11.85	11.57	11.43	11.43

Table 6.30: Refined cumulative collision risk estimates for great black-backed gull using the Basic model for all projects compared against baseline mortality of the largest BDMPS population

Collision risk estimates	Parameter scenarios			
	Natural England	1	3	Applicant
Model Option used for Hornsea Three collision risk estimates	2	2	1	1
Model Option used for other projects	Basic	Basic	Basic	Basic
Refined cumulative impact from other projects	590	590	590	590
Mean Hornsea Three collision risk estimate (Table 6.27)	52	42	20	20
Annual refined cumulative collision rate				
LCL	606	603	596	596
Mean	**642**	**632**	**610**	**610**
UCL	679	661	624	624
Increase in baseline mortality (%)				
LCL	9.47	9.42	9.32	9.32
Mean	**10.03**	**9.88**	**9.53**	**9.53**
UCL	10.61	10.33	9.75	9.75

Table 6.31: Refined cumulative collision risk estimates for great black-backed gull using collision risk estimates calculated using the Extended model, where available compared against baseline mortality of the largest BDMPS population

Collision risk estimates	Parameter scenarios			
	Natural England	1	3	Applicant
Model Option used for Hornsea Three collision risk estimates	2	2	3	3
Model Option used for other projects	Extended, where available	Extended, where available	Extended, where available	Extended, where available
Refined cumulative impact from other projects	427	427	427	427
Mean Hornsea Three collision risk estimate	52	42	36	36
Annual refined cumulative collision rate				
LCL	443	440	438	438
Mean	**479**	**469**	**463**	**463**
UCL	516	498	489	489
Increase in baseline mortality (%)				
LCL	6.92	6.88	6.85	6.85
Mean	**7.49**	**7.33**	**7.24**	**7.24**
UCL	8.07	7.78	7.64	7.64

7. Collision risk estimates – mitigation 40 m lower rotor tip height

Gannet

EIA scale

Project alone

Table 7.1: Collision risk estimates for gannet calculated using a 40 m lower rotor tip height and different parameter scenarios compared against baseline mortality of the largest BDMPS population

Collision risk estimates	Parameter scenario				
	Natural England	1	2	3	6 (Applicant)
Annual collision rate					
LCL	14	13	6	6	5
Mean	**24**	**22**	**10**	**9**	**8**
UCL	34	31	14	13	11
Increase in baseline mortality (%)					
LCL	0.04	0.04	0.02	0.02	0.01
Mean	**0.06**	**0.06**	**0.03**	**0.03**	**0.02**
UCL	0.09	0.08	0.04	0.04	0.03

Cumulative

Table 7.2: Cumulative collision risk estimates for gannet using the Basic model for all projects compared against baseline mortality of the largest BDMPS population

Collision risk estimates	**Parameter scenarios**				
	Natural England	1	2	3	6 (Applicant)
Model Option used for Hornsea Three collision risk estimates	2	2	2	1	1
Model Option used for other projects	Basic	Basic	Basic	Basic	Basic
Cumulative impact from other projects (APP-065 and REP1-005)	1184	1184	1184	1184	1184
Mean Hornsea Three collision risk estimate (Table 7.1)	24	22	10	9	8
Annual cumulative collision rate					
LCL	1198	1197	1190	1190	1189
Mean	**1208**	**1206**	**1194**	**1193**	**1192**
UCL	1218	1215	1198	1197	1195
Increase in baseline mortality (%)					
LCL	3.24	3.24	3.22	3.22	3.22
Mean	**3.27**	**3.26**	**3.23**	**3.23**	**3.23**
UCL	3.30	3.29	3.24	3.24	3.23

Table 7.3: Cumulative collision risk estimates for gannet using collision risk estimates calculated using the Extended model, where available compared against baseline mortality of the largest BDMPS population

Collision risk estimates	Parameter scenarios				
	Natural England	1	2	3	6 (Applicant)
Model Option used for Hornsea Three collision risk estimates	3	2	2	3	3
Model Option used for other projects	Extended, where available	Extended, where available	Extended, where available	Extended, where available	Extended, where available
Cumulative impact from other projects (APP-065 and REP1-005)	1238	1238	1238	1238	1238
Mean Hornsea Three collision risk estimate	24	22	10	10	8
Annual cumulative collision rate					
LCL	1252	1251	1244	1244	1243
Mean	**1262**	**1260**	**1248**	**1248**	**1246**
UCL	1272	1269	1252	1251	1249
Increase in baseline mortality (%)					
LCL	3.39	3.38	3.37	3.37	3.36
Mean	**3.41**	**3.41**	**3.38**	**3.38**	**3.37**
UCL	3.44	3.43	3.39	3.38	3.38

Table 7.4: Refined cumulative collision risk estimates for gannet using the Basic model for all projects compared against baseline mortality of the largest BDMPS population

Collision risk estimates	Parameter scenarios				
	Natural England	1	2	3	6 (Applicant)
Model Option used for Hornsea Three collision risk estimates	2	2	2	1	1
Model Option used for other projects	Basic	Basic	Basic	Basic	Basic
Refined cumulative impact from other projects	844	844	844	844	844
Mean Hornsea Three collision risk estimate (Table 7.1)	24	22	10	9	8
Annual refined cumulative collision rate					
LCL	858	857	850	850	849
Mean	**868**	**866**	**854**	**853**	**852**
UCL	878	875	858	857	855
Increase in baseline mortality (%)					
LCL	2.32	2.32	2.30	2.30	2.30
Mean	**2.35**	**2.34**	**2.31**	**2.31**	**2.31**
UCL	2.38	2.37	2.32	2.32	2.31

Table 7.5: Refined cumulative collision risk estimates for gannet using collision risk estimates calculated using the Extended model, where available compared against baseline mortality of the largest BDMPS population

Collision risk estimates	Parameter scenarios				
	Natural England	1	2	3	6 (Applicant)
Model Option used for Hornsea Three collision risk estimates	2	2	2	3	3
Model Option used for other projects	Extended, where available	Extended, where available	Extended, where available	Extended, where available	Extended, where available
Refined cumulative impact from other projects	837	837	837	837	837
Mean Hornsea Three collision risk estimate	24	22	10	10	8
Annual refined cumulative collision rate					
LCL	851	850	843	843	842
Mean	**861**	**859**	**847**	**847**	**845**
UCL	871	868	851	850	848
Increase in baseline mortality (%)					
LCL	2.30	2.30	2.28	2.28	2.28
Mean	**2.33**	**2.32**	**2.29**	**2.29**	**2.29**
UCL	2.36	2.35	2.30	2.30	2.29

RIAA scale

Project alone

Table 7.6: Collision risk estimates for gannet calculated using a 40 m lower rotor tip height and different parameter scenarios compared against baseline mortality and PVA metrics for the FFC SPA population

Collision risk estimates	**Parameter scenario**						
	Natural England	1	2	3	4	5	Applicant
Annual collision rate							
LCL	5	5	2	2	1	1	1
Mean	**9**	**8**	**4**	**3**	**2**	**2**	**2**
UCL	12	12	5	5	3	3	2
Increase in baseline mortality (%)							
LCL	0.36	0.34	0.15	0.14	0.10	0.08	0.07
Mean	**0.63**	**0.59**	**0.27**	**0.25**	**0.17**	**0.14**	**0.12**
UCL	0.90	0.84	0.38	0.36	0.24	0.19	0.17
PVA (Counterfactual of final population size (35 years))							
LCL	0.996	0.996	0.998	0.998	0.999	0.999	0.999
Mean	**0.993**	**0.994**	**0.997**	**0.998**	**0.998**	**0.998**	**0.998**
UCL	0.991	0.991	0.996	0.996	0.998	0.998	0.998
PVA (Counterfactual of growth rate)							
LCL	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Mean	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**
UCL	1.000	1.000	1.000	1.000	1.000	1.000	1.000

In-combination impact

Table 7.7: In-combination collision risk estimates for gannet at FFC SPA using the Basic model for all projects compared against baseline mortality and PVA metrics for the FFC SPA population

Collision risk estimates	**Parameter scenarios**						
	Natural England	1	2	3	4	5	Applicant
Model Option used for Hornsea Three collision risk estimates	2	2	2	1	1	1	1
Model Option used for other projects	Basic	Basic	Basic	Basic	Basic	Basic	Basic
In-combination impact from other projects (APP-065 and REP1-005)	160	160	160	160	160	160	160
Mean Hornsea Three collision risk estimate (Table 7.6)	9	8	4	3	2	2	2
Annual in-combination collision rate							
LCL	165	165	162	162	161	161	161
Mean	**169**	**168**	**164**	**163**	**162**	**162**	**162**
UCL	172	172	165	165	163	163	162
Increase in baseline mortality (%)							
LCL	12.03	12.03	11.81	11.81	11.73	11.73	11.73
Mean	**12.32**	**12.25**	**11.95**	**11.88**	**11.81**	**11.81**	**11.81**
UCL	12.54	12.54	12.03	12.03	11.88	11.88	11.81
PVA (Counterfactual of final population size (35 years))							
LCL	0.775	0.775	0.779	0.779	0.780	0.780	0.780
Mean	**0.770**	**0.771**	**0.776**	**0.777**	**0.779**	**0.779**	**0.779**
UCL	0.767	0.767	0.775	0.775	0.777	0.777	0.779
PVA (Counterfactual of growth rate)							
LCL	0.992	0.992	0.993	0.993	0.993	0.993	0.993
Mean	**0.992**	**0.992**	**0.992**	**0.992**	**0.993**	**0.993**	**0.993**
UCL	0.992	0.992	0.992	0.992	0.992	0.992	0.993

Table 7.8: In-combination collision risk estimates for gannet at FFC SPA using collision risk estimates calculated using the Extended model, where available compared against baseline mortality and PVA metrics for the FFC SPA population

Collision risk estimates	Parameter scenarios						
	Natural England	1	2	3	4	5	Applicant
Model Option used for Hornsea Three collision risk estimates	2	2	2	3	3	3	3
Model Option used for other projects	Extended, where available	Extended, where available	Extended, where available	Extended, where available	Extended, where available	Extended, where available	Extended, where available
In-combination impact from other projects (APP-065 and REP1-005)	195	195	195	195	195	195	195
Mean Hornsea Three collision risk estimate	9	8	4	3	2	2	2
Annual in-combination collision rate							
LCL	200	200	197	197	196	196	196
Mean	**204**	**203**	**199**	**198**	**197**	**197**	**197**
UCL	207	207	200	200	198	198	197
Increase in baseline mortality (%)							
LCL	14.58	14.58	14.36	14.36	14.29	14.29	14.29
Mean	**14.87**	**14.80**	**14.50**	**14.43**	**14.36**	**14.36**	**14.36**
UCL	15.09	15.09	14.58	14.58	14.43	14.43	14.36
PVA (Counterfactual of final population size (35 years))							
LCL	0.734	0.734	0.737	0.737	0.739	0.739	0.739
Mean	**0.730**	**0.731**	**0.735**	**0.736**	**0.737**	**0.737**	**0.737**
UCL	0.726	0.726	0.734	0.734	0.736	0.736	0.737
PVA (Counterfactual of growth rate)							
LCL	0.991	0.991	0.991	0.991	0.991	0.991	0.991
Mean	**0.991**	**0.991**	**0.991**	**0.991**	**0.991**	**0.991**	**0.991**
UCL	0.991	0.991	0.991	0.991	0.991	0.991	0.991

Table 7.9: Refined in-combination collision risk estimates for gannet at FFC SPA using the Basic model for all projects compared against baseline mortality and PVA metrics for the FFC SPA population

Collision risk estimates	Parameter scenarios						
	Natural England	1	2	3	4	5	Applicant
Model Option used for Hornsea Three collision risk estimates	2	2	2	1	1	1	1
Model Option used for other projects	Basic	Basic	Basic	Basic	Basic	Basic	Basic
Refined in-combination impact from other projects (REP4-049)	106	106	106	106	106	106	106
Mean Hornsea Three collision risk estimate (Table 7.6)	9	8	4	3	2	2	2
Annual refined in-combination collision rate							
LCL	111	111	108	108	107	107	107
Mean	**115**	**114**	**110**	**109**	**108**	**108**	**108**
UCL	118	118	111	111	109	109	108
Increase in baseline mortality (%)							
LCL	8.09	8.09	7.87	7.87	7.80	7.80	7.80
Mean	**8.38**	**8.31**	**8.02**	**7.94**	**7.87**	**7.87**	**7.87**
UCL	8.60	8.60	8.09	8.09	7.94	7.94	7.87
PVA (Counterfactual of final population size (35 years))							
LCL	0.843	0.843	0.847	0.847	0.848	0.848	0.848
Mean	**0.838**	**0.839**	**0.844**	**0.845**	**0.847**	**0.847**	**0.847**
UCL	0.834	0.834	0.843	0.843	0.845	0.845	0.847
PVA (Counterfactual of growth rate)							
LCL	0.995	0.995	0.995	0.995	0.995	0.995	0.995
Mean	**0.994**	**0.994**	**0.995**	**0.995**	**0.995**	**0.995**	**0.995**
UCL	0.994	0.994	0.995	0.995	0.995	0.995	0.995

Table 7.10: Refined in-combination collision risk estimates for gannet at FFC SPA using collision risk estimates calculated using the Extended model, where available compared against baseline mortality and PVA metrics for the FFC SPA population

Collision risk estimates	Parameter scenarios						
	Natural England	1	2	3	4	5	Applicant
Model Option used for Hornsea Three collision risk estimates	2	2	2	3	3	3	3
Model Option used for other projects	Extended, where available	Extended, where available	Extended, where available	Extended, where available	Extended, where available	Extended, where available	Extended, where available
Refined in-combination impact from other projects (REP4-049)	125	125	125	125	125	125	125
Mean Hornsea Three collision risk estimate	9	8	4	3	2	2	2
Annual refined in-combination collision rate							
LCL	130	130	127	127	126	126	126
Mean	**134**	**133**	**129**	**128**	**127**	**127**	**127**
UCL	137	137	130	130	128	128	127
Increase in baseline mortality (%)							
LCL	9.48	9.48	9.26	9.26	9.18	9.18	9.18
Mean	**9.77**	**9.69**	**9.40**	**9.33**	**9.26**	**9.26**	**9.26**
UCL	9.99	9.99	9.48	9.48	9.33	9.33	9.26
PVA (Counterfactual of final population size (35 years))							
LCL	0.819	0.819	0.822	0.822	0.824	0.824	0.824
Mean	**0.813**	**0.815**	**0.820**	**0.821**	**0.822**	**0.822**	**0.822**
UCL	0.810	0.810	0.819	0.819	0.821	0.821	0.822
PVA (Counterfactual of growth rate)							
LCL	0.994	0.994	0.994	0.994	0.994	0.994	0.994
Mean	**0.994**	**0.994**	**0.994**	**0.994**	**0.994**	**0.994**	**0.994**
UCL	0.994	0.994	0.994	0.994	0.994	0.994	0.994

Kittiwake

EIA scale

Project alone

Table 7.11: Collision risk estimates for kittiwake calculated using a 40 m lower rotor tip height and different parameter scenarios compared against baseline mortality of the largest BDMPS population

Collision risk estimates	Parameter scenario				
	Natural England	1	2	3	6 (Applicant)
Annual collision rate					
LCL	95	70	63	17	14
Mean	**154**	**113**	**102**	**28**	**23**
UCL	220	161	147	40	32
Increase in baseline mortality (%)					
LCL	0.08	0.06	0.05	0.01	0.01
Mean	**0.13**	**0.09**	**0.08**	**0.02**	**0.02**
UCL	0.18	0.13	0.12	0.03	0.03

Cumulative

Table 7.12: Cumulative collision risk estimates for kittiwake using the Basic model for all projects compared against baseline mortality of the largest BDMPS population

Collision risk estimates	**Parameter scenario**				
	Natural England	1	2	3	6 (Applicant)
Model Option used for Hornsea Three collision risk estimates	2	2	2	1	1
Model Option used for other projects	Basic	Basic	Basic	Basic	Basic
Cumulative impact from other projects (APP-065 and REP1-005)	2988	2988	2988	2988	2988
Mean Hornsea Three collision risk estimate (Table 7.11)	154	113	102	28	23
Annual cumulative collision rate					
LCL	3083	3058	3051	3005	3002
Mean	**3142**	**3101**	**3090**	**3016**	**3011**
UCL	3208	3149	3135	3028	3020
Increase in baseline mortality (%)					
LCL	2.54	2.52	2.52	2.48	2.48
Mean	**2.59**	**2.56**	**2.55**	**2.49**	**2.48**
UCL	2.65	2.60	2.59	2.50	2.49

Table 7.13: Cumulative collision risk estimates for kittiwake using collision risk estimates calculated using the Extended model, where available compared against baseline mortality of the largest BDMPS population

Collision risk estimates	Parameter scenario				
	Natural England	1	2	3	6 (Applicant)
Model Option used for Hornsea Three collision risk estimates	2	2	2	3	3
Model Option used for other projects	Extended model, where available	Extended model, where available	Extended model, where available	Extended model, where available	Extended model, where available
Cumulative impact from other projects (APP-065 and REP1-005)	1312	1312	1312	1312	1312
Mean Hornsea Three collision risk estimate	154	113	102	53	42
Annual cumulative collision rate					
LCL	1407	1382	1375	1345	1338
Mean	**1466**	**1425**	**1414**	**1365**	**1354**
UCL	1532	1473	1459	1388	1373
Increase in baseline mortality (%)					
LCL	1.16	1.14	1.13	1.11	1.10
Mean	**1.21**	**1.18**	**1.17**	**1.13**	**1.12**
UCL	1.26	1.22	1.20	1.15	1.13

Table 7.14: Refined cumulative collision risk estimates for kittiwake using the Basic model for all projects compared against baseline mortality of the largest BDMPS population

Collision risk estimates	Parameter scenario				
	Natural England	1	2	3	6 (Applicant)
Model Option used for Hornsea Three collision risk estimates	2	2	2	1	1
Model Option used for other projects	Basic	Basic	Basic	Basic	Basic
Refined cumulative impact from other projects	2058	2058	2058	2058	2058
Mean Hornsea Three collision risk estimate (Table 7.11)	154	113	102	28	23
Annual refined cumulative collision rate					
LCL	2153	2128	2121	2075	2072
Mean	**2212**	**2171**	**2160**	**2086**	**2081**
UCL	2278	2219	2205	2098	2090
Increase in baseline mortality (%)					
LCL	1.78	1.76	1.75	1.71	1.71
Mean	**1.83**	**1.79**	**1.78**	**1.72**	**1.72**
UCL	1.88	1.83	1.82	1.73	1.72

Table 7.15: Refined cumulative collision risk estimates for kittiwake using the Basic model for all projects compared against baseline mortality of the largest BDMPS population

Collision risk estimates	Parameter scenario				
	Natural England	1	2	3	6 (Applicant)
Model Option used for Hornsea Three collision risk estimates	2	2	2	3	3
Model Option used for other projects	Extended model, where available	Extended model, where available	Extended model, where available	Extended model, where available	Extended model, where available
Refined cumulative impact from other projects	722	722	722	722	722
Mean Hornsea Three collision risk estimate	154	113	102	53	42
Annual refined cumulative collision rate					
LCL	817	792	785	755	748
Mean	**876**	**835**	**824**	**775**	**764**
UCL	942	883	869	798	783
Increase in baseline mortality (%)					
LCL	0.67	0.65	0.65	0.62	0.62
Mean	**0.72**	**0.69**	**0.68**	**0.64**	**0.63**
UCL	0.78	0.73	0.72	0.66	0.65

RIAA scale

Project alone

Table 7.16: Collision risk estimates for kittiwake calculated using a 40 m lower rotor tip height and different parameter scenarios compared against baseline mortality and PVA metrics for the FFC SPA population

Collision risk estimates	Parameter scenario						
	Natural England	1	2	3	4	5	Applicant
Annual collision rate							
LCL	58	43	39	11	5	4	3
Mean	**94**	**69**	**62**	**17**	**8**	**6**	**5**
UCL	133	98	89	24	11	9	7
Increase in baseline mortality (%)							
LCL	0.45	0.33	0.30	0.08	0.04	0.03	0.03
Mean	**0.72**	**0.53**	**0.48**	**0.13**	**0.06**	**0.05**	**0.04**
UCL	1.02	0.75	0.68	0.19	0.09	0.07	0.06
PVA (Counterfactual of final population size (35 years))							
LCL	0.978	0.984	0.985	0.996	0.998	0.998	0.999
Mean	**0.964**	**0.974**	**0.976**	**0.994**	**0.997**	**0.998**	**0.998**
UCL	0.950	0.963	0.966	0.991	0.996	0.997	0.997
PVA (Counterfactual of growth rate)							
LCL	0.999	0.999	0.999	1.000	1.000	1.000	1.000
Mean	**0.999**	**0.999**	**0.999**	**1.000**	**1.000**	**1.000**	**1.000**
UCL	0.998	0.999	0.999	1.000	1.000	1.000	1.000

In-combination impact

Table 7.17: In-combination collision risk estimates for kittiwake at FFC SPA using the Basic model for all projects compared against baseline mortality and PVA metrics for the FFC SPA population

Collision risk estimates	**Parameter scenario**						
	Natural England	1	2	3	4	5	Applicant
Model Option used for Hornsea Three collision risk estimates	2	2	2	1	1	1	1
Model Option used for other projects	Basic	Basic	Basic	Basic	Basic	Basic	Basic
In-combination impact from other projects (APP-065 and REP1-005)	250	250	250	250	250	250	250
Mean Hornsea Three collision risk estimate (Table 7.16)	94	69	62	17	8	6	5
Annual in-combination collision rate							
LCL	308	293	289	261	255	254	253
Mean	**344**	**319**	**312**	**267**	**258**	**256**	**255**
UCL	383	348	339	274	261	259	257
Increase in baseline mortality (%)							
LCL	2.37	2.25	2.22	2.01	1.96	1.95	1.95
Mean	**2.65**	**2.45**	**2.40**	**2.05**	**1.98**	**1.97**	**1.96**
UCL	2.95	2.68	2.61	2.11	2.01	1.99	1.98
PVA (Counterfactual of final population size (35 years))							
LCL	0.889	0.894	0.896	0.905	0.907	0.908	0.908
Mean	**0.877**	**0.886**	**0.888**	**0.903**	**0.906**	**0.907**	**0.907**
UCL	0.864	0.876	0.879	0.901	0.905	0.906	0.907
PVA (Counterfactual of growth rate)							
LCL	0.997	0.997	0.997	0.997	0.997	0.997	0.997
Mean	**0.996**	**0.997**	**0.997**	**0.997**	**0.997**	**0.997**	**0.997**
UCL	0.996	0.996	0.996	0.997	0.997	0.997	0.997

Table 7.18: In-combination collision risk estimates for kittiwake at FFC SPA using collision risk estimates calculated using the Extended model, where available compared against baseline mortality and PVA metrics for the FFC SPA population

Collision risk estimates	Parameter scenario						
	Natural England	1	2	3	4	5	Applicant
Model Option used for Hornsea Three collision risk estimates	2	2	2	3	3	3	3
Model Option used for other projects	Extended, where available	Extended, where available	Extended, where available	Extended, where available	Extended, where available	Extended, where available	Extended, where available
In-combination impact from other projects (APP-065 and REP1-005)	107	107	107	107	107	107	107
Mean Hornsea Three collision risk estimate	94	69	62	32	15	12	10
Annual in-combination collision rate							
LCL	165	150	146	127	116	114	113
Mean	**201**	**176**	**169**	**139**	**122**	**119**	**117**
UCL	240	205	196	153	128	123	121
Increase in baseline mortality (%)							
LCL	1.27	1.15	1.12	0.98	0.89	0.88	0.87
Mean	**1.55**	**1.35**	**1.30**	**1.07**	**0.94**	**0.92**	**0.90**
UCL	1.85	1.58	1.51	1.18	0.98	0.95	0.93
PVA (Counterfactual of final population size (35 years))							
LCL	0.939	0.944	0.945	0.952	0.956	0.957	0.957
Mean	**0.926**	**0.935**	**0.937**	**0.948**	**0.954**	**0.955**	**0.956**
UCL	0.912	0.924	0.927	0.943	0.952	0.954	0.954
PVA (Counterfactual of growth rate)							
LCL	0.998	0.998	0.998	0.998	0.999	0.999	0.999
Mean	**0.998**	**0.998**	**0.998**	**0.998**	**0.999**	**0.999**	**0.999**
UCL	0.997	0.998	0.998	0.998	0.998	0.999	0.999

Table 7.19: Refined in-combination collision risk estimates for kittiwake at FFC SPA using the Basic model for all projects compared against baseline mortality and PVA metrics for the FFC SPA population

Collision risk estimates	Parameter scenario						
	Natural England	1	2	3	4	5	Applicant
Model Option used for Hornsea Three collision risk estimates	2	2	2	1	1	1	1
Model Option used for other projects	Basic	Basic	Basic	Basic	Basic	Basic	Basic
Refined in-combination impact from other projects	170	170	170	170	170	170	170
Mean Hornsea Three collision risk estimate (Table 7.16)	94	69	62	17	8	6	5
Annual refined in-combination collision rate							
LCL	228	213	209	181	175	174	173
Mean	**264**	**239**	**232**	**187**	**178**	**176**	**175**
UCL	303	268	259	194	181	179	177
Increase in baseline mortality (%)							
LCL	1.75	1.64	1.61	1.39	1.35	1.34	1.33
Mean	**2.03**	**1.84**	**1.78**	**1.44**	**1.37**	**1.35**	**1.35**
UCL	2.33	2.06	1.99	1.49	1.39	1.38	1.36
PVA (Counterfactual of final population size (35 years))							
LCL	0.916	0.922	0.923	0.933	0.935	0.935	0.936
Mean	**0.904**	**0.913**	**0.915**	**0.931**	**0.934**	**0.935**	**0.935**
UCL	0.891	0.903	0.906	0.928	0.933	0.934	0.934
PVA (Counterfactual of growth rate)							
LCL	0.997	0.998	0.998	0.998	0.998	0.998	0.998
Mean	**0.997**	**0.997**	**0.997**	**0.998**	**0.998**	**0.998**	**0.998**
UCL	0.997	0.997	0.997	0.998	0.998	0.998	0.998

Table 7.20: Refined in-combination collision risk estimates for kittiwake at FFC SPA using collision risk estimates calculated using the Extended model, where available compared against baseline mortality and PVA metrics for the FFC SPA population

Collision risk estimates	Parameter scenario						
	Natural England	1	2	3	4	5	Applicant
Model Option used for Hornsea Three collision risk estimates	2	2	2	3	3	3	3
Model Option used for other projects	Extended, where available	Extended, where available	Extended, where available	Extended, where available	Extended, where available	Extended, where available	Extended, where available
Refined in-combination impact from other projects	58	58	58	58	58	58	58
Mean Hornsea Three collision risk estimate (Table 7.16)	94	69	62	32	15	12	10
Annual refined in-combination collision rate							
LCL	116	101	97	78	67	65	64
Mean	**152**	**127**	**120**	**90**	**73**	**70**	**68**
UCL	191	156	147	104	79	74	72
Increase in baseline mortality (%)							
LCL	0.89	0.78	0.75	0.60	0.52	0.50	0.49
Mean	**1.17**	**0.98**	**0.92**	**0.69**	**0.56**	**0.54**	**0.52**
UCL	1.47	1.20	1.13	0.80	0.61	0.57	0.55
PVA (Counterfactual of final population size (35 years))							
LCL	0.956	0.962	0.963	0.970	0.975	0.975	0.976
Mean	**0.943**	**0.952**	**0.955**	**0.966**	**0.972**	**0.973**	**0.974**
UCL	0.929	0.942	0.945	0.961	0.970	0.972	0.973
PVA (Counterfactual of growth rate)							
LCL	0.999	0.999	0.999	0.999	0.999	0.999	0.999
Mean	**0.998**	**0.998**	**0.999**	**0.999**	**0.999**	**0.999**	**0.999**
UCL	0.998	0.998	0.998	0.999	0.999	0.999	0.999

Lesser black-backed gull

EIA scale

Project alone

Table 7.21: Collision risk estimates for lesser black-backed gull calculated using a 40 m lower rotor tip height and different parameter scenarios compared against baseline mortality of the largest BDMPS population

Collision risk estimates	Parameter scenario			
	Natural England	1	3	Applicant
Annual collision rate				
LCL	3	3	3	3
Mean	**11**	**9**	**12**	**12**
UCL	19	16	20	20
Increase in baseline mortality (%)				
LCL	0.01	0.01	0.01	0.01
Mean	**0.05**	**0.04**	**0.05**	**0.05**
UCL	0.08	0.06	0.08	0.08

Cumulative

Table 7.22: Cumulative collision risk estimates for lesser black-backed gull using the Basic model for all projects compared against baseline mortality of the largest BDMPS population

Collision risk estimates	**Parameter scenarios**			
	Natural England	1	3	Applicant
Model Option used for Hornsea Three collision risk estimates	2	2	1	1
Model Option used for other projects	Basic	Basic	Basic	Basic
Cumulative impact from other projects (APP-065 and REP1-005)	494	494	494	494
Mean Hornsea Three collision risk estimate (Table 7.21)	11	9	12	12
Annual cumulative collision rate				
LCL	497	497	497	497
Mean	**505**	**503**	**506**	**506**
UCL	513	510	514	514
Increase in baseline mortality (%)				
LCL	2.07	2.07	2.07	2.07
Mean	**2.10**	**2.09**	**2.11**	**2.11**
UCL	2.13	2.12	2.14	2.14

Table 7.23: Cumulative collision risk estimates for lesser black-backed gull using collision risk estimates calculated using the Extended model, where available compared against baseline mortality of the largest BDMPS population

Collision risk estimates	**Parameter scenarios**			
	Natural England	1	3	Applicant
Model Option used for Hornsea Three collision risk estimates	2	2	3	3
Model Option used for other projects	Extended, where available	Extended, where available	Extended, where available	Extended, where available
Cumulative impact from other projects (APP-065 and REP1-005)	454	454	454	454
Mean Hornsea Three collision risk estimate	11	9	7	7
Annual cumulative collision rate				
LCL	457	457	456	456
Mean	**465**	**463**	**461**	**461**
UCL	473	470	465	465
Increase in baseline mortality (%)				
LCL	1.90	1.90	1.90	1.90
Mean	**1.93**	**1.93**	**1.92**	**1.92**
UCL	1.97	1.96	1.93	1.93

Table 7.24: Refined cumulative collision risk estimates for lesser black-backed gull using the Basic model for all projects compared against baseline mortality of the largest BDMPS population

Collision risk estimates	Parameter scenarios			
	Natural England	1	3	Applicant
Model Option used for Hornsea Three collision risk estimates	2	2	1	1
Model Option used for other projects	Basic	Basic	Basic	Basic
Refined cumulative impact from other projects	376	376	376	376
Mean Hornsea Three collision risk estimate (Table 7.21)	11	9	12	12
Annual refined cumulative collision rate				
LCL	379	379	379	379
Mean	**387**	**385**	**388**	**388**
UCL	395	392	396	396
Increase in baseline mortality (%)				
LCL	1.58	1.58	1.58	1.58
Mean	**1.62**	**1.61**	**1.61**	**1.61**
UCL	1.66	1.64	1.65	1.65

Table 7.25: Refined cumulative collision risk estimates for lesser black-backed gull using collision risk estimates calculated using the Extended model, where available compared against baseline mortality of the largest BDMPS population

Collision risk estimates	Parameter scenarios			
	Natural England	1	3	Applicant
Model Option used for Hornsea Three collision risk estimates	2	2	3	3
Model Option used for other projects	Extended, where available	Extended, where available	Extended, where available	Extended, where available
Refined cumulative impact from other projects	312	312	312	312
Mean Hornsea Three collision risk estimate	11	9	7	7
Annual refined cumulative collision rate				
LCL	315	315	314	314
Mean	**323**	**321**	**319**	**319**
UCL	331	328	323	323
Increase in baseline mortality (%)				
LCL	1.31	1.31	1.31	1.31
Mean	**1.35**	**1.34**	**1.33**	**1.33**
UCL	1.39	1.37	1.35	1.35

Herring gull

EIA scale

Project alone

Table 7.26: Collision risk estimates for herring gull calculated using a 40 m lower rotor tip height and different parameter scenarios compared against baseline mortality of the largest BDMPS population

Collision risk estimates	Parameter scenario			
	Natural England	1	3	Applicant
Annual collision rate				
LCL	1	1	1	1
Mean	**6**	**5**	**5**	**5**
UCL	13	11	11	11
Increase in baseline mortality (%)				
LCL	<0.01	<0.01	<0.01	<0.01
Mean	**0.01**	**0.01**	**0.01**	**0.01**
UCL	0.02	0.01	0.01	0.01

Great black-backed gull

EIA scale

Project alone

Table 7.27: Collision risk estimates for great black-backed gull calculated using a 40 m lower rotor tip height and different parameter scenarios compared against baseline mortality of the largest BDMPS population

Collision risk estimates	Parameter scenario			
	Natural England	1	3	Applicant
Annual collision rate				
LCL	14	11	6	6
Mean	**45**	**36**	**20**	**20**
UCL	77	62	34	34
Increase in baseline mortality (%)				
LCL	0.22	0.17	0.09	0.09
Mean	**0.70**	**0.57**	**0.31**	**0.31**
UCL	1.21	0.97	0.53	0.53

Cumulative

Table 7.28: Cumulative collision risk estimates for great black-backed gull using the Basic model for all projects compared against baseline mortality of the largest BDMPS population

Collision risk estimates	**Parameter scenarios**			
	Natural England	1	3	Applicant
Model Option used for Hornsea Three collision risk estimates	2	2	1	1
Model Option used for other projects	Basic	Basic	Basic	Basic
Cumulative impact from other projects (APP-065 and REP1-005)	766	766	766	766
Mean Hornsea Three collision risk estimate (Table 7.27)	45	36	20	20
Annual cumulative collision rate				
LCL	780	777	772	772
Mean	**811**	**802**	**786**	**786**
UCL	843	828	800	800
Increase in baseline mortality (%)				
LCL	12.19	12.14	12.07	12.07
Mean	**12.68**	**12.54**	**12.29**	**12.29**
UCL	13.18	12.94	12.50	12.50

Table 7.29: Cumulative collision risk estimates for great black-backed gull using collision risk estimates calculated using the Extended model, where available compared against baseline mortality of the largest BDMPS population

Collision risk estimates	Parameter scenarios			
	Natural England	1	3	Applicant
Model Option used for Hornsea Three collision risk estimates	2	2	3	3
Model Option used for other projects	Extended, where available	Extended, where available	Extended, where available	Extended, where available
Cumulative impact from other projects (APP-065 and REP1-005)	669	669	669	669
Mean Hornsea Three collision risk estimate	45	36	31	31
Annual cumulative collision rate				
LCL	683	680	679	679
Mean	**714**	**705**	**700**	**700**
UCL	746	731	723	723
Increase in baseline mortality (%)				
LCL	10.68	10.63	10.61	10.61
Mean	**11.16**	**11.02**	**10.94**	**10.94**
UCL	11.66	11.43	11.30	11.30

Table 7.30: Refined cumulative collision risk estimates for great black-backed gull using the Basic model for all projects compared against baseline mortality of the largest BDMPS population

Collision risk estimates	Parameter scenarios			
	Natural England	1	3	Applicant
Model Option used for Hornsea Three collision risk estimates	2	2	1	1
Model Option used for other projects	Basic	Basic	Basic	Basic
Refined cumulative impact from other projects	590	590	590	590
Mean Hornsea Three collision risk estimate (Table 7.27)	45	36	20	20
Annual refined cumulative collision rate				
LCL	604	601	596	596
Mean	**635**	**626**	**610**	**610**
UCL	667	652	624	624
Increase in baseline mortality (%)				
LCL	9.44	9.39	9.32	9.32
Mean	**9.93**	**9.78**	**9.53**	**9.53**
UCL	10.43	10.19	9.75	9.75

Table 7.31: Refined cumulative collision risk estimates for great black-backed gull using collision risk estimates calculated using the Extended model, where available compared against baseline mortality of the largest BDMPS population

Collision risk estimates	Parameter scenarios			
	Natural England	1	3	Applicant
Model Option used for Hornsea Three collision risk estimates	2	2	3	3
Model Option used for other projects	Extended, where available	Extended, where available	Extended, where available	Extended, where available
Refined cumulative impact from other projects	427	427	427	427
Mean Hornsea Three collision risk estimate	45	36	31	31
Annual refined cumulative collision rate				
LCL	441	438	437	437
Mean	**472**	**463**	**458**	**458**
UCL	504	489	481	481
Increase in baseline mortality (%)				
LCL	6.89	6.85	6.83	6.83
Mean	**7.38**	**7.24**	**7.16**	**7.16**
UCL	7.88	7.64	7.52	7.52