# Sheringham Shoal and Dudgeon Offshore Wind Farm Extension Projects

## Annex 1C - Initial Review of Compensatory Measures for Gannet, Guillemot and Razorbill

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## Glossary of Acronyms

| | |
|---|---|
| DCO | Development Consent Order |
| DEP | Dudgeon Offshore Wind Farm Extension Project |
| ETG | Expert Topic Group |
| FFC | Flamborough and Filey Coast |
| HRA | Habitats Regulations Assessment |
| NNC | North Norfolk Coast |
| OWF | Offshore Wind Farm |
| PEIR | Preliminary Environmental Information Report |
| SEP | Sheringham Shoal Extension Project |
| SNCB | Statutory Nature Conservation Bodies |
| SPA | Special Protection Areas |
| UK | United Kingdom |

## Glossary of Terms

| | |
|---|---|
| The Applicant | Equinor New Energy Limited. |
| Dudgeon Offshore Wind Farm Extension site | The Dudgeon Offshore Wind Farm Extension offshore wind farm boundary. |
| The Dudgeon Offshore Wind Farm Extension Project (DEP) | The Dudgeon Offshore Wind Farm Extension site as well as all onshore and offshore infrastructure. |
| Sheringham Shoal Offshore Wind Farm Extension site | Sheringham Shoal Offshore Wind Farm Extension offshore wind farm boundary. |
| The Sheringham Shoal Offshore Wind Farm Extension Project (SEP) | The Sheringham Offshore Wind Farm Extension site as well as all onshore and offshore infrastructure. |

# 1 Introduction

1. Outline in principle compensatory measures for the Sheringham Shoal Offshore Wind Farm Extension Project (SEP) and Dudgeon Offshore Wind Farm Extension Project (DEP) have been consulted on with ornithology Expert Topic Group (ETG) members, on a without prejudice[1] basis. Work has principally focused on two species; North Norfolk Coast (NNC) Special Protection Area (SPA) breeding Sandwich tern *Thalasseus sandvicensis* and Flamborough and Filey Coast (FFC) SPA breeding kittiwake *Rissa tridactyla*. For these species, detailed consideration of all potential compensatory measures have been presented (see Royal HaskoningDHV, 2021a; MacArthur Green, 2021a).
2. Other offshore wind farm (OWF) projects in planning have recently put forward in principle compensatory measures for several other breeding seabird qualifying features of the FFC SPA: guillemot *Uria aalge*; razorbill *Alca torda;* and gannet *Morus bassanus*. The associated submissions all provide considerable detail. Whilst the project-alone contribution from SEP and DEP to the overall in-combination impact on these populations is very small (as detailed below), and do not occur in the same location as impacts from other OWFs, the in-combination impacts are at a level which is causing concern amongst Statutory Nature Conservation Bodies (SNCBs).
3. Therefore, as a precautionary approach and to ensure that SEP and DEP have followed the advice given in the Secretary of State's decision letter for Hornsea Project Three[2], in principle compensatory measures have been considered for guillemot, razorbill and gannet, in addition to Sandwich tern and kittiwake. However, the approach taken and as set out below is considered to be proportionate to the very unlikely scenario that adverse effect on integrity cannot be ruled out for these species.
4. The purpose of this document is as follows:
    1. To summarise the level of impacts predicted on each species for SEP and DEP alone and in-combination with other plans and projects. It should be noted that the impacts are based on the numbers presented in the Preliminary Environmental Information Report (PEIR), however these are in the process of being revised for the Environmental Statement submission;

[1] For the avoidance of doubt, at this stage in the assessment process, significant adverse impacts have not been identified. As such, any discussion and information provided are on a without prejudice basis. It should not be assumed that the provision of information regarding possible compensatory measures signifies agreement as to the existence of significant adverse impacts.
[2] The Secretary of State's decision letter for Hornsea Project Three set out, amongst other matters, the importance of applicants and SNCBs engaging constructively during the pre-application period, including on possible compensatory measures, for consideration during the examination.

2. Presentation of potential compensatory measures for each species. Detailed information describing all of the potential compensatory measures has already been provided by existing reviews and other OWF projects, as detailed below. Rather than repeat the extensive work recently carried out by those other projects, the findings of work already undertaken on the same subject are summarised; and
3. Make recommendations about the compensatory measures that could be adopted by SEP and DEP for these species, should they be required.

## 2 Sources of Information

5. The documents listed in **Table 2-1** are the key information sources to inform the compensatory measures available to SEP and DEP, for guillemot, razorbill and gannet.

*Table 2-1: Documents Produced during the Assessments for Other OWFs which Provide Detailed Consideration of In-Principle Compensatory Measures for Guillemot, Razorbill and Gannet*

| OWF Project | Document | Date | Species Considered |
|---|---|---|---|
| N/A | MacArthur Green (2021b) - HRA Derogation Scope B - Review of seabird strategic compensation options | April 2021 | Guillemot, razorbill, gannet |
| Norfolk Boreas | MacArthur Green (2021c) - Norfolk Boreas Offshore Wind Farm In Principle Habitats Regulations Derogation Provision of Evidence Appendix 1 Flamborough and Filey Coast SPA In Principle Compensation | June 2021 | Guillemot, razorbill |
| Norfolk Vanguard | MacArthur Green (2021d) - Norfolk Vanguard Offshore Wind Farm In Principle Habitats Regulations Derogation Provision of Evidence Appendix 1 Flamborough and Filey Coast SPA In Principle Compensation | July 2021 | Guillemot, razorbill |
| East Anglia ONE North | MacArthur Green and Royal HaskoningDHV (2021a) - East Anglia ONE North Offshore Windfarm Offshore Ornithology Without Prejudice Compensation Measures (Deadline 12) | June 2021 | Guillemot, razorbill, gannet |
| East Anglia TWO | MacArthur Green and Royal HaskoningDHV (2021b) - East Anglia TWO Offshore Windfarm Offshore Ornithology Without Prejudice Compensation Measures (Deadline 12) | June 2021 | Guillemot, razorbill, gannet |
| Hornsea Project Four | GoBe Consultants (2021a) - Hornsea Project Four: Derogation Information PINS Document Reference: B2.8 APFP Regulation: 5(2)(q) Volume B, Chapter 8: FFC SPA: Gannet, Guillemot and Razorbill Compensation Plan – along with supporting annexes 8.1 to 8.6 | Aug 2021 | Guillemot, razorbill, gannet |

# 3 Strategic Approaches to Compensation

6. As detailed in the species-specific sections below, fisheries management has the potential to generate very large benefits to the seabird populations which are dependent on the fished stocks. This is not a measure which developers of OWFs, either acting alone or with others, can offer since this is under government control. The feasibility of this measure therefore depends on the UK Government taking this on board as strategic compensation for the industry. The measure has a strong evidence base to indicate high confidence in being successful in providing compensation, but requires a strategic approach by UK Government. The Applicant strongly advocates a collaborative process between SNCBs, developers and non-governmental organisations (NGOs) to encourage the UK Government to take this approach forward on behalf of the industry and UK society. Therefore, while the Applicant would be fully supportive of the UK government in undertaking this measure as strategic compensation for the industry, this cannot be offered as compensation as a developer led measure.

7. Equinor will submit information with its Development Consent Order (DCO) application for SEP and DEP that sets out the detail of its suggested approach to any strategic compensatory measures.

# 4 Guillemot

8. The key impact from OWFs for this species is disturbance and displacement during the operational phase.

## 4.1 Predicted Impacts

### 4.1.1 Project Alone

9. In the SEP and DEP PEIR worst-case scenario, the annual total of breeding adult guillemots from the FFC SPA at risk of operational phase displacement from SEP and DEP combined was 382 (27+355 respectively). For reference, the number of birds at risk of impact annually, predicted for other OWFs currently in the planning system are as follows:

- Norfolk Boreas: 606 breeding adult FFC SPA birds at risk of displacement;
- Norfolk Vanguard: 210 breeding adult FFC SPA birds at risk of displacement;
- East Anglia ONE North: 83 breeding adult FFC SPA birds at risk of displacement;
- East Anglia TWO: 74 breeding adult FFC SPA birds at risk of displacement; and
- Hornsea Project Four: 7,010 breeding adult FFC SPA birds at are risk of displacement.

10. At displacement rates of 30% to 70% and mortality rates of 1% to 10% of displaced birds (UK SNCBs, 2017), the number of FFC SPA breeding adults predicted to die each year as a result of SEP and DEP would be one to 27. Using an evidence-based displacement rate of 50% and a mortality rate of 1% (MacArthur Green, 2019a, 2019b), the annual mortality rate (from SEP and DEP combined) would be two (1.91) birds per year. This would increase the baseline mortality of the FFC SPA breeding population by 0.03%, assuming a starting population of 121,754 individuals (Aitken *et al*., 2017) and an adult survival rate of 0.94 (Horswill and Robinson, 2015). No adverse effect on the integrity of this population due to the impacts of SEP and DEP are predicted as a result of this impact. To date, Natural England have not commented on this conclusion.

11. For reference, the evidence-based (i.e. 50% displacement and 1% mortality) annual mortality predicted for other OWFs currently in the planning system are as follows:

- Norfolk Boreas: three (3.03) breeding adult FFC SPA birds at risk of mortality due to displacement;
- Norfolk Vanguard: one (1.05) breeding adult FFC SPA birds at risk of mortality due to displacement;
- East Anglia ONE North: zero to one (0.42) breeding adult FFC SPA birds at risk of mortality due to displacement;
- East Anglia TWO: zero to one (0.37) breeding adult FFC SPA birds at risk of mortality due to displacement; and
- Hornsea Project Four: 35 (35.05) breeding adult FFC SPA birds at risk of mortality due to displacement.

12. These figures were all published in MacArthur Green and Royal HaskoningDHV (2020), except for Hornsea Project Four, which was published in GoBe Consultants (2021b).

### 4.1.2 In-combination

13. The latest total of breeding adult guillemots from the FFC SPA at risk of displacement due to in-combination OWF effects that has been reviewed by Natural England was presented in a deadline two document for the East Anglia ONE North DCO Examination (MacArthur Green and Royal HaskoningDHV, 2020). This stated that the total annual number of breeding FFC SPA guillemots displaced by OWFs was 43,342 birds, or 25,037 birds excluding Hornsea Project Four. Adding the totals from SEP and DEP to the existing values, plus the revised value of 7,010 birds for Hornsea Project Four (GoBe Consultants, 2021b) to the latter total gives an overall number of birds at risk of displacement of either 43,724 (previous Hornsea Project Four numbers) or 32,429 (revised Hornsea Project Four numbers).

14. At displacement rates of 30% to 70% and mortality rates of 1% to 10% of displaced birds, the number of FFC SPA breeding adults predicted to die each year would be 130 to 3,029 using the previous Hornsea Project Four numbers (increasing annual adult FFC SPA mortality by between 1.8% and 41.5%), or 97 to 2,270 using the revised Hornsea Project Four numbers (increasing annual adult FFC SPA mortality by between 1.3% and 31.0%) . Using an evidence-based displacement rate of 50% and a mortality rate of 1%, the annual mortality rate would be 219 birds per year using the previous Hornsea Project Four numbers (3.0% increase in FFC SPA adult mortality), or 162 birds per year using the revised Hornsea Project Four numbers (2.2% FFC SPA adult mortality increase).

15. SEP and DEP's mortality rate of two guillemots annually contribute 0.9% to 1.2% of predicted FFC SPA adult guillemot mortality due to in-combination operational phase displacement.

16. Based on recent advice published for East Anglia ONE North (Natural England, 2021), Natural England consider that an adverse effect on the integrity of the FFC SPA cannot be ruled out.

## 4.2 Potential Compensatory Measures

17. Potential compensatory measures for this species, most of which were originally presented in Furness (2013), but more recently in the documents listed in **Table 2-1**, are listed in **Table 4-1**.

*Table 4-1: Potential Compensatory Measures for FFC SPA Guillemot*

| Measure | Taken Forward? |
|---|---|
| Fisheries management: for example the purchase of sandeel fishing quota by an OWF developer (either within or outside OWFs), or the closure of defined areas currently allocated for fisheries, which may be in areas used by guillemot at various times of year | No. Not deliverable at the project level. There is no legal mechanism to deliver such measures; details of why this is the case are set out in the compensation documents of Norfolk Vanguard and Norfolk Boreas. Rather than being a project-level compensation option, it is considered that fisheries management compensatory measures would only be feasible if led by the UK Government. It is likely that the benefits of this measure would be much greater than any other measure listed here, both in terms of the number of colonies and the number of seabirds at/for which breeding and survival rates could be increased.<br><br>Should appropriate schemes be developed with a view to enabling fishery management to be undertaken as strategic compensation for OWF impacts, Equinor would be willing to participate in their delivery, providing that these were within acceptable timeframes for SEP and DEP. |
| Funding research into alternative food sources for the industries that sandeel and sprat are fished for | No. It is not considered that this has a sufficiently high chance of success to pursue. |
| Oil spill prevention | No. It is considered likely that this measure would benefit this species, but considerable efforts are already made to avoid oil spills. It is therefore not known what further steps could be taken. |
| Predator eradication from a breeding colony | Yes. There is a large body of evidence that demonstrates the effectiveness of this method for this species, which is reviewed |

| Measure | Taken Forward? |
|---|---|
| | in the documentation listed in **Table 2-1** (GoBe Consultants, 2021c; MacArthur Green, 2021c, 2021d). |
| Bycatch prevention | Yes. Guillemot is susceptible to gillnet bycatch (Žydelis *et al*., 2013, 2009), and an annual estimate of many thousands of guillemot fatalities across Europe due to longline bycatch has previously been made (ICES, 2008), though the exact level of impact is not certain. |

## 4.3 Compensatory Measures Taken Forward

18. There is detailed information on these compensatory measures presented in the documents identified below. There is nothing to be added to the information presented elsewhere, and it is not reproduced here. Due to the very small contribution of SEP and DEP to overall in-combination impacts, and the nature of the compensatory measures being considered for this species, it is considered that both measures would be suited to delivery through collaboration of a number of different OWF developers, including Equinor. It is currently anticipated that the commencement of the installation of turbines would occur no earlier than 2028, irrespective of whether SEP and DEP are constructed sequentially or concurrently. Therefore, whichever measure(s) is/are taken forward would need to be in place by the end of 2027 to be able to compensate for impacts due to SEP and DEP.

19. The location of information relevant to each compensatory measure is as follows:

### 4.3.1 Predator Eradication

- Section 5.2 of MacArthur Green (2021b);
- Section 5.4 of MacArthur Green (2021c) and MacArthur Green (2021d);
- Section 7.4.3.2.1 of MacArthur Green and Royal HaskoningDHV (2021a) and MacArthur Green and Royal HaskoningDHV (2021b); and
- Section 3 of GoBe Consultants (2021a), along with supporting ecological evidence in GoBe Consultants (2021c) and a roadmap in GoBe Consultants (2021d).

### 4.3.2 Bycatch Prevention

- Section 7 of MacArthur Green (2021c) and MacArthur Green (2021d);
- Section 11 of MacArthur Green and Royal HaskoningDHV (2021a) and MacArthur Green and Royal HaskoningDHV (2021b); and
- Section 4 of GoBe Consultants (2021a), along with supporting ecological evidence in GoBe Consultants (2021e) and a roadmap in GoBe Consultants (2021f).

# 5 Razorbill

20. The key impact from OWFs for this species is disturbance and displacement during the operational phase.

## 5.1 Predicted Impacts

### 5.1.1 Project Alone

21. In the SEP and DEP PEIR worst-case scenario, the annual total of breeding adult razorbills from the FFC SPA at risk of operational phase displacement from SEP and DEP combined was 196 (43+153 respectively). For reference, the number of birds annually at risk of impact predicted for other OWFs currently in the planning system are as follows:

- Norfolk Boreas: 49 breeding adult FFC SPA birds at risk of displacement;
- Norfolk Vanguard: 84 breeding adult FFC SPA birds at risk of displacement;
- East Anglia ONE North: 11 breeding adult FFC SPA birds at risk of displacement;
- East Anglia TWO: 13 breeding adult FFC SPA birds at risk of displacement; and
- Hornsea Project Four: 301 breeding adult FFC SPA birds at are risk of displacement.

22. At displacement rates of 30% to 70% and mortality rates of 1% to 10% of displaced birds (UK SNCBs, 2017), the number of FFC SPA breeding adults predicted to die each year would be one to 14. Using an evidence-based displacement rate of 50% and a mortality rate of 1% (MacArthur Green, 2019a, 2019b), the annual mortality rate would be one (0.98) bird per year. This would increase the baseline mortality of the FFC SPA breeding population by 0.02%, assuming a starting population of 40,506 individuals (Aitken *et al*., 2017) and an adult survival rate of 0.895 (Horswill and Robinson, 2015). No adverse effect on the integrity of this population due to the impacts of SEP and DEP are predicted as a result of this impact. To date, Natural England have not commented on this conclusion.

23. For reference, the evidence-based (i.e. 50% displacement and 1% mortality) annual mortality predicted for other OWFs currently in the planning system are as follows:

- Norfolk Boreas: zero to one (0.25) breeding adult FFC SPA birds at risk of mortality due to displacement;
- Norfolk Vanguard: zero to one (0.42) breeding adult FFC SPA birds at risk of mortality due to displacement;
- East Anglia ONE North: zero to one (0.06) breeding adult FFC SPA birds at risk of mortality due to displacement;
- East Anglia TWO: zero to one (0.07) breeding adult FFC SPA birds at risk of mortality due to displacement; and
- Hornsea Project Four: 2 (1.51) breeding adult FFC SPA birds at risk of mortality due to displacement.

24. These figures were all published in MacArthur Green and Royal HaskoningDHV (2020), except for Hornsea Project Four, which was published in GoBe Consultants (2021b).

### 5.1.2 In-Combination

25. The latest total of breeding adult razorbills from the FFC SPA at risk of displacement due to in-combination OWF effects that has been reviewed by Natural England was presented in a deadline two document for the East Anglia ONE North DCO Examination (MacArthur Green and Royal HaskoningDHV, 2020). This stated that the total annual number of breeding FFC SPA razorbills displaced by OWFs was 7,091 birds, or 6,244 birds excluding Hornsea Project Four. Adding the totals from SEP and DEP to the existing values, plus the revised value of 301 birds for Hornsea Project Four (GoBe Consultants, 2021b) to the latter total gives an overall number of birds at risk of displacement of either 7,287 (previous Hornsea Project Four numbers) or 6,741 (revised Hornsea Project Four numbers).

26. At displacement rates of 30% to 70% and mortality rates of 1% to 10% of displaced birds, the number of FFC SPA breeding adults predicted to die each year would be 22 to 510 using the previous Hornsea Project Four numbers (increasing annual adult FFC SPA mortality by between 0.51% and 11.99%), or 20 to 472 using the revised Hornsea Project Four numbers (increasing annual adult FFC SPA mortality by between 0.48% and 11.09%). Using an evidence-based displacement rate of 50% and a mortality rate of 1%, the annual mortality rate would be 36 birds per year using the previous Hornsea Project Four numbers (0.86% increase in FFC SPA adult mortality), or 34 birds per year using the revised Hornsea Project Four numbers (0.79% FFC SPA adult mortality increase). SEP and DEP contribute 2.7% to 2.9% of predicted FFC SPA adult razorbill mortality due to operational phase displacement.

27. Based on recent advice published for East Anglia ONE North (Natural England, 2021), Natural England consider that an adverse effect on the integrity of the FFC SPA cannot be ruled out.

## 5.2 Potential Compensatory Measures

28. The potential compensatory measures for this species are as per FFC SPA guillemot, which are presented in **Section 4.2**.

## 5.3 Compensatory Measures Taken Forward

29. There is detailed information on these compensatory measures presented in the documents identified below. There is nothing to be added to the information presented elsewhere, and it is not reproduced here. Due to the very small contribution of SEP and DEP to overall in-combination impact, and the nature of the compensatory measures being considered for this species, it is currently considered that these measures would be suited to delivery through collaboration of a number of different OWF developers, including Equinor. It is currently anticipated that the commencement of the installation of turbines would occur no earlier than 2028, irrespective of whether SEP and DEP are constructed sequentially or concurrently. Therefore, whichever measure(s) is/are taken forward would need to be in place by the end of 2027 to be able to compensate for impacts due to SEP and DEP.

30. The location of information relevant to each compensatory measure is as follows:

### 5.3.1 Predator Eradication

- Section 5.2 of MacArthur Green (2021b);
- Section 6.4 of MacArthur Green (2021c) and MacArthur Green (2021d);
- Section 8.5.2.1 of MacArthur Green and Royal HaskoningDHV (2021a) and MacArthur Green and Royal HaskoningDHV (2021b); and
- Section 3 of GoBe Consultants (2021a), along with supporting ecological evidence in GoBe Consultants (2021c) and a roadmap in GoBe Consultants (2021d).

### 5.3.2 Bycatch Prevention

- Section 7 of MacArthur Green (2021c) and MacArthur Green (2021d);
- Section 11 of MacArthur Green and Royal HaskoningDHV (2021a) and MacArthur Green and Royal HaskoningDHV (2021b); and
- Section 4 of GoBe Consultants (2021a), along with supporting ecological evidence in GoBe Consultants (2021e) and a roadmap in GoBe Consultants (2021f).

# 6 Gannet

31. The key impacts from OWFs for this species are collision risk, and disturbance and displacement during the operational phase.

## 6.1 Predicted Impacts

### 6.1.1 Project Alone

32. In the SEP and DEP PEIR worst-case scenario, the annual total of breeding adult gannets from the FFC SPA at risk of collision at SEP and DEP combined was 4 (0.40+3.89 = 4.29).

33. The annual total of breeding adult gannets from the FFC SPA at risk of operational phase displacement from SEP and DEP combined was 435 (54+380 respectively).

34. For reference, the scale of the number of birds predicted to die annually due to collision for other OWFs currently in the planning system are as follows:

- Norfolk Boreas: 15.1 breeding adult FFC SPA birds at risk of collision;
- Norfolk Vanguard: 9.4 breeding adult FFC SPA birds at risk of collision;
- East Anglia ONE North: 13.0 breeding adult FFC SPA birds at risk of collision;
- East Anglia TWO: 12.2 breeding adult FFC SPA birds at risk of collision; and
- Hornsea Project Four: 8.5 breeding adult FFC SPA birds at risk of collision.

35. These figures were all published in MacArthur Green and Royal HaskoningDHV (2021c), except for Hornsea Project Four, which was published in GoBe Consultants (2021b).

36. At displacement rates of 60% to 80% and mortality rates of 1% of displaced birds (UK SNCBs, 2017), the number of FFC SPA breeding adults predicted to die each year would be three (2.61 to 3.48). The combined impact of displacement and collision at SEP and DEP (i.e. seven birds per year) would increase the baseline mortality of the FFC SPA breeding population by 0.32%, assuming a starting population of 26,784 individuals (Aitken *et al*., 2017) and an adult survival rate of 0.919 (Horswill and Robinson, 2015). No adverse effect on the integrity of this population due to the impacts of SEP and DEP are predicted as a result of these combined impacts. To date, Natural England have not commented on this conclusion.

37. For reference, the number of birds at risk of impact predicted for other OWFs currently in the planning system are as follows:

- Norfolk Boreas: 1,344 breeding adult FFC SPA birds at risk of displacement;
- Norfolk Vanguard: 416 breeding adult FFC SPA birds at risk of displacement;
- East Anglia ONE North: 174 breeding adult FFC SPA birds at risk of displacement;
- East Anglia TWO: 247 breeding adult FFC SPA birds at risk of displacement; and
- Hornsea Project Four: 540 (previously 1,990 at PEIR) breeding adult FFC SPA birds at are risk of displacement.

38. For reference, the evidence-based (i.e. 60-80% displacement and 1% mortality) annual mortality predicted for other OWFs currently in the planning system are as follows:

- Norfolk Boreas: eight to 11 (9.41) breeding adult FFC SPA birds at risk of mortality due to displacement;
- Norfolk Vanguard: two to three (2.91) breeding adult FFC SPA birds at risk of mortality due to displacement;
- East Anglia ONE North: one to two (1.22) breeding adult FFC SPA birds at risk of mortality due to displacement;

- East Anglia TWO: one to two (2.73) breeding adult FFC SPA birds at risk of mortality due to displacement; and
- Hornsea Project Four: three to four (3.78) breeding adult FFC SPA birds at risk of mortality due to displacement. This value was 12 to 16 (13.93) at PEIR.

39. These figures were all published in the Habitats Regulations Assessment (HRA) for SEP and DEP submitted at PEIR (Royal HaskoningDHV, 2021b), except for Hornsea Project Four, which was published in GoBe Consultants (2021b).

### 6.1.2 In-Combination

40. The latest total of breeding adult gannets from the FFC SPA at risk of collision due to in-combination OWF effects that has been reviewed by Natural England was presented in a deadline four document for the East Anglia ONE North DCO Examination (MacArthur Green and Royal HaskoningDHV, 2021c). This stated that the total annual number of breeding FFC SPA gannets at risk of collision with OWFs was 356 birds, or 312 birds excluding Hornsea Project Four. Adding the totals from SEP and DEP to the existing values, plus the revised value of nine birds for Hornsea Project Four (GoBe Consultants, 2021b) to the latter total gives an overall number of birds at risk of collision of either 360 (previous Hornsea Project Four numbers) or 325 (revised Hornsea Project Four numbers). These values represent an increase in FFC SPA adult annual mortality of 13.03% to 14.23%.

41. The total of breeding adult gannets from FFC SPA at risk of displacement due to in-combination OWF effects has not been updated by any recent DCO Examination. The draft HRA submitted with the SEP and DEP PEIR (Royal HaskoningDHV, 2021b) stated that the total annual number of breeding FFC SPA gannets displaced by OWFs was 10,633 birds, or 8,643 birds excluding Hornsea Project Four. These numbers include birds potentially displaced by SEP and DEP. Using the revised value of 540 birds for Hornsea Project Four (GoBe Consultants, 2021b) to the latter total gives an overall number of birds at risk of displacement of either 9,183 birds.

42. At displacement rates of 60% to 80% and a mortality rate of 1% of displaced birds, the number of FFC SPA breeding adult gannets predicted to die each year would be 64 to 85 using the previous Hornsea Project Four numbers (increasing annual adult FFC SPA mortality by between 2.86% and 3.77%), or 55 to 73 using the revised Hornsea Project Four numbers (increasing annual adult FFC SPA mortality by between 2.48% and 3.28%) .

43. Combined annual FFC SPA breeding adult gannet mortality is therefore between 424 and 445 (mortality increase of 16.35% to 17.02%) if the previous Hornsea Project Four numbers are used, or 380 to 398 (mortality increase of 14.90% to 15.50%) if the latest Hornsea Project Four numbers are used. SEP and DEP therefore contribute 1.6% to 1.8% of this total impact on the FFC SPA breeding adult gannet population.

44. Based on recent advice published for East Anglia ONE North (Natural England, 2021), Natural England consider that an adverse effect on the integrity of the FFC SPA cannot be ruled out.

## 6.2 Potential Compensatory Measures

45. Potential compensatory measures for this species, most of which were originally presented in Furness (2013), but more recently in the documents listed in **Table 2-1**, are listed in **Table 6-1**.

*Table 6-1: Potential Compensatory Measures for FFC SPA Gannet*

| Measure | Taken Forward? |
|---|---|
| Ending licensed harvesting of chicks | No; not considered feasible. An annual harvest (under license) of 2,000 gannet chicks occurs at Sula Sgeir, north of the Isle of Lewis. Population viability analysis suggests that the harvest has reduced the rate of population growth rate below the level that would be predicted in its absence. It is considered likely that this has also had an effect (to a lesser extent) on other populations that are linked through immigration and emigration (Trinder, 2016).<br><br>Stopping the current harvest would offset the predicted losses due to OWF collisions across the SPA suite. This harvest is considered to be of cultural importance, and efforts to reduce or end it would be expected to be strongly opposed by both members of the community involved and the Scottish Government. |
| Measures to encourage establishment of new colonies | Yes. In the North Sea, the only gannet colony located further south than FFC SPA is on Helgoland, in German waters. Given an appropriate location, a colony could potentially be established further south on the English North Sea coast (e.g. Norfolk or Suffolk). A colony in this area would be around 200km from FFC SPA and therefore competition for prey resources would not be expected to be high. Birds breeding at a new site in this area could be at risk of collisions at existing OWFs, although the relatively high degree of avoidance exhibited by gannet would suggest this risk is likely to be small. |
| Mortality reduction at existing colonies | No; not considered feasible. There is some evidence that a small amount of potentially avoidable mortality of adults and chicks occurs at breeding colonies (Votier *et al*., 2011). For example, gannets collect discarded plastic waste for use in nest building (presumably mistaking it for natural material) and individuals occasionally become entangled and die.<br><br>Indications from investigations carried out by other OWF projects are that this could be extremely challenging due to the volumes of waste present at some sites, and may not be possible to undertake safely or without disturbance to birds. |
| Bycatch prevention | Yes. Gannet is susceptible to fisheries bycatch (ICES, 2008; Žydelis *et al*., 2013, 2009), and an annual estimate of many thousands of guillemot fatalities across Europe due to longline bycatch has previously been made (ICES, 2008), though the exact level of impact is not certain. |

## 6.3 Compensatory Measures Taken Forward

46. There is detailed information on these compensatory measures presented in the documents identified below. There is nothing to be added to the information presented elsewhere, and it is not reproduced here. Due to the very small contribution of SEP and DEP to overall in-combination impact, and the nature of the compensatory measures being considered for this species, it is currently considered that these measures would be suited to delivery through collaboration of a number of different OWF developers, including Equinor. It is currently anticipated that the commencement of the installation of turbines would occur no earlier than 2028, irrespective of whether SEP and DEP are constructed sequentially or concurrently. Therefore, whichever measure(s) is/are taken forward would need to be in place by the end of 2027 to be able to compensate for impacts due to SEP and DEP.

47. The location of information relevant to each compensatory measure is as follows:

### 6.3.1 Measures to Encourage Establishment of New Colonies

- Section 6.4.2.1 of MacArthur Green and Royal HaskoningDHV (2021a) and MacArthur Green and Royal HaskoningDHV (2021b).

### 6.3.2 Bycatch Prevention

- Section 7 of MacArthur Green (2021c) and MacArthur Green (2021d) (these sections refer to guillemot and razorbill);
- Section 11 of MacArthur Green and Royal HaskoningDHV (2021a) and MacArthur Green and Royal HaskoningDHV (2021b) (these sections refer to guillemot and razorbill); and
- Section 4 of (GoBe Consultants, 2021a), along with supporting ecological evidence in GoBe Consultants (2021e) and a roadmap in GoBe Consultants (2021f).

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GoBe Consultants, 2021b. Hornsea Project Four: Reports PINS Document Reference B2.2 APFP Regulation: 5(2)(g) B2.2: Report to Inform Appropriate Assessment Part 1 (No. B2.2 Version A).

GoBe Consultants, 2021c. Hornsea Project Four: Derogation Information PINS Document Reference: B2.8.3 APFP Regulation: 5(2)(q) Volume B2, Annex 8.3: Compensation measures for FFC SPA: Predator Eradication: Ecological Evidence.

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