Sheringham Shoal and Dudgeon Offshore Wind Farm Extension Projects

Appendix 3 - Kittiwake Compensation Document

August 2022
Document Reference: 5.5.3
APFP Regulation: 5(2)(g)

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Title: **Sheringham Shoal and Dudgeon Offshore Wind Farm Extension Projects DCO Application** **Appendix 3: Kittiwake Compensation Document**		
PINS Document no.: 5.5.3		
Document no.: C282-RH-Z-GA-00172		
Date:	Classification	
August 2022	**Final**	
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Approved by: **Sarah Chandler, Equinor**	Date: August 2022	

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Glossary of Acronyms

AEoI	Adverse Effect on Integrity
AON	Apparently Occupied Nest
BDMPS	Biologically Defined Minimum Population Size
BEIS	Business Energy and Industrial Strategy
BT	British Telecom
BTO	British Trust for Ornithology
CIMP	Compensation Implementation and Monitoring Plan
CRM	Collision Risk Model
DCO	Development Consent Order
Defra	Department for the Environment and Rural Affairs
DEL	Dudgeon Extension Limited
DEP	Dudgeon Offshore Wind Farm Extension Project
DIN	Dissolved Inorganic Nitrogen
DML	Deemed Marine Licence
DO	Dissolved Oxygen
DOW	Dudgeon Offshore Wind Farm
EC	European Commission
EIA	Environmental Impact Assessment
EPP	Evidence Plan Process
ES	Environmental Statement
ETG	Expert Topic Group
EU	European Union
FFC	Flamborough and Filey Coast
FID	Final Investment Decision
HRA	Habitats Regulations Assessment
ICES	International Council for the Exploration of the Sea
IROPI	Imperative Reasons of Overriding Public Interest
JNCC	Joint Nature Conservation Committee
KCSG	Kittiwake Compensation Steering Group
km	Kilometre
MMO	Marine Management Organisation
MPA	Marine Protected Area

NE	Natural England
OWF	Offshore Wind Farm
OWIC	Offshore Wind Industry Council
PEIR	Preliminary Environmental Information Report
PINS	Planning Inspectorate
RIAA	Report to Inform Appropriate Assessment
RSPB	Royal Society for the Protection of Birds
SEL	Scira Extension Limited
SEP	Sheringham Shoal Offshore Wind Farm Extension Project
SMP	Seabird Monitoring Programme
SNCB	Statutory Nature Conservation Body
SoS	Secretary of State
SOW	Sheringham Shoal Offshore Wind Farm
SPA	Special Protection Area
TAC	Total Allowable Catch
UK	United Kingdom
UKCEH	United Kingdom Centre for Ecology and Hydrology

Glossary of Terms

B_{lim}	A deterministic biomass limit below which a fish stock is considered to have reduced reproductive capacity.
B_{pa}	A fish stock status reference point above which the stock is considered to have full reproductive capacity, having accounted for estimation uncertainty.
Dudgeon Offshore Wind Farm Extension Project (DEP)	The Dudgeon Offshore Wind Farm Extension onshore and offshore sites including all onshore and offshore infrastructure.
DEP offshore site	The Dudgeon Offshore Wind Farm Extension consisting of the DEP wind farm site, interlink cable corridors and offshore export cable corridor (up to mean high water springs).
European site	Sites designated for nature conservation under the Habitats Directive and Birds Directive. This includes candidate Special Areas of Conservation, Sites of Community Importance, Special Areas of Conservation, potential Special Protection Areas, Special Protection Areas, Ramsar sites, proposed Ramsar sites and sites compensating for damage to a European site and is defined in regulation 8 of the Conservation of Habitats and Species Regulations 2017, although some of the sites listed here are afforded equivalent policy protection under the National Planning Policy Framework (2021) (paragraph 176) and joint Defra/Welsh Government/Natural England/NRW Guidance (February 2021).
Evidence Plan Process (EPP)	A voluntary consultation process with specialist stakeholders to agree the approach, and information to support, the EIA and HRA for certain topics.
Expert Topic Group (ETG)	A forum for targeted engagement with regulators and interested stakeholders through the EPP.
Integrated transmission system	Transmission infrastructure which serves both extension projects.
Sheringham Shoal Offshore Wind Farm Extension Project (SEP)	The Sheringham Shoal Offshore Wind Farm Extension site as well as all onshore and offshore infrastructure.

The Applicant	Equinor New Energy Limited. As the owners of SEP and DEP, Scira Extension Limited (SEL) and Dudgeon Extension Limited (DEL) are the named undertakers that have the benefit of the Development Consent Order. References in this document to obligations on, or commitments by, 'the Applicant' are given on behalf of SEL and DEL as the undertakers of SEP and DEP.

KITTIWAKE COMPENSATION DOCUMENT

1 Introduction

1.1 Background

1. The Sheringham Shoal Offshore Wind Farm Extension Project (SEP) and Dudgeon Offshore Wind Farm Extension Project (DEP) are proposed extensions to the existing Sheringham Shoal and Dudgeon Offshore Wind Farms (SOW and DOW). When operational, SEP and DEP would have the potential to generate renewable power for around 785,000 United Kingdom (UK) homes from up to 23 wind turbines at SEP and up to 30 wind turbines at DEP.
2. Equinor New Energy Limited (the Applicant) is submitting an application for a Development Consent Order (DCO) including a **Report to Inform Appropriate Assessment (RIAA)** (document reference 5.4), which provides the information necessary for the competent authority to undertake an appropriate assessment to determine if there is any adverse effect on integrity (AEoI) on the national site network.
3. With respect to kittiwake from the Flamborough and Filey Coast Special Protection Area (FFC SPA), the Applicant's **RIAA** (document reference 5.4) concludes that AEoI cannot be ruled out as a result of predicted kittiwake mortality due to collisions when considered in-combination with other offshore wind farms (OWF). This is the same conclusion reached by the Secretary of State (SoS) with respect to the recent consents granted for the Hornsea Project Three, Norfolk Vanguard, Norfolk Boreas, East Anglia One North and East Anglia Two OWFs. Additionally, in January 2022, Hornsea Project Four updated its position with respect to kittiwake to reflect an overall conclusion that there is potential for an AEoI from Hornsea Four in-combination with other projects (Orsted, 2022). As such, the Applicant has provided compensatory measures as part of its consent application to compensate for the predicted impacts from SEP and DEP, which are described in this Kittiwake Compensation Document. This forms part of the Applicant's overarching **Habitats Regulations Derogation Provision of Evidence** (document reference 5.5) submission.

1.2 Purpose of Document

4. This document sets out the detail of the proposed compensatory measures for kittiwake from the FFC SPA. It demonstrates how the proposed compensatory measures can be secured and that the mechanism for delivery can be implemented. The Kittiwake Compensation Implementation and Monitoring Plan (CIMP) will be produced by the Applicant and approved by the SoS prior to the start of construction, based on the outline version provided with the DCO application (**Annex 3A: Kittiwake Outline Compensation Implementation and Monitoring Plan** (document reference 5.5.3.1)). The Kittiwake CIMP will set out the detailed delivery proposals for the agreed compensatory measures based on those set out in this Kittiwake Compensation Document.
5. As such, this document provides the following details (where relevant) of each of the proposed compensatory measures for kittiwake:

- Overview;
- Delivery Mechanism i.e. how the measures are proposed to be delivered;
- Scale;
- Location;
- Outline Design Details;
- Timescales;
- Monitoring, Maintenance and Adaptive Management;
- Implementation and Delivery Programme; and
- Potential Impacts from Implementation of the Compensation.

1.3 Implications of the Project Development Scenarios

6. SEP and DEP may be delivered under a range of project development scenarios. Details of the scenarios and how these are reflected in the DCO application are set out in the **Scenarios Statement** (document reference 9.28). The pre-application engagement relating to the proposed compensatory measures has assumed that both projects are developed, and the package of measures proposed for FFC SPA kittiwake is considered by the Applicant to deliver the level of compensation required in comparable proportion (factoring in the risks and uncertainties associated with delivering successful compensation) to address the worst-case impacts of both SEP and DEP, as required by draft Defra guidance (Defra, 2021).

7. The scenario under which SEP and/or DEP will be delivered will be confirmed prior to the commencement of the authorised development, and the **Draft DCO** (document reference 3.1) secures the requirement to notify the relevant planning authority and the Marine Management Organisation (MMO) as appropriate of which scenario is being undertaken. This will need to be confirmed before further requirements of the DCO and conditions of the Deemed Marine Licences (DMLs) can be discharged.

8. The Applicant has considered the requirements for compensation under each project development scenario and has determined that the delivery of the proposed measures under each scenario is dependent on how scalable the given measure is.

9. The project development scenarios for SEP and DEP can be broadly categorised as:

- In isolation – where only SEP or DEP is constructed;
- Sequential – where SEP and DEP are both constructed in a phased approach with either SEP or DEP being constructed first; or
- Concurrent – where SEP and DEP are both constructed at the same time.

10. The **Scenarios Statement** (document reference 9.28) describes the ambition to deliver SEP and DEP with an integrated transmission system, however the predicted impact on kittiwake is no different if the transmission system for the two projects are delivered integrated or separately.

11. Where both projects are delivered in the sequential scenario, the overall final package of compensation to be delivered will be the same as in the concurrent scenario. The Applicant therefore considers it practical to deliver all of the compensation at the same time under either the sequential or concurrent scenario.

In the sequential scenario this may mean that one project delivers compensation earlier than may have otherwise been required if it were a standalone project, which could be at risk e.g. prior to Final Investment Decision (FID). The Applicant considers however that the second project would have the benefit of the compensation being in place slightly longer than the first project thereby reducing pressure on the onward project programme.

12. Should SEP or DEP be delivered in isolation then it would be necessary to deliver only the scale of measures required to achieve adequate compensation in proportion to the impacts predicted from the given project (SEP or DEP). Where this is not practical because the measure is not ecologically scalable, the Applicant is proposing to deliver the compensation measure to its full extent. Where compensation is scalable, or partially scalable, compensation would be delivered on a scale appropriate to the nature and extent of the predicted impact from SEP, or from DEP.

13. It should be noted that, as owners of SEP and DEP, Scira Extension Limited (SEL) and Dudgeon Extension Limited (DEL) are the named undertakers that have the benefit of the DCO. References throughout this document and any supporting annexes to obligations on, or commitments by, 'the Applicant' are given on behalf of SEL and DEL as the undertakers of SEP and DEP.

2 Legislation and Guidance

14. The Habitats Regulations Assessment (HRA) process covers those features designated under the European Council Directive 2009/147/EC on the conservation of wild birds (the 'Birds Directive') and Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora (the 'Habitats Directive'). These are implemented into UK legislation by the Conservation of Habitats and Species Regulations 2017 and the Conservation of Offshore Marine Habitats and Species Regulations 2017. The UK also has to meet its obligations under relevant international agreements such as the Ramsar Convention.

15. The UK exited the European Union (EU) on 31st January 2020. The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019 provide amendments to the Habitats Regulations to enable their continued operation following the UK's exit from the EU (see **Section 2.1**).

16. The Birds Directive provides a framework for the conservation and management of wild birds in Europe. The relevant provisions of the Directive are the identification and classification of SPAs for rare or vulnerable species listed in Annex I of the Directive and for all regularly occurring migratory species (required by Article 4). The Directive requires national Governments to establish SPAs and to have in place mechanisms to protect and manage them. The SPA protection procedures originally set out in Article 4 of the Birds Directive have been replaced by the Article 6 provisions of the Habitats Directive.

17. Full details of the relevant legislative and policy context are provided in **Habitats Regulations Derogation Provision of Evidence** (document reference 5.5).

2.1 UK National Legislation

18. The Conservation of Habitats and Species Regulations 2017 and the Conservation of Offshore Marine Habitats and Species Regulations 2017 (hereafter the 'Habitats Regulations') together with the Wildlife and Countryside Act 1981 transpose the Habitats and Birds Directives into UK legislation covering terrestrial areas out to and including the UK Offshore Marine Area with the exception of within Scottish territorial waters, where The Conservation (Natural Habitats, &c.) Regulations 1994 continue to apply.

19. The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019 (the EU Exit Regulations) make changes to the Habitats Regulations so that they continue to work (are operable) following the UK's exit from the EU on 31st January 2020. While the basic legal framework for HRA is maintained, the EU Exit Regulations transfer functions previously undertaken by the European Commission (EC) to UK Ministers. Furthermore, where the Habitats Regulations continue to use the term 'European sites', those sites now form part of a 'national site network' rather than the European 'Natura 2000' site network.

20. The Habitats Regulations place an obligation on 'competent authorities' to carry out an appropriate assessment of any proposal likely to significantly affect a designated site, to seek advice from Natural England and not to approve an application that would have an adverse effect on a designated site unless certain conditions are met (where there are no alternative solutions, the plan or project can only proceed if there are imperative reasons of over-riding public interest and if the necessary compensatory measures can be secured). The competent authority in the case of SEP and DEP is the SoS for Business Energy and Industrial Strategy (BEIS).

2.2 Guidance on Compensatory Measures

21. Should the Competent Authority conclude that, following Appropriate Assessment, an AEoI on a European site cannot be ruled out, that there are no alternative solutions and that there are Imperative Reasons of Over-riding Public Interest (IROPI), Article 6(4) of the Habitats and Birds Directives *"requires that all necessary compensatory measures are taken to ensure the overall coherence of the network of European sites as a whole is protected*."

22. Department for the Environment and Rural Affairs (Defra) (2021a) and EC (2012 and 2018) explain that for SPAs, the overall coherence of the European site setwork can be maintained by:

- Compensation that fulfils the same purposes that motivated the site's designation;
- Compensation that fulfils the same function along the same migration path; and
- The compensation site(s) are accessible with certainty by the birds usually occurring on the site affected by the project.

23. The guidance provides an element of flexibility, recognising that compensation of a '*like for like'* habitat and/or in the same designated site may not be practicable.

24. Compensation should not be used to address issues that are causing designated habitats or species to be in an unfavourable condition. This is the responsibility of the UK Government.

25. Ideally, compensation should be functioning before the effect takes place, although it is recognised that this may not always be possible, as stated in the Defra (2021a) and EC (2012) guidance: "*in principle, the result of implementing compensation has normally to be operational at the time when the damage is effective on the site concerned. Under certain circumstances where this cannot be fully fulfilled, overcompensation would be required for the interim losses*."

26. Draft guidance has been published by Defra 'Best practice guidance for developing compensatory measures in relation to Marine Protected Areas' (Defra, 2021b), including a hierarchy within which to consider compensatory measures for the marine environment. This guidance also recognises the potential issues with the ability to provide 'like-for-like' compensation stating:

> "*As it will not always be possible to deliver compensatory measures in a like-for like capacity as is accepted terrestrially, Defra has created a framework to help advisors, regulators and developers to explore and develop compensatory measures. The underlying principle is that compensatory measures that benefit the same feature which is impacted by the development will be the most preferable as they balance the damage caused by the development.*
>
> *Each step down the hierarchy moves away from like for like measures and therefore may decrease the certainty of success, and therefore increase the extent of compensation required. The key is to ensure the biological structure and function of the network is maintained. The more significant the impact to the protected feature or species, the more important it is that compensatory measures are developed within steps 1 and 2 of the Hierarchy of Compensatory Measures.*"

27. Compensatory measures for the kittiwake feature of the FFC SPA are presented in the following sections in line with this guidance and the hierarchy presented within it.

28. In addition, Natural England has developed a list of those aspects of compensatory measures that it considers need to be described in detail when developers are submitting or updating applications where impacts on marine protected areas (MPA) are anticipated. Whilst not exhaustive, it lists key areas where Natural England considers sufficient detail is needed to provide the SoS with appropriate confidence that compensatory measures can be secured. The list is summarised below:

a) What, where, when: clear and detailed statements regarding the location and design of the proposal.

b) Why and how: ecological evidence to demonstrate compensation for the impacted site feature is deliverable in the proposed locations.

c) Demonstrate that on ground construction deliverability is secured and not just the requirement to deliver in the DCO i.e. landowner agreement is in place.

d) Policy/legislative mechanism for delivering the compensation (where needed).

e) Agreed DCO/ DML conditions.

f) Clear aims and objectives of the compensation.

g) Mechanism for further commitments if the original compensation objectives are not met – i.e. adaptive management.

h) Clear governance proposals for the post-consent phase – we do not consider simply proposing a steering group is sufficient.

i) Ensure development of compensatory measures is open and transparent as a matter of public interest, including how information on the compensation would be publicly available.

j) Timescales for implementation esp. where compensation is part of a strategic project, including how timescales relate to the ecological impacts from the development.

k) Commitments to monitoring specified success criteria.

l) Proposals for ongoing 'sign off' procedure for implementing compensation measures throughout the lifetime of the project. Including implementing feedback loops from monitoring.

m) Continued annual management of the compensation area and ensure other factors are not hindering the success of the compensation e.g. changes in habitat, increased disturbance as a result of subsequent plans/projects.

29. This list, and an equivalent list provided by Royal Society for the Protection of Birds (RSPB) has been used to help guide the development of the proposed compensatory measures at the pre-application stage.

3 Development of Compensatory Measures – Methodology

3.1 General Approach

30. The approach taken by the Applicant to identify potential compensatory measures and for considering their suitability is as follows:

- Review of compensatory measures discussed in Furness *et al.* (2013) (see **Section 6.1**).
- Iterative development of the proposals through a detailed process of consultation with relevant stakeholders, implemented in this case through an extension to the ornithology Expert Topic Group (ETG) as part of the Projects' Evidence Plan Process (EPP). This group includes the MMO, Natural England, RSPB and National Trust. The Planning Inspectorate (PINS) were also invited to attend. Details of the consultation undertaken including minutes of the ETG meetings are provided in the **Consultation Report** (document reference 5.1).
- Engagement with other stakeholders where necessary including with other OWF developers, Natural England and Defra through the Offshore Wind Industry Council (OWIC) Derogation Subgroup.

- Ongoing review of other OWF applications for which compensatory measures have been presented (e.g. Hornsea Project Three, Norfolk Vanguard and Norfolk Boreas, East Anglia TWO/ONE North and Hornsea Project Four), including those accepted as appropriate in the determination (to date all of these projects other than Hornsea Project Four which is yet to be determined).
- Consideration of emerging evidence on wind farm and seabird interactions and influences on seabird ecology more widely to determine whether novel options may be appropriate.
- Features of the options identified through this process were then considered in relation to various criteria (feasibility, spatial and temporal scale, how it would be monitored, etc.).
- Targeted consultation with relevant stakeholders as necessary to help inform the development of specific compensatory measures.

31. As described in **Section 6.1**, project-led, collaborative and strategic delivery models have been considered. Those measures that would appear to be more appropriate to be taken forward as part of a collaborative approach with other developers, or a strategic approach by Government and industry, or a combination of the two, are described in detail in the **Strategic and Collaborative Approaches to Compensation and Measures of Equivalent Environmental Benefit** (document reference 5.8).

32. The Applicant also notes that it is likely that impacts of OWF will prove to be much less than the precautionary estimates derived following Statutory Nature Conservation Body (SNCB) guidance, in which case it will be important to avoid over-compensation, since there may be a need to retain potential for future compensation as further projects are developed. Therefore the importance of adaptive management over the timescale of the Projects is recognised, to ensure that compensation is adequate, but does not overcompensate at potential detriment to future projects.

3.2 Summary of Consultation Undertaken

33. The Applicant has given early and detailed consideration to the requirement for compensatory measures and has consulted with a range of stakeholders at regular intervals throughout the pre-application process. Feedback from the consultation has been used to shape the development of the compensatory measures. Consultation has included:

- As described above, an Ornithology Compensation ETG was set up as a part of the Projects' EPP. Of relevance to kittiwake, ETG members have included the MMO, Natural England and RSPB. Three Ornithology Compensation ETG meetings were held between January and June 2022, with compensatory measures also being discussed at earlier stages of the pre-application process as part of the Offshore Ornithology ETG meetings, in December 2020 and August 2021.

- In March 2021 the Applicant provided ETG members with an **Initial Review of Compensatory Measures for Sandwich Tern and Kittiwake** (**Annex 1A** (document reference 5.5.1.1)). This document was developed to inform early pre-application consultation with ETG members and was provided ahead of the section 42 consultation on the Preliminary Environmental Information Report (PEIR) and draft Information for HRA report to maximise the timeframe available for discussions on compensatory measures in the pre-application period. It provided an initial review of potential compensatory measures, based on those discussed in Furness *et al.*, (2013), with the aim of identifying the opportunities and constraints associated with each and the necessary next steps in determining a feasible approach in the context of SEP and DEP. Written feedback on this review was provided by Natural England in May 2021.
- In November 2021 the Applicant provided ETG members with a detailed review of the ecological evidence supporting the potential compensatory measures that had been identified to date (MacArthur Green 2021a, included at **Annex 1B Sandwich Tern and Kittiwake Ecological Evidence** (document reference 5.5.1.2)). The review addressed a number of specific issues relevant to kittiwake compensatory measures where further information had been indicated by stakeholders in the March 2021 consultation as being of benefit in determining the suitability and feasibility of the measures under consideration. Feedback on this review was discussed with the Ornithology Compensation ETG in January 2022, following receipt of written responses from Natural England and RSPB.
- In April 2022 the Applicant provided ETG members with an HRA Compensation Briefing Note, which was designed to share the main updates in the development of the proposed compensatory measures since the last round of consultation and to enable more targeted engagement around the key remaining issues and questions. This included an update on all potential measures still under consideration at that time, with detailed information provided on the proposed measure of 'nest site improvements to enhance breeding success'. The briefing note also provided details of the delivery models for each of the measures under consideration, including project-led, collaborative and strategic delivery. Feedback was discussed with the Ornithology Compensation ETG in April 2022.
- In the April 2022 ETG meeting, ETG members expressed a wish to have one further meeting pre-application and to use this as an opportunity to review the detailed compensatory measures proposals against the lists that had been provided by both Natural England and RSPB for other OWF applications (included in **Section 2.2**). To help inform this exercise the Applicant provided a further document for consultation in June 2022, detailing the proposed measure of 'nest site improvements to enhance breeding success', which had emerged as the leading measure. Feedback was discussed with the Ornithology Compensation ETG in a final pre-application meeting held in late June 2022.

- Additional meetings were held with other relevant stakeholders as necessary to discuss the proposals as they were developed. This included meetings with Natural England, RSPB, other OWF developers, the relevant local planning authorities for the locations in question and other local stakeholders such as the Lowestoft Kittiwake Partnership.
- Meetings were held with PINS through the pre-application process in order to appraise them of the intended approach to the derogation case for the Projects and the development of the associated compensatory measures (meetings held in November 2020, February 2021, January 2022 and July 2022).
- Opportunities for the development of strategic approaches to compensation were discussed directly with Defra, including in meetings in June 2021, December 2021, March 2022 and July 2022.

4 Flamborough and Filey Coast SPA

4.1 Overview

34. The FFC SPA was designated in 2018. It is a geographical extension to the former Flamborough Head and Bempton Cliffs SPA, which was designated in 1993 (Natural England, 2018).

35. The SPA is located on the Yorkshire coast between Bridlington and Scarborough, and is composed of two sections. The northern section runs from Cunstone Nab to Filey Brigg, and the southern section from Speeton, around Flamborough Head, to South Landing. The seaward boundary extends 2km offshore and applies to both sections of the SPA.

36. The predominantly chalk cliffs of Flamborough Head rise to 135m and have been eroded into a series of bays, arches, pinnacles and gullies. The cliffs from Filey Brigg to Cunstone Nab are formed from various sedimentary rocks including shales and sandstones. The adjacent sea out to 2km off Flamborough Head as well as Filey Brigg to Cunstone Nab is characterised by reefs supporting kelp forest communities in the shallow subtidal, and faunal turf communities in deeper water. The southern side of Filey Brigg shelves off gently from the rocks to the sandy bottom of Filey Bay. This site does not support any priority habitats or species (Natural England, 2018).

37. The coastal areas of the SPA cover cliffs supporting internationally important breeding populations of seabirds, the marine extension includes areas close to the colony used by seabirds for maintenance behaviours (loafing, preening etc).

4.2 Conservation Objectives

38. The site's conservation objectives are to ensure that, subject to natural change, the integrity of the site is maintained or restored as appropriate, and that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring:

- The extent and distribution of the habitats of the qualifying features;
- The structure and function of the habitats of the qualifying features;

- The supporting processes on which the habitats of the qualifying features rely;
- The populations of each of the qualifying features; and
- The distribution of qualifying features within the site.

39. Natural England (2020) has stated the target is to restore the size of the kittiwake breeding population at a level which is above 83,700 breeding pairs, whilst avoiding deterioration from its current level as indicated by the latest mean peak count or equivalent.

4.3 Designated Features – Breeding Kittiwake

40. At the time of the classification of the former Flamborough Head and Bempton Cliffs SPA in 1993, the kittiwake breeding population was cited as 83,370 breeding pairs. This was based on a count carried out in 1987. The breeding adult kittiwake population of the FFC SPA at classification in 2018 was cited as 44,420 pairs or 89,040 breeding adults. This was based on counts carried out between 2008 and 2011 (Natural England, 2018). This suggests a decline of about 50% in the size of the breeding population between 1987 and 2008 to 2011.

41. There is uncertainty as to whether there were ever as many as 83,370 pairs of kittiwakes at this site. This number has been challenged repeatedly. The colony should have been increasing in numbers based on monitoring data on its productivity (Coulson, 2017). The apparent decline from 83,370 pairs in 1987 to 37,617 pairs in 2008 (i.e. by 50%) therefore does not correspond with population trajectories based on the influence of productivity on population change. No details of the methodology that were followed during the 1987 count have ever been published. It has previously been suggested that the count in 1987 may have been expressed as individuals rather than pairs, and then mistakenly recorded as pairs (Coulson, 2011). That would fit well with previous and subsequent counts which have consistently been around 40,000 to 50,000 pairs (**Plate 4-1** and **Plate 4-2**).

42. Recent counts indicate increases in the kittiwake breeding population since 2008, with estimates of 51,001 pairs or 102,002 breeding adults in 2016 (Babcock *et al.*, 2016) and 51,535 pairs or 103,070 breeding adults in 2017 (Aitken *et al.*, 2017). The latter was a complete census of the colony and is considered to represent the best available evidence of the current population size.

43. Since the Seabird 2000 national seabird colony census (Mitchell *et al.*, 2004) the kittiwake population at the FFC SPA has increased by 7% (Aitken *et al.*, 2017; Joint Nature Conservation Committee (JNCC), 2022, 2020). This is in contrast to the declining trend of the species in the UK (JNCC, 2022, 2020).

44. Using the published adult mortality rate of 0.146 (Horswill and Robinson, 2015), 15,048 birds would be expected to die annually from the breeding adult population of 103,070 individuals.

45. The count of 1987, which as discussed above has been disputed, has a substantial effect on the longer term population trend (and subsequently the conservation status of the qualifying feature), as shown in **Plate 4-1** (which assumes the 1987 count to be breeding pairs) and **Plate 4-2** (which assumes the 1987 count to be breeding adults).

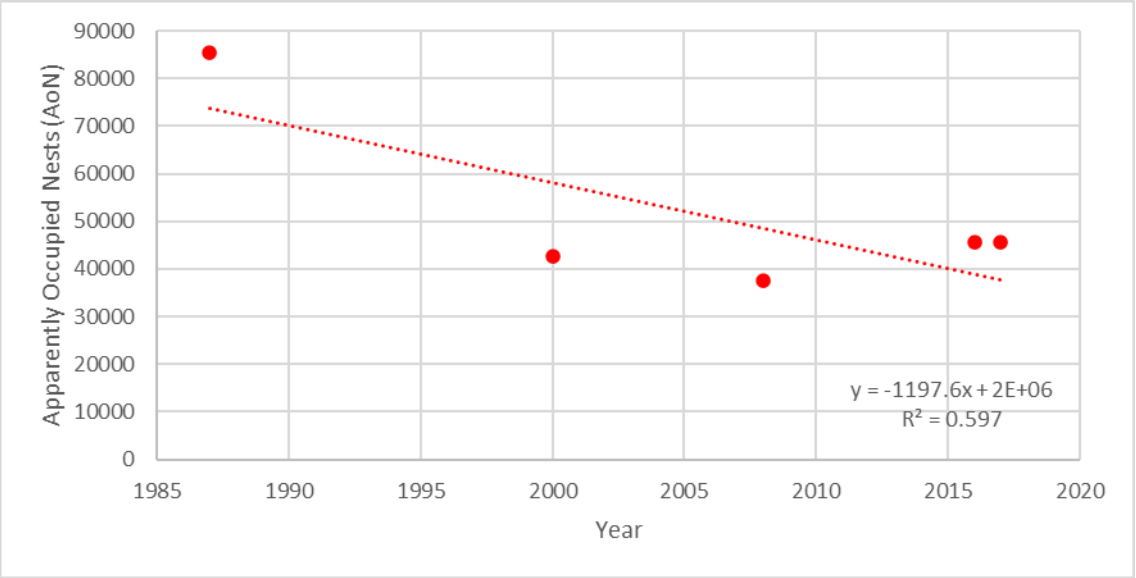

Plate 4-1: Kittiwake Counts (Apparently Occupied Nests (AONs)) at the FFC SPA between 1986 and 2017 Included in the Seabird Monitoring Programme (SMP) Database (JNCC, 2022), with Linear Trendline. The 1986 Count is Presumed to Have Reflected the Number of Breeding Pairs Present.

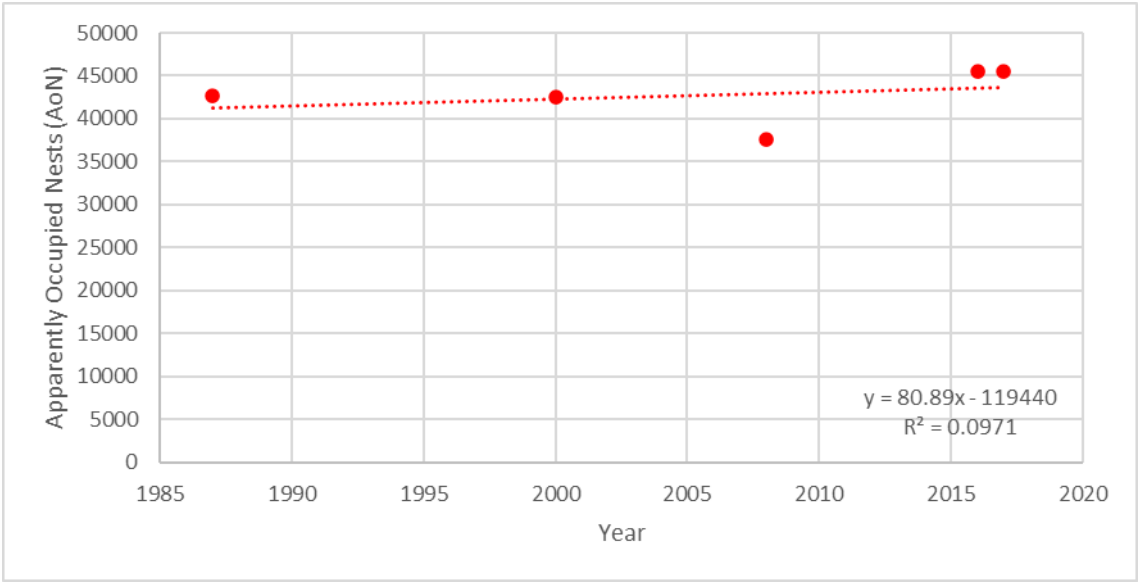

Plate 4-2: Kittiwake Counts (AONs) at the FFC SPA between 1986 and 2017 Included in the SMP Database (JNCC, 2022), with Linear Trendline. The 1986 Count is Presumed to Have Reflected the Number of Breeding Adults Present.

46. Supplementary advice on the conservation objectives were added for qualifying features of the FFC SPA in 2020 (Natural England, 2020). For kittiwake, these are:

- Restore the size of the breeding population at a level which is above 83,700 breeding pairs, whilst avoiding deterioration from its current level as indicated by the latest mean peak count or equivalent;
- Restore safe passage of birds moving between nesting and feeding areas;

- Restrict the frequency, duration and / or intensity of disturbance affecting roosting, nesting, foraging, feeding, moulting and/or loafing birds so that they are not significantly disturbed;
- Restrict predation and disturbance caused by native and non-native predators.
- Maintain concentrations and deposition of air pollutants at below the site-relevant Critical Load or Level values given for this feature of the site on the Air Pollution Information System;
- Restore the structure, function and supporting processes associated with the feature and its supporting habitat through management or other measures (whether within and/or outside the site boundary as appropriate) and ensure these measures are not being undermined or compromised;
- Maintain the extent, distribution and availability of suitable breeding habitat which supports the feature for all necessary stages of its breeding cycle (courtship, nesting, feeding) at: current extent;
- Restore the distribution, abundance and availability of key food and prey items (e.g. sandeel, sprat, cod, squid, shrimps) at preferred sizes;
- Restrict aqueous contaminants to levels equating to High Status according to Annex VIII and Good Status according to Annex X of the Water Framework Directive, avoiding deterioration from existing levels;
- Maintain the dissolved oxygen (DO) concentration at levels equating to High Ecological Status (specifically ≥5.7mg per litre (at 35 salinity) for 95% of the year), avoiding deterioration from existing levels;
- Maintain water quality and specifically mean winter dissolved inorganic nitrogen (DIN) at a concentration equating to High Ecological Status (specifically mean winter DIN is <12µM for coastal waters), avoiding deterioration from existing levels; and
- Maintain natural levels of turbidity (e.g. concentrations of suspended sediment, plankton and other material) across the habitat.

5 Summary of Potential Impacts on FFC SPA Kittiwake from SEP and DEP

47. The following sections provide a summary of the potential impacts on kittiwake at FFC SPA in order to set the context for the proposed compensatory measures. The SoS will determine the level of effect based on the Appropriate Assessment conclusions for the potential impact of SEP and DEP on the breeding adult kittiwake associated with the FFC SPA. The following section describes the Applicant's position, as set out in the **RIAA** (document reference 5.4), which is based on the precautionary estimates derived by following SNCB guidance.

5.1 Overview

48. The screening process undertaken in the development of **Environment Statement (ES) Chapter 11 Offshore Ornithology** (document reference 6.1.11) has identified kittiwake as being of relatively high sensitivity to potential collision with operational offshore wind turbines at SEP and DEP. The species is considered to be insensitive to impacts relating to disturbance and displacement during any project phase, or

any indirect impacts that may occur as a result of the construction, operation or decommissioning of SEP and DEP.

49. It is presumed that 100% of breeding adult birds present at SEP and DEP during the breeding season are breeding adults from the FFC SPA and therefore 100% of all predicted impacts during the full breeding season (March to August) are attributable to this population. During the full breeding season, 2,573 kittiwakes were recorded during the baseline surveys of SEP and DEP. Of these, 935 birds were able to be assigned to an age class. 784 birds (83.9% of those assigned to an age class) were classified as adults. It is therefore assumed that this proportion of kittiwakes recorded at SEP and DEP during the breeding season are breeding adult birds from the Flamborough and Filey Coast SPA.

50. Outside of the breeding season, impacts on kittiwake have been compared to the appropriate Biologically Defined Minimum Population Size (BDMPS) for the season in question. The relevant background population is considered to be the UK North Sea BDMPS, consisting of 829,937 individuals during autumn migration (August to December), and 627,816 individuals during spring migration (January to April) (Furness, 2015). During autumn and spring migration, 5.4% and 7.2% of collisions respectively are considered to affect birds from the SPA.

51. During the autumn migration season, 1,609 kittiwakes were recorded during the baseline surveys of SEP and DEP. Of these, 487 birds were able to be assigned to an age class. 400 birds (82.1% of those assigned to an age class) were classified as adults. It is therefore assumed that the proportion of kittiwakes recorded at SEP and DEP during the autumn migration season that are breeding adult birds from the Flamborough and Filey Coast SPA is 4.4% (i.e. 0.054 x 0.821).

52. During the spring migration season, 63 kittiwakes were recorded during the baseline surveys of SEP and DEP. Of these, 23 birds were able to be assigned to an age class. 21 birds (91.3% of those assigned to an age class) were classified as adults. It is therefore assumed that the proportion of kittiwakes recorded at SEP and DEP during the spring migration season that are breeding adult birds from the Flamborough and Filey Coast SPA is 6.6% (i.e. 0.072 x 0.913).

5.1.1 Quantification of Effect – Collisions

53. Potential collision risk for kittiwake at SEP and DEP was estimated using the Band (2012) collision risk model (CRM). Full details of the input parameters used are provided in **ES Appendix 11.1 Offshore Ornithology Technical Report** (document reference 6.3.11.1).

5.1.1.1 Project Alone

54. Based on the mean collision rates, the annual total of breeding adult kittiwakes from the FFC SPA at risk of collision at DEP is 8.09 (95% confidence intervals (CIs) 1.25 - 20.00), and 0.78 collisions (95% CIs 0.00 - 3.76) at SEP. This gives a combined total annual collision rate for SEP and DEP combined of 8.86 (95% CIs 1.25 - 23.76) FFC SPA breeding adult kittiwakes. This would increase the existing mortality of the SPA breeding population by 0.06% (0.05% due to DEP, and 0.01% due to SEP). The maximum predicted mortality increase that could occur in the population is 0.16% due to the collision impacts of SEP and DEP combined.

55. It is concluded that predicted kittiwake mortality due to collision at SEP, DEP, and SEP and DEP combined would not adversely affect the integrity of the FFC SPA.

56. The confidence in the assessment is high (based on the criteria discussed in **ES Chapter 11 Offshore Ornithology** (document reference 6.1.11)). The evidence used to define the CRM input parameters presented in **ES Chapter 11 Offshore Ornithology** (document reference 6.1.11) and **Appendix 11.1 Offshore Ornithology Technical Report** (document reference 6.3.11.1) is of high applicability and quality. Whilst there is uncertainty around some of the input parameters (e.g. avoidance rate), the rates selected are considered to be sufficiently precautionary based on expert opinion to provide confidence that collision rates are not underestimated. Finally, the conclusion of the assessment is the same irrespective of whether the mean or upper 95% CI flying bird densities are used to calculate collision rates and increases in the baseline mortality rate of the background population.

57. For the purpose of this kittiwake compensation document, SNCB guidance is that compensatory measures should be based on the upper 95% CI collision rates. As such, a total annual collision rate for SEP and DEP of up to 24 birds per year is applied to the measures described in **Section 6**.

5.1.1.2 In-Combination

58. The total predicted annual in-combination collision mortality for breeding adult kittiwakes from the FFC SPA is 487.9 individuals. Between them, SEP and DEP contribute, based on the mean collision rates, 8.9 birds to this total, or 1.8%. The predicted in-combination mortality would increase the baseline adult mortality rate of the FFC SPA breeding adult kittiwake population by 3.2%.

59. The contribution of SEP and DEP to FFC SPA kittiwake mortality is small in the context of the overall in-combination impact of OWF collision; 1.7% of all predicted FFC SPA kittiwake mortality due to OWF impacts are due to DEP, and 0.2% due to SEP. However, despite the impacts being small, they contribute to the current situation, which is that the population is unable to be restored due to existing impacts. This situation is reflected in information presented in recent OWF examinations, such as Hornsea Project Three, Norfolk Vanguard, Norfolk Boreas, East Anglia One North and East Anglia Two.

60. As such, it is concluded that an adverse effect on the integrity of the FFC SPA cannot be ruled out as a result of predicted kittiwake mortality due to collision at SEP, DEP, and SEP and DEP combined, in-combination with other OWFs.

6 Compensatory Measures

6.1 Potential Measures Considered

61. Potential compensatory measures for kittiwake were considered in the **Annex 1A Initial Review of Compensatory Measures for Sandwich Tern and Kittiwake** (document reference 5.5.1.1), consulted on with the ETG in March 2021. This built on the measures that had been identified in Furness *et al.,* 2013, which were:

- Closure of sandeel and sprat fisheries in UK waters (i.e. prey enhancement);

- Provision of artificial structures for new kittiwake colonies; and
- A range of predator control measures including: mink eradication; feral cat eradication; rat eradication; fencing out foxes from colonies; and exclusion of great skuas.

62. From the evidence in Furness *et al.* (2013) in the context of FFC SPA and more recent literature, it was considered by the Applicant at this early stage that there were three potential compensatory measures that should be investigated further with respect to delivery by SEP and DEP (see **Annex 1A Initial Review of Compensatory Measures for Sandwich Tern and Kittiwake** (document reference 5.5.1.1 for details). These were:
    1. Construction of new artificial breeding sites for kittiwakes at sea;
    2. Construction of new artificial breeding sites for kittiwakes on the coast; and
    3. Adjustment of existing artificial nest sites to enhance breeding success of kittiwakes.

63. Prey enhancement (referred to at the time as 'habitat management plans to establish no-take zones for sandeel/sprat') was also identified as being potentially suitable at this stage, but was not short listed as a project-led measure, recognising that it would need to be delivered as part of a strategic approach by Government. Despite this, the Applicant engaged with Defra directly, and latterly with the OWIC Derogation Subgroup, to further explore how prey enhancement could be taken forward strategically with support from industry. The Applicant also undertook additional work (as summarised below) to update the ecological evidence base to support the suitability of such measures for kittiwake (also see **Strategic and Collaborative Approaches to Compensation and Measures of Equivalent Environmental Benefit** (document reference 5.8)).

64. Accounting for feedback received from stakeholders on the potential for each of these measures to be taken forward as compensation for SEP and DEP, the Applicant then commissioned a further review of compensation options (**Annex 1B Sandwich Tern and Kittiwake Ecological Evidence** (document reference 5.5.1.2)) aimed at supporting an objective evidence-based assessment of the emerging proposals. This included the measures and topics described in **Table 6-1**.

Table 6-1: Measures and Topics for Kittiwake Reviewed in the Sandwich Tern and Kittiwake Ecological Evidence Review

Potential compensatory measure addressed	Activity
Construction of new artificial breeding sites (or modification of existing) at sea	a. Review the scope for provision of artificial breeding sites for kittiwakes on offshore structures in the UK southern North Sea.
Adjustment of existing onshore artificial nest sites to enhance breeding success	b. Develop the case for improving existing onshore artificial structures for kittiwake breeding to increase breeding numbers and productivity.
Prey enhancement (habitat management plans to establish no-take zones for sandeel/sprat)	c. Review recent developments in evidence regarding the strategic reduction in sandeel fishing effort as a potential compensation measure for kittiwakes.

65. Following consultation with stakeholders on the review presented in **Sandwich Tern and Kittiwake Ecological Evidence** (**Annex 1B** (document reference 5.5.1.2)) (see **Annex 1D: Record of HRA Derogation Consultation**, document reference 5.5.1.4 for further details), 'nest site improvements to enhance breeding success', alongside prey enhancement as a strategic measure, emerged as the Applicant's preferred options for further development.

66. The compensatory measures were considered in the context of different delivery models, with those of relevance to kittiwake including strategic, collaborative and project-led measures. The delivery models reflect how the Applicant considers each measure could be most feasibly, effectively and proportionately delivered, relative to the Projects' predicted impacts. Of the potential compensatory measures considered further with respect to SEP and DEP:

- Prey enhancement through sandeel stock recovery and ecosystem-based management is considered by the Applicant to be the most effective means of increasing breeding success and therefore populations of kittiwake. This is evidenced by information presented in **Annex 1B Sandwich Tern and Kittiwake Ecological Evidence** (document reference 5.5.1.2) and **Section 6.3.1** below. However, as outlined in **Section 6.3.2**, this would necessitate, for example, a decision by Defra to legislate to reduce fishing pressure on sandeels in UK waters as strategic compensation for offshore wind, for which there is currently no agreed mechanism for delivery and which may not be achievable within the necessary timeframes for SEP and DEP. Given the huge potential of such an action to provide far greater compensation than even the most precautionary estimates of losses incurred due to SEP and DEP and offshore wind in total, prey enhancement is included as a key part of the Applicant's proposals for kittiwake compensation, but as a measure that could only be delivered strategically. Nonetheless, an option for the Applicant to pay a financial contribution towards the establishment of prey enhancement as a strategic compensation measure or as an adaptive management measure (should a mechanism become available within the necessary timescales for SEP and DEP) has been included within the **Draft DCO** (document reference 3.1). Further details are set out in the **Strategic and Collaborative Approaches to Compensation and Measures of Equivalent Environmental Benefit** (document reference 5.8); and
- Nest site improvements to enhance breeding success of kittiwakes is considered the most suitable measure for project-led delivery by the Applicant and is described in detail in **Section 6.4**.

67. Construction of new artificial breeding sites for kittiwakes onshore or offshore is considered to have some potential, however the Applicant is aware that several other developers have proposed and/or are in the process of implementing similar measures. Concerns have been raised by stakeholders around the potential for diminishing returns with an increasing number of new structures. As such these measures have been identified by the Applicant as having the potential to be

delivered as part of a collaborative delivery model, whereby the Applicant would seek to deliver this measure as compensation (or adaptive management) through a partnership arrangement with one or more other OWF developers. This measure represents an alternative option that would be delivered wholly or partly in place of the measures outlined above. To ensure this option is available to SEP and DEP, the Applicant has included wording to this effect within the **Draft DCO** (document reference 3.1). Further details are set out in the **Strategic and Collaborative Approaches to Compensation and Measures of Equivalent Environmental Benefit** (document reference 5.8).

68. **Table 6-2** provides a summary of the compensatory measures that are proposed by the Applicant for kittiwake alongside the intended delivery model.

Table 6-2: Summary of Compensatory Measures for Kittiwake and Delivery Model

Measure	Project-led	Collaborative	Strategic
Prey enhancement through sandeel stock recovery and ecosystem-based management			X
Nest site improvements to enhance breeding success	X		
Construction of new artificial breeding sites for kittiwakes onshore or offshore (as an alternative option to those outlined above)		X	

69. As outlined in **Strategic and Collaborative Approaches to Compensation and Measures of Equivalent Environmental Benefit** (document reference 5.8), the Applicant has also included within the **Draft DCO** (document reference: 3.1) the option for a contribution to be made to a Strategic Compensation Fund (such as the Marine Recovery Fund) wholly or partly in place of the Applicant's proposed measures outlined in **Table 6-2** or as an adaptive management measure. This option has been included in light of the emerging Offshore Wind Environment Improvement Package and Marine Recovery Fund which is expected to provide a viable strategic compensation funding mechanism within the necessary timescales for SEP and DEP and therefore could be relied upon to discharge its derogation requirements. The term 'Strategic Compensation Fund' is used to refer to the Marine Recovery Fund or any other equivalent funding mechanism that may be developed by Defra or an alternative government body for the purpose of delivering strategic compensation.

6.2 Summary of Discounted Measures and Rationale

70. For completeness, **Table 6-3** provides a summary of all of the kittiwake measures that have been considered by the Applicant during the pre-application process, but that were discounted, accounting for the feedback received from stakeholders.

Table 6-3: Kittiwake Discounted Measures and Rationale

Measure	Details	Rationale for discounting
Prey enhancement: fishery quota purchase	The Applicant considered the possibility of purchasing fishing quotas as a means of reducing fishing effort on key seabird prey species such as sandeel. This was presented as part of the Applicant's initial review of compensatory measures (**Annex 1A Initial Review of Compensatory Measures for Sandwich Tern and Kittiwake** (document reference 5.5.1.1)) for Sandwich tern, but is equally applicable to kittiwake.	Sandeel quota is not held by UK fishing vessels. The ability of the Applicant to purchase fishing quotas would also be dependent on fishermen with appropriate quotas being willing to sell.
Predator control measures including: mink eradication; feral cat eradication; rat eradication; and fencing out foxes from colonies.	As described in Furness *et al.* 2013.	Not suitable. Due to the nature of the sheer cliffs, mammalian predation is not deemed to be a significant problem at FFC SPA (see **Annex 1A Initial Review of Compensatory Measures for Sandwich Tern and Kittiwake** (document reference 5.5.1.1)).
Predator control measure: exclusion of great skuas	As described in Furness *et al.* 2013.	Not suitable. Great skuas do not breed at or near FFC SPA (see **Annex 1A Initial Review of Compensatory Measures for Sandwich Tern and Kittiwake** (document reference 5.5.1.1)).
Construction of new artificial breeding sites for kittiwakes onshore or offshore *as a project-led measure*	Not suitable at FFC SPA itself, however, construction of artificial breeding sites at suitable locations elsewhere on the east coast of England has been proposed by other OWFs as possible compensation for impacts on FFC SPA kittiwakes. That approach to compensation has been supported, with some reservations, by Natural England. Taken forward to the short list in the Applicant's initial review (**Annex 1A Initial Review of Compensatory Measures for Sandwich Tern and Kittiwake** (document reference 5.5.1.1)).	As described in **Section 6.1** above, these measures have been included in the Applicant's proposals under a potential collaborative delivery model only. With respect to new onshore/coastal sites, in their response to the Applicant's initial review (**Annex 1A Initial Review of Compensatory Measures for Sandwich Tern and Kittiwake** (document reference 5.5.1.1)), Natural England advised that "*there is limited scope for further creation of coastal artificial nest sites given that all projects since Hornsea Three have also included this as their main option. Thus, identifying suitable locations will now be a limiting factor.*" With respect to new offshore sites, in the same response, Natural England advised that it considered there was "*likely to be merit in exploring options to utilise existing marine structures in UK waters to*

Measure	Details	Rationale for discounting
		create artificial nest site". As a result, the Applicant undertook a review of the scope for provision of artificial breeding sites for kittiwakes on offshore structures (**Annex 1B Initial Review of Compensatory Measures for Sandwich Tern and Kittiwake** (document reference 5.5.1.1)). This review noted that, whilst it would be difficult to locate an offshore kittiwake colony in the southern North Sea without it being close to other OWFs, a site off Northumberland could provide good access to high densities of sandeels, and could be moderately distant from offshore wind farms. Subsequent to this the Applicant reviewed the existing structures off Northumberland that could provide a suitable opportunity for kittiwake compensation, which indicated a lack of such structures in this area. As such this option was not considered by the Applicant to present a credible option for delivery of compensation for SEP and DEP and was discounted as a project-led measure in favour of the nest site improvements described in **Section 6.4**.

6.3 Prey Enhancement through Sandeel Stock Recovery and Ecosystem-Based Management

6.3.1 Overview

71. Kittiwakes breeding at most colonies around the North Sea feed mainly on sandeels throughout the breeding season (Furness and Tasker 2000, Coulson 2011). Sandeel abundance strongly influences breeding success of kittiwakes (Frederiksen *et al.*, 2004, Cury *et al.*, 2011, Carroll *et al.*, 2017, Christensen-Dalsgaard *et al.*, 2018), and breeding success strongly influences whether kittiwake colonies increase or decrease in breeding numbers (Monnat *et al.*, 1990, Cadiou *et al.*, 1994, Coulson 2011, 2017).

72. In Shetland, kittiwake breeding success, and breeding numbers, decreased dramatically after the collapse of the Shetland sandeel stock (Furness and Tasker 2000). At Foula, kittiwake breeding success shows a strong relationship with Shetland sandeel total stock biomass. Kittiwake breeding success was much lower in most years of sandeel biomass below 40,000 tonnes but was high in almost all years when sandeel biomass was above that level.

73. Kittiwake breeding success has also been affected at the Isle of May, when the sandeel stock in that area (which is distinct from the sandeel stocks at Shetland or in the southern North Sea; Frederiksen *et al.*, 2005, ICES, 2017, Olin *et al.*, 2020) was heavily fished (Frederiksen *et al.*, 2004). Frederiksen *et al.* (2004) showed that breeding success of kittiwakes at the Isle of May (part of Forth Islands SPA) was on average 0.5 chicks per pair lower during years when sandeel fishing occurred in the area than it was in years with no sandeel fishing. Adult survival was also lower during years with sandeel fishing in the area (Frederiksen *et al.*, 2004).

74. Kittiwake breeding success and adult return rate from the previous year (an index of adult survival rate but not corrected for birds missed in that year but that returned in later years, so an underestimate of true survival) at the Isle of May, which is monitored every year by the United Kingdom Centre for Ecology and Hydrology (UKCEH), averaged 0.88 chicks/pair and 0.81 in 2011-2016 (data from UKCEH annual reports on Isle of May seabird studies) when the sandeel stock biomass in International Council for the Exploration of the Sea (ICES) Sandeel Area 4 (SA4) was generally above 200,000 tonnes, but averaged only 0.44 chicks/pair and 0.75 in 2004-2010 (data from UKCEH annual reports on Isle of May seabird studies), when sandeel stock biomass was generally below 200,000 tonnes.

75. The productivity of kittiwakes at FFC SPA is significantly correlated with sandeel stock biomass. The relationship found by Carroll *et al.* (2017) for kittiwakes at FFC SPA in relation to the sandeel stock in ICES North Sea sandeel management Area 1r ('Dogger Bank' and neighbouring areas) is similar to that previously identified elsewhere.

76. These studies, which have been reviewed in greater detail in **Annex 1B Sandwich Tern and Kittiwake Ecological Evidence** (document reference 5.5.1.2), provide evidence that measures to increase abundance of sandeels can be expected to result in an increase in breeding success, adult survival, and breeding numbers of kittiwakes in colonies within the area of the sandeel stock.

77. Measures that result in an increase in abundance of sandeels can therefore be considered to be targeted and likely to be effective.

78. Fishing on sandeels is one of the main factors that reduces the abundance of sandeels in the North Sea (Lindegren *et al.*, 2018 and reviewed in **Annex 1B Sandwich Tern and Kittiwake Ecological Evidence** (document reference 5.5.1.2)). Ecopath-Ecosim ecosystem modelling (Bayes and Kharadi 2022) concluded that a closure of the sandeel fishery in the North Sea would lead to a 40% increase in the biomass of the sandeel stock and a 42% increase in the number of seabirds within the first 10-15 years after closure of the sandeel fishery (Bayes and Kharadi 2022). That modelling did not separate out effects on kittiwake numbers from effects on all seabird species in general, but since kittiwakes are more dependent on sandeels for food than are many other seabird species (Furness and Tasker 2000), it is reasonable to expect that the increase in kittiwake numbers would be greater than that of some other seabird species. The Consultation Outcome summary of responses published by Defra (2022) stated that the introduction of new restrictions in the sandeel fishery "*could lead to positive ecological impacts by allowing these stocks to recover and support the health of the rest of the marine ecosystem*" with "*the bounce back of heathy fish, seabird and marine mammal populations*", further supporting the conclusion that this could be an effective strategic compensation mechanism, as also reflected by MacArthur Green (2022).

79. Lindegren *et al.* (2018) carried out a hindcast analysis of the Dogger Bank sandeel stock to assess the consequence of the high fishing mortality. They estimated that sandeel spawning stock biomass would have been about twice as large now as it is, if the fishery had maintained fishing mortality (F) at F=0.4 rather than at the levels of F=0.8 to 1.2 as seen during 1999-2009. Indeed, the stock would be even larger now if there had been no fishery harvesting sandeels, although Lindegren *et al.* (2018) did not report on that scenario. However, their results further support the conclusion that the high fishing mortality imposed on the sandeel stock has been a major influence on the abundance of the sandeel, and hence on the breeding success of kittiwakes. Lindegren *et al.* (2018) also identified influences of sea temperature and copepod abundance on the abundance of sandeels and suggested that long term trends in those drivers may inhibit recovery of sandeels if fishing pressure was reduced. In addition, severe reduction in forage fish stock biomass can lead to increased natural mortality that may inhibit recovery, and there is evidence of this with sandeel declines to low biomass (Saraux *et al.*, 2020).

80. At present, the Dogger Bank sandeel stock remains considerably below its long-term average abundance and is subject to a fishing mortality around F=0.6 (ICES 2020, 2021), a figure above the level tested in the scenario of Lindegren *et al.* (2018), and a figure which their scenario modelling clearly demonstrates has a negative impact on sandeel abundance. Indeed, at present the spawning stock biomass in this area is less than 10% of its highest historical level and is slightly below the limiting spawning stock biomass at which ICES should recommend closure of the fishery (B_{lim} of 110,000 tonnes SSB) because there is an increased risk of recruitment failure in this stock (ICES 2020, 2021).

81. Cury *et al.* (2011) used empirical evidence from several seabird-fishery interactions around the world to suggest that management should aim to keep food fish stocks such as sandeels above a threshold of one-third of their historical maximum

biomass in order to achieve good productivity among dependent seabird populations. The southern North Sea sandeel stock has fallen far below that rule of thumb management objective. Maximum total stock biomass in ICES area 1r was just below 2,000,000 tonnes during the 1980s at a time of high fishing effort, so likely to be reduced relative to unfished biomass (Lindegren *et al.*, 2018). Nevertheless, if we take 2,000,000 tonnes as maximum biomass for this stock, then the Cury *et al.* (2011) threshold to avoid impacts on dependent predators such as kittiwakes would be a fished total stock biomass of 666,667 tonnes. Using this rule of thumb, the sandeel fishery has been harvesting from a stock biomass that was below this threshold abundance in 13 of the 16 years between 2003 and 2018 (ICES, 2020).

82. This suggests that the continuation of the sandeel fishery is likely to continue to cause mortality of many thousands of kittiwake chicks per year compared to a scenario with no fishing of the sandeel stock. It also identifies that the single most effective practical management action to assist the kittiwake population would be closure of the sandeel fishery (Carroll *et al.*, 2017, Lindegren *et al.*, 2018, Wright *et al.*, 2018).

83. Sandeel management in the North Sea aims to avoid reducing spawning stock biomass below a threshold at which future reproduction of sandeel might be compromised, but does not aim to keep sandeel biomass above the threshold needed to support good breeding success of dependent seabirds such as kittiwake. As a result, in recent years, sandeel spawning stock biomass in ICES Sandeel area 1r has been well below the 'one-third for the birds' threshold identified by Cury *et al.* (2011) as a basis for ecosystem-based management. In reviewing this fishery management and implications for seabirds, MacArthur Green (2021) concluded that continuation of sandeel fishing under existing ICES management advice is likely to have an adverse impact on kittiwake numbers and demography at colonies in the east of England.

84. The recently published ICES report on sandeel stocks in the North Sea (ICES, 2022) provides clear evidence that management of this fishery is putting at risk not only the sandeel stock as a sustainable resource, but also dependent predators in the ecosystem such as sandeel-dependent seabirds. In 2021, ICES advised that the sandeel Total Allowable Catch (TAC)) in ICES 1r should be less than 5,464 tonnes and the TAC agreed was 5,351 tonnes (ICES, 2022). However, the catch taken was 16,944 tonnes (ICES 2022), nearly three times the size of the agreed TAC. This failure to comply with established TAC limits is unexplained in ICES (2022). The short-term forecast of the latest stock assessment is that even fishing mortality of zero in 2022 will result in the SSB being below the minimum precautionary limit of spawning stock biomass considered by ICES to be capable of still producing adequate numbers of young fish (B_{pa}). On that basis a TAC of zero should be set. However, despite the depletion of this stock in 2021, ICES recommend a catch of 5,000 tonnes in 2022 to ensure that further monitoring of the stock biomass is possible. There is no explanation of why 5,000 tonnes of sandeel are required to permit monitoring, but the fishing in excess of the appropriate TAC in 2021 and setting a TAC 5,000 tonnes above the limit that is considered to risk damage to stock recruitment risks further depletion and failure of the depleted spawning stock to produce future cohorts.

6.3.2 Delivery Mechanism

85. The most effective way to allow sandeel stocks to recover is to change sandeel management. Normal management is for ICES to advise on appropriate quotas for sandeel harvest based on the objective of not depleting spawning stock biomass below B_{lim} which is the spawning stock biomass below which future recruitment of sandeels becomes increasingly at risk. One delivery mechanism could be a change in ICES advice to shift to ecosystem-based management rather than an objective to maximise sustainable yield of sandeel. Adopting ecosystem-based management that recognises threshold abundances of forage fish needed to sustain dependent predators has been advocated for forage fish fisheries globally, including North Sea sandeels (e.g. Hill *et al.*, 2020). Nevertheless, such a change can be considered as compensation in that it represents change 'over and above' normal management practiced throughout the history of this fishery and remaining in place at the present time.

86. In view of the large numbers of kittiwake chicks dying at FFC SPA as a consequence of reduced abundance of sandeels due to fishing impacts, there is evidently scope for compensation through either reducing fishing effort directed at sandeels, or through closing areas within the main foraging range of this kittiwake population to sandeel fishing. ICES promotes 'ecosystem-based management' of fish stocks. However, their management of the sandeel stock has recently been criticised as not being 'ecosystem-based' because it sets a quota only on the basis of sustaining the sandeel stock and not on the basis of the needs of higher trophic level predators such as kittiwakes (Hill *et al.*, 2020). ICES should therefore be highly receptive to the need to better manage that sandeel stock to avoid adverse impacts on kittiwakes and other top predators.

87. An alternative delivery mechanism could be a strategic decision by Defra to legislate to reduce fishing pressure on sandeels in UK waters as strategic compensation for offshore wind. An extension to a proposed fisheries management area or a new proposal to provide protection through closure to fishing for sandeels would need to be facilitated by the UK Government in allocating appropriate powers to a relevant management body and, potentially, through the delivery of legislation to secure the necessary powers.

88. Of these two different delivery mechanisms, the Applicant considers that the more suitable as compensation would be a strategic decision by Defra to legislate to reduce fishing pressure on sandeels in UK waters as strategic compensation for offshore wind. Creating a change in ICES policy would require international agreement that may be difficult to achieve.

89. Key stakeholders (Natural England and RSPB), engaged through the Projects' EPP, have expressed significant support for tackling the pressure on seabird prey resources as a form of compensation for offshore wind. This is not only reflected in **Annex 1D Record of HRA Derogation Consultation** (document reference 5.5.1.4) also within submissions from interested parties during examination and determination of the Hornsea Project Three, Norfolk Vanguard, Norfolk Vanguard, East Anglia One North and Two DCOs.

90. Closing sandeel fisheries has also been proposed by Berwick Bank Offshore Wind as a compensation measure (BBC 2022). According to BBC (2022) SSE stated "*We*

think that it's important that we manage the sandeel fisheries carefully to allow enough prey for the seabirds and to allow for offshore wind development, which is key to addressing the climate emergency which also sits behind the decline in seabird numbers. We recognise that there might be an impact from an offshore wind farm on birds but we know that the bigger impact is caused by climate change".

91. It has also been raised in relation to the Hornsea Project Four DCO examination with Natural England stating that "Natural England have long held the view that a primary pressure acting on English seabirds, and especially kittiwake, is the reduction in prey availability associated with commercial fisheries targeting forage fish (notably sandeels). A number of reviews have concluded that improving prey availability is likely to be the most effective way of compensating for offshore wind impacts on seabirds. However, forage fish management is highly complex, and an ecosystem-based approach is needed to safeguard sufficient prey resources for seabirds, whilst reducing the risk of unintended consequences (e.g. pressure on other fisheries). Nevertheless, improving the amount of prey remains the single strategic measure most likely to deliver significant benefits to FFC SPA seabird populations. We highlight that prey availability measures would also have the additional benefit of addressing the effective habitat loss that could result from auk displacement, by increasing the foraging resource within those areas that remain available." (Natural England, 2022).

92. Given the acknowledged and significant potential of such an action to provide far greater compensation than even the most precautionary estimates of losses incurred due to SEP and DEP and offshore wind in total, prey enhancement measures could form a valuable part of the compensation proposals for SEP and DEP, but as a measure that could only be delivered strategically. Nonetheless, an option for the Applicant to pay a financial contribution towards the establishment of prey enhancement as a strategic compensation measure has been included within the **Draft DCO** (document reference 3.1). Further details with respect to this are set out in **Strategic and Collaborative Approaches to Compensation and Measures of Equivalent Environmental Benefit** (document reference 5.8).

6.4 Nest Site Improvements to Enhance Breeding Success

6.4.1 Overview

93. The Hornsea Three OWF project is developing proposals for constructing new artificial colonies for kittiwakes at sites in the vicinity of Lowestoft to Sizewell, and the Tees Estuary to the south of Seaham. Similar structures, in the same part of England, have been proposed as compensation by other OWF projects, including Norfolk Vanguard, Norfolk Boreas and East Anglia One North and Two. At the time of writing, compensation for kittiwakes is being taken forward by all of these projects (although consent has not yet been granted for Hornsea Four).

94. There is a limit to how many sites would be satisfactory locations for new artificial colonies of kittiwakes, but there is also a limit to how many immature prospecting kittiwakes will be available to take advantage of such opportunities. Although there clearly is a pool of immature kittiwakes seeking to recruit into colonies, the size of that pool is uncertain. Therefore, other possible, and complementary, approaches to increasing productivity of kittiwakes should be explored. One obvious approach

would be to enhance existing artificial structures in order to increase breeding success achieved by kittiwakes using those structures, as a compensatory measure that would be complementary to increasing breeding numbers on new artificial structures. One objective of such an approach would be to achieve an immediate increase in breeding success that would then provide increased numbers of potential recruits to fill spaces in the new artificial colonies that may soon be constructed by other developers. Getting birds to move from failing nest sites on buildings to enhanced nesting ledges on the same or nearby building will be likely to occur immediately. For example, six extra ledges of the type proposed were put onto the British Telecom (BT) building in Lowestoft in mid-May 2021 and were already adopted by about 20 pairs of kittiwakes before the end of May, which number had increased to 40 pairs (but only 33 nests in which breeding took place because these ledges were put up after the kittiwake breeding season was already underway) by 20 June 2021 (MacArthur Green 2021b). Because kittiwake breeding numbers are increasing at Lowestoft and the Tyne and increasing numbers of building owners are deploying deterrents to remove nesting kittiwakes so are impacting their breeding success, this approach will provide a quick boost to breeding success at one or both of these locations.

95. As far as the Applicant is aware, this approach has not yet been proposed by any of the OWF developers that have been required to consider provision of compensation for kittiwakes to date. But in principle, an adaptation to an existing structure that increased breeding success could be a greater contribution to kittiwake conservation than provision of new structures if those new structures achieved no greater breeding success than currently achieved by kittiwakes already nesting on existing artificial sites. Adaptations to existing artificial structures that increased breeding success of kittiwakes in a population could be a significant contribution to kittiwake conservation that would be complementary to provision of new structures and would reduce risk that the pool of site-seeking immatures might be depleted by overprovision of new sites in a short timescale.

96. Allowing increased breeding success on structures that avoid conflict with local people where kittiwakes nest on buildings where they are not welcome could not only provide compensation by increasing productivity of the population, but could also reduce conflict by allowing birds to move off structures (or areas of those structures) where they are being prevented from breeding successfully as a result of deliberate actions to deter or prevent kittiwakes from nesting. This would be, for example, very well aligned with the Lowestoft Kittiwake Partnership ‘vision, objectives and outputs’ dated March 2022.

97. Breeding success of kittiwakes can be highly variable. When the sandeel stock at Shetland collapsed in the 1990s, kittiwake breeding success fell to close to zero in most years and breeding numbers fell by over 90% (Frederiksen *et al.* 2005, Heubeck *et al.* 2015). However, in locations where food supply has been good, there is little or no impact from human disturbance or from predators such as large gulls or crows, and weather conditions are favourable, breeding success can reach 1.4 to 1.6 chicks per nest (Coulson 2011). Efforts to improve sites should therefore focus on locations where the potential for high breeding success is good but where constraints due to human actions or site design would limit the success achieved. This indicates that such measures may be fruitless in locations such as Shetland

where breeding success is limited by low food availability, but could be highly successful in locations such as Lowestoft or the Tyne where breeding success tends to be high except at certain sites where birds are deliberately deterred by people who do not want these birds at particular locations or buildings.

98. Kittiwake breeding numbers tend to increase at colonies where breeding success is high, because immature kittiwakes and failed breeders prefer to recruit into more productive colonies or nest sites and visit colonies/nest sites to assess their productivity before selecting and acquiring a nest site (Monnat *et al.* 1990, Cadiou *et al.* 1994, Coulson 2011, Ponchon *et al.* 2015, 2017, Coulson 2017, McKnight *et al.* 2019).

99. At some colonies the breeding success of kittiwakes on some nest sites is impaired by the nest sites being of low quality (e.g. exposed to direct sunshine, exposed to risk of wave action or sea spray, exposed to rain and wind, open to access by predators, or on sites where human disturbance or deterrence from nesting may impact breeding success). Higher breeding success could be achieved for the colony as a whole if kittiwakes were provided with higher quality nest sites that allowed them to move from unsatisfactory nest sites to better ones, which they will naturally do as kittiwakes will return to the same nest site year after year if that site is successful but are likely to move to a new nest site if their nest site tends to be unsuccessful (Coulson 2011).

100. At Lowestoft, kittiwake breeding numbers increased from 185 AONs in 2010 (JNCC 2022) to 390 AONs in 2017 (CH2M 2017), 446 AONs in 2018 (JNCC 2022) and 700 AONs in 2021 (MacArthur Green 2021b). In 2017, kittiwakes nested on 13 different structures/buildings in Lowestoft (CH2M 2017). In 2021 kittiwakes nested on at least 45 different structures/buildings in Lowestoft (MacArthur Green 2021b). If this population growth continues, the birds are likely to colonise many more sites in the town. As the birds spread, they become increasingly likely to colonise sites where they are unwelcome, resulting in owners using deterrent measures to prevent kittiwakes from nesting, or potentially even destroying active nests.

101. For example, while there were 36 nests on the Columbus Building in 2017 (CH2M 2017) there were only two there in 2021 after the frontage had been redeveloped to exclude kittiwake nests (MacArthur Green 2021b). While there were 34 nests on the building above Papa John's at Station Square in 2019 (based on Google streetview observations) there were only eight there in 2021, all eight being on a small remaining part of the building not covered with exclusion netting (MacArthur Green 2021b). While there were 49 nests on the BT building in 2017 (CH2M 2017), there were only 33 there in 2021, with most of those nests relocated onto newly established artificial ledges put up in May 2021 (MacArthur Green 2021b). The common feature in the decline in breeding numbers on these particular buildings is that each was covered with bird-exclusion netting to prevent kittiwakes from returning in spring to their established nest sites. Birds prevented from nesting may have achieved zero breeding success, or may have moved to breed elsewhere, but the outcome for these pairs from year to year is unknown because these birds are not individually ringed.

102. Breeding success of kittiwakes at Lowestoft in 2021 nesting on Our Lady Star of the Sea Roman Catholic Church averaged 1.38 chicks per nest for a sample of 175 nests (MacArthur Green 2021b) and this provides a useful benchmark for the

population because nests on the church were not subject to any deterrence or human disturbance. However, kittiwakes nested in 2021 on several buildings where deterrence was practiced. At the BT building where the traditional nest sites were netted off before the birds returned, 33 nests produced only 28 chicks, despite being provided (late in the season) with new nesting ledges. In London Road North 16 nests produced only six chicks and it was evident that several nests had been subject to deterrence. In Commercial Road, 15 nests on three buildings produced only seven chicks, where it was again evident that several nests had been subject to deterrence. In Surrey Street two nests on one building disappeared so produced no chicks. In total these 66 nests that were subject to deterrence of kittiwake nesting achieved breeding success of 0.6 chicks per nest (largely due to BT's new ledges providing a new safe nesting place). However, if these pairs had achieved the same breeding success as the birds on the church, there would have been 50 more chicks produced than there were.

103. Provision of artificial ledges by BT on a part of the building where the kittiwakes are welcome, to offset the exclusion of birds from window ledges on another face of the building, represents an example of how small changes can solve a 'problem' as well as benefit kittiwakes.

104. Another example of minor adaptation that could be highly beneficial is the Saltmeadows tower at Gateshead. That structure has three identical faces, each with ledges for kittiwake nests. However, kittiwakes avoid nesting on the south-facing face, and achieve lower breeding success on that face. All faces are identical in size and construction details, so only the orientation differs. In 2021, the Northumbria Ringing Group ringed kittiwake chicks on the Saltmeadows tower on 5 July. They found 14 chicks in nests on the south face, but 155 chicks on nests on the other two faces (Andy Rickeard, in litt.). The east and west faces of the tower have very little capacity for any increased number of nests, so the potential for further increase at this site is likely to be on the south face, which is evidently less suitable.

105. Conflict between people and kittiwakes occurs not only in Lowestoft, but also in other locations where there are urban-nesting kittiwakes, such as the Tyne (MacArthur Green 2021b) and Scarborough. Adapting sites to allow kittiwakes to achieve higher breeding success where they are welcome would therefore help to reduce conflict where they are unwelcome (because over time birds will relocate from sites where their breeding success is reduced by human actions to sites where they can achieve higher success) as well as to provide compensation by increasing the output of young kittiwakes.

106. At Newcastle Quayside, kittiwakes have been excluded from nesting or deterred by exclusion netting, electric shock wires and other deterrents. These have not all been successful but have reduced breeding success of kittiwakes on some buildings. For example, kittiwake nests on Vermont Hotel and Vermont Aparthotel buildings disappeared during the incubation period, resulting in zero breeding success of those pairs (MacArthur Green 2021b). Provision of increased numbers of optimal nesting ledges at Saltmeadows tower, which is within sight of the Newcastle Quayside buildings, could not only increase chick production but also help to reduce conflict where kittiwakes are attempting to spread onto buildings where they are

unwelcome and where their breeding success, and possibly survival, are at risk from human actions.

6.4.2 Delivery Mechanism

107. The successful creation of narrow ledges on one wall of the BT building in Lowestoft to provide high quality nest sites for birds that were unable to breed on established nest sites from which they had been excluded by netting provides a good example of how availability of high-quality nest sites can be modified on existing structures.

108. Two mechanisms are proposed that would each be capable of delivering the necessary compensation:

1. To provide kittiwakes with nesting ledges on areas of buildings where they can relocate to avoid the deterrence to which they are currently being subjected; and/or
2. Adjustment to existing structures where there is evidence that alteration of the design can significantly increase kittiwake breeding success.

109. There is scope for sufficient compensation to be provided either through provision of nesting ledges, or adjustment to existing structures (see further details in **Section 6.4.3** and **Section 6.4.4**).

6.4.3 Scale

110. The impact of SEP and DEP on kittiwake adults from FFC SPA has been estimated to be nine kittiwakes per year, with the upper 95% CI of 24 birds per year (**Section 5**). On the basis of the demographic parameters of kittiwakes in the North Sea (adult survival 0.854, juvenile survival 0.79, age of first breeding four years; Horswill and Robinson 2015), two fledglings would be required, on average, to give rise to one adult surviving to recruit into a local colony at four years of age. Therefore to compensate for the loss of 24 adults per year, increased production of at least 48 chicks fledged per year is required. With typical breeding success of about one chick per pair at colonies such as Lowestoft and Tyne, an extra 48 chicks per year could be achieved by facilitating the move of 48 pairs of kittiwakes from nest sites that fail to nest sites that achieve average breeding success. Key to this is that birds that are excluded or fail completely are most likely to move nest site (Coulson 2011).

111. Some of the new optimal sites may be taken by birds moving from sites that are suboptimal but do not fail completely. If in a hypothetical (and likely unrealistic) worst-case scenario, all birds that moved onto optimal sites were from sites that could achieve half the success rate of good sites (i.e. about 0.5 chicks per nest) then to achieve compensation the number of birds on the new optimal sites would need to be double that required if breeding success was increased from zero to one chick per nest. Therefore, in this hypothetical worst-case scenario, 96 pairs of kittiwakes breeding on the new optimal sites would achieve sufficient compensation. However, in practice, it is much more likely that birds that move onto new sites will be the ones that are excluded or are failing completely (Coulson 2011), rather than birds that achieve production as high as 0.5 chicks per nest.

112. It is important to avoid the likelihood of over-compensating for the predicted impacts at potential detriment to future projects, with those predicted impacts already being

based on the precautionary upper 95% CI. It is likely that impacts of OWF will prove to be much less than the precautionary estimates derived by following SNCB guidance. For these reasons the target of replacing 48 failing nest sites with 48 optimal nest sites is considered to be a sufficient and appropriate scale of compensation for SEP and DEP.

113. The scale of compensation required will also be influenced according to when it will be possible to implement the measures i.e. it may be necessary to account for any accumulated deficit if measures cannot be implemented sufficiently in advance of SEP and DEP becoming operational. As such, sufficient flexibility has been designed into the proposals such that they can be readily adapted to suit the scale of compensation needed (see further discussion in **Section 6.4.6**).

6.4.4 Location

114. Based on evidence in MacArthur Green (2021b), the target of replacing 48 failing nest sites with 48 optimal nest sites (as set out in **Section 6.4.3**) could be achieved by providing:

- Ledges of the style used at BT Lowestoft at two of the dozen or so buildings at Lowestoft where neighbouring nests are failing due to exclusion netting deployment and other forms of deterrence; and/or
- A new north/north-east and/or north-west-facing surface at the Saltmeadows tower in Gateshead.

115. There is, therefore, scope for sufficient compensation to be provided at a subset of the potential sites, at Lowestoft and/or at the Saltmeadows tower in Gateshead.

116. The following sections provide some examples of potential sites or buildings. Note that each one of the potential examples outlined would provide more compensation than required. Following the detailed design process to be undertaken post-consent (see **Section 6.4.5** and **Section 6.4.8**), it is anticipated that some of the examples will be found to be impossible to put into effect (for technical or commercial reasons for example), but any one case would provide the necessary compensation.

117. The Applicant considers that the Lowestoft Kittiwake Partnership would be best placed to identify priorities in this regard in Lowestoft and, if this option were to be taken forward, would seek to work with them to achieve gains. The Applicant continues to engage with the Lowestoft Kittiwake Partnership and, in July 2022, initiated a pre-application consultation with East Suffolk Council in order to get the council's views on initial site selection work undertaken on potential sites and buildings (see **Annex 1D: Record of HRA Derogation Consultation** (document reference 5.5.1.4) for further details). However, discussions are also being progressed with Gateshead Council regarding the enlargement and enhancement of the Saltmeadows tower structure. That action alone has the potential to provide considerably more compensation gain than required.

6.4.4.1 Potential Locations at Lowestoft

118. Several suitable sites for enhancing kittiwake nesting opportunities exist on buildings in Lowestoft and selection of the best site(s) to develop will depend on discussions with owners of the relevant buildings and the local authorities. However,

to indicate the potential some examples are given below, though since exact sites to deliver this compensatory measure are yet to be secured, the identities of the sites and/or buildings have not been provided at this stage. The examples provided are indicative of the principle but are not yet preferred options. As indicated above, there are about a dozen sites in Lowestoft where provision of optimal nest sites could be carried out and doing so at two of these sites could provide the necessary level of compensation.

119. One potential site for such improvements is the east-facing side wall of a large public amenity building. That site held a few nests in 2021 but the sheer brick wall lacks ledges so is mostly not suitable for kittiwakes. In contrast, 15 pairs nested on the ornate façade at the front of the building and seven pairs on an adjacent house front. Construction of ledges similar to those on the BT building, on the brick wall at the rear of the east side of the building, could provide nest sites for a larger number of kittiwakes in a location that would be less intrusive than is currently the case and where high breeding success can be anticipated. It should be possible to provide ledges that could accommodate about 50 pairs of kittiwakes on this wall, in an area that is distant from houses or shops and so would minimise nuisance to local residents.

120. Another nearby building that holds a retail premises has had exclusion netting placed on most of the front of the building and kittiwakes have been displaced. However, the north-east facing gable end is a window-less sheer wall of brick, so could potentially accommodate kittiwakes if BT-style ledges were added high up on that wall. In such a location the birds would be unlikely to be a nuisance for customers as they would be round the corner and high up, well away from the access to the premises. Ledges on the end of that building could potentially hold about 50 pairs of kittiwakes on nest sites that would avoid the conflict that is occurring along the street frontage of buildings and adjacent streets.

121. There are several warehouses and other industrial buildings in Lowestoft with east-facing sides, and some of these appear to be highly suitable for installing ledges of the sort deployed on the BT building. Some of these buildings already have kittiwakes nesting on window ledges, so it is highly likely that birds would move onto suitable new ledges on parts of these buildings away from windows, where the birds would represent less of a nuisance. It should be possible to provide ledges that could accommodate about 50 to 150 pairs of kittiwakes on these buildings.

122. It might also be possible for repairs to a local recreational facility to provide spaces for more kittiwake nests on part of the structure away from the area most used by people. Alternatively, a new section of the existing structure with nest sites for kittiwakes could be installed. Birds displaced off buildings in Lowestoft town centre would be likely to adopt those improved sites, reducing conflict in town and increasing overall breeding success of these kittiwakes. It should be possible to create at least 60 new kittiwake nest sites at this location by adding suitable ledges following the recommendations in MacArthur Green (2021b).

6.4.4.2 Gateshead

123. Enlargement of the Saltmeadows tower to add another section with one or two north/north-east or north-west-facing sides would allow numbers of kittiwakes

nesting there to increase and to achieve higher productivity than on the existing south face. The difference in output seen in 2021 suggests that replacing the south face with similarly-sized new faces oriented north/north-east and/or north-west could increase chick production by about 140 chicks per year on this structure, and therefore would be able to more than compensate for the predicted impacts of SEP and DEP.

124. At least seven kittiwake nests on buildings at Newcastle appeared to have been subject to deterrence during late May or early June 2021, so achieved zero breeding success. In addition, several nests were lost or failed on buildings where the nests were built in or through exclusion netting. Either those nests were destroyed or perhaps more likely movement of the netting on windy days dislodged the nests from the ledge. Anti-kittiwake measures therefore seem to have led to breeding failure of at least ten, possibly as many as 20 pairs in Newcastle in 2021, in what was otherwise a particularly successful breeding season for kittiwakes on the Tyne (MacArthur Green 2021b). In addition, nests exposed to direct sunshine produced on average 0.24 fewer chicks per nest than nests not exposed to direct sunshine (MacArthur Green 2021b). Over 130 nests were scored as being subject to direct sunshine (MacArthur Green 2021b). Providing opportunities for kittiwakes at nest sites subject to deterrence and exposure to direct sunshine can therefore be expected to increase breeding success of these birds when they relocate to the improved sites. Birds that had failed could increase output by about 1 to 1.3 chicks per nest. Birds exposed to direct sunshine that move to these improved nest sites could increase output by about 0.24 chicks per nest. With a need for compensation to increase chick output by at least 48 extra chicks per year, it would require 48 pairs to move from sites where deterrence was causing breeding failure, or 200 pairs to move from sites affected by direct sunshine, or some combination of these two. With over 100 nests on the two better faces of the Gateshead Saltmeadows tower in 2021, this number could clearly be accommodated easily on new faces of similar total area added to the existing structure in an appropriate orientation. There is adequate open ground belonging to Gateshead Council at the tower to make this addition possible.

6.4.5 Outline Design Details

125. MacArthur Green (2021b) provides several recommendations regarding the design of artificial breeding sites for kittiwakes:

- Any new sites developed as breeding colonies for kittiwakes should aim to provide nesting ledges that are between 80mm and 150mm wide, and no more than 200mm wide;
- Several rows of ledges would be preferable to a single row, as kittiwakes benefit from nesting at high density. However, it would be desirable to design structures to reduce risk that birds nesting on lower ledges will be fouled by excrement ejected by kittiwakes on ledges higher up. That might be achieved by having a stepped structure with the lower ledges recessed relative to the ledges above, or a back wall angled outwards at few degrees from the vertical. Such a design could also increase shelter from rain, wind, sun and predators;

- The location should be selected to ensure shelter from waves or sea spray during storms;
- Direct access for the birds to the sea would be desirable, but seems not to be essential as kittiwakes will nest on artificial structures hundreds of metres inland. However, since 'clubs' of immature birds tend to gather close to existing colonies, locating new sites near to existing colonies would be likely to result in faster colonisation of a new site;
- Shelter from direct sun should be provided, either by selecting north, north-east or north-west-facing sites for artificial ledges, or by providing a large overhanging roof;
- Shelter from crow and large gull access should be designed into the structure. That could be achieved by providing a large overhanging roof, but is also inherent in narrow ledges;
- Shelter from rain should be designed into the structure. Where possible, that could be achieved by providing a large overhanging roof;
- Any new site should be constructed to minimize risk that kittiwake nests could be accessed by fox, mink or rat;
- Construction material may be stone, brick, concrete, timber and even tyres, as kittiwakes seem content to nest on all of these. Metal may be suitable too, providing the site is sheltered from direct sun to avoid it overheating, but metal should certainly be avoided if it might be in direct sunshine;
- Ledges can be continuous without breaks, as on the Saltmeadows tower, but having stops built into ledges every 1.5m or so may be beneficial, as kittiwakes often select nest sites against a side wall. Side walls are likely to further increase protection of the nest site against crows, large gulls, fulmars, pigeons, and mammals such as rats; and
- Kittiwakes are highly tolerant of human activity and noise around their nests, so sites do not need to be away from human activity and could be compatible with industrial activity, but the noise and mess made by kittiwakes means that sites away from human residential, commercial or business areas would be preferable.

126. In line with these recommendations, the Applicant considers that ledges (between 80 and 150 mm wide) to be installed on existing structures in Lowestoft could be based on the successful design used on the BT building. Ledges can be made of marine ply or pressure-treated softwood, screwed into the retaining wall. The length of the ledge is a determining factor in how many nests it would be able to support, with kittiwakes preferring to be very close to neighbours on either side. Approximately five to ten nests per ledge is a reasonable guide to what might be expected i.e. for 48 new nests on optimal sites between five and ten ledges would be required. As an example, a typical bedroom window ledge on a terraced house will hold two or three nests. Meanwhile, there is only a single ledge on the Dean Street railway bridge site on the Tyne but it holds approximately 80 nests. There are

about six ledges put on the Lowestoft BT building in 2021 which held 33 nests within weeks of being put up, equating to about five nests per ledge, but with space to fit up to ten nests per ledge.

127. The Applicant has held preliminary discussions with Gateshead Council ecologists (**Annex 1D Record of HRA Derogation Consultation** (document reference 5.5.1.4)) and has considered alterations to the Saltmeadows tower to add up to two new faces, oriented north-east and/or north-west, but similar in size and design to the existing three faces on the current structure. Consultation with Gateshead Council has indicated that it may be necessary to move the existing tower slightly further back from the quay wall from its current position to ensure that visual monitoring observations are still able to be made following the alterations and that access is maintained for ringing purposes. This will be further explored with the Council as the proposals are developed.

128. Given that the proposal for making nest site improvements for kittiwakes has been demonstrated to be feasible from an ecological perspective at a range of sites and locations, the detailed design of any such improvements will be developed at a later stage and agreed through the Kittiwake CIMP (see details in **Section 6.4.8**). This will enable the detailed plans to account for the specifics of the selected site location, the status of any other similar plans or proposals for kittiwake compensation in that location, and other relevant points of detail including the final scale of compensation to be provided.

129. Examples of key considerations at the detailed design stage include:

- Confirmation (where relevant) of the location, size and scale of modifications;
- Dimensions;
- Materials;
- Installation requirements;
- Maintenance, security and monitoring requirements to be built into the design; and
- Incorporation (where relevant) of any ‘added value’ measures into the design, such as public information boards.

6.4.6 Timescales

6.4.6.1 Timescale to Achieve Compensation

130. Kittiwakes start to breed on average at four years old (Horswill and Robinson 2015). The proposed compensation for increased mortality of adult kittiwakes involves increased production of young birds, and so in order to avoid a delay in providing compensation, measures to increase breeding success should ideally be in place four years before the wind farm becomes operational. However, increasing the scale of compensation can readily be used to offset any accumulated deficit that might result in the first years if measures cannot be implemented this soon. Such flexibility is a key benefit of the proposed measure, whereby relatively straightforward adjustments can be made to the scale of compensation as required. This is particularly useful in responding to the inherent uncertainties in the development

programme for a major infrastructure project such as SEP and DEP, as well as any uncertainties in how quickly the measures themselves can be agreed and implemented.

131. Based on the current project programme (see **Section 6.4.8**), the Applicant intends to implement the measures as soon as possible, but at least three breeding seasons prior to first power. Subject to obtaining the necessary permissions, it is considered highly likely that measures could be implemented sooner than this, noting the relative simplicity of the measures in design and implementation.

132. The proposed compensatory measures will boost breeding success of kittiwakes that move from failing nest sites on structures where they are unwelcome, or where they are exposed to detrimental environmental conditions, to these new or adjusted sites where they can achieve high breeding success. In Lowestoft in particular this commitment responds to any concern around there being a limit to how many immature prospecting kittiwakes will be available to take advantage of such opportunities (although in reality, and as set out in **Section 6.4.1**, the proposed measure is simply seeking to encourage kittiwakes to move from nest sites that fail to new nest sites nearby designed to achieve average breeding success, rather than being focussed on the existing pool of site-seeking immatures). As described in **Section 6.4.1**, this approach would achieve an immediate increase in breeding success that would then provide increased numbers of potential recruits to fill spaces in the new artificial colonies that may soon be constructed by other developers.

133. Nevertheless, **Table 6-4** illustrates the theoretical accumulated deficit where the measures are implemented less than four seasons prior to first power and how any such deficit could be offset by making a simple adjustment to the scale of compensation, such that the necessary level of compensation would still be delivered over time. Blue shading indicates where compensatory measures have been implemented prior to operation, green shading indicates where compensation is being delivered with no deficit and grey shading indicates where compensation is being delivered with a potential deficit arising due to the measures having been implemented less than four years prior to operation. In the example given, an increase in the scale of the compensation resulting in an annual 25% increase in production (equating to 12 birds) is capable of offsetting an accumulated deficit by the second year of operation, assuming measures are in place three years before first power rather than four (as is proposed). After that point the scale of compensation could in theory be reduced, although in practice measures would likely remain in place and therefore be providing more than the minimum scale of compensation required.

134. Any requirement to increase the scale of compensation, as well as steps to reduce it again once any deficit has been reduced to zero will be confirmed through the suggested programme of monitoring and adaptive management and agreed with the Kittiwake Compensation Steering Group (KCSG), as set out in **Section 6.4.7**.

Table 6-4: Timescale to Achieve Compensation and Offset of Any Accumulated Deficit

Year	Scenario and theoretical increased production / accumulated deficit		
	4 years before first power	3 years before first power, no increase in annual compensation	3 years before first power, 25% increase in annual compensation
4 breeding seasons before first power	48 / 0 (increased production / deficit)	-	-
3 breeding seasons before first power	48 / 0	48 / 0	60 / 0
2 breeding seasons before first power	48 / 0	48 / 0	60 / 0
1 breeding season before first power	48 / 0	48 / 0	60 / 0
Year 1 of operation	48 / 0	48 / 48	60 / 12
Year 2 of operation	48 / 0	48 / 48	60 / 0
Year 3 of operation	48 / 0	48 / 48	48 / 0
Year 4 of operation	48 / 0	48 / 48	48 / 0
Year 5 of operation	48 / 0	48 / 48	48 / 0
Year 6 of operation	48 / 0	48 / 48	48 / 0
Year 7 of operation	48 / 0	48 / 48	48 / 0

6.4.6.2 Other Timing Considerations

135. The works, whether the installation of nesting ledges on buildings or the adjustment of existing structures, would be undertaken outside of the kittiwake full breeding season (March to August inclusive at Lowestoft and Gateshead) to avoid disturbance to existing nesting activity and to allow birds to choose a suitable nesting site from those newly installed or adjusted, from the start of the breeding season.

136. Further information on the timescales for implementation and delivery of the compensation is provided in **Section 6.4.8**.

6.4.7 Monitoring, Maintenance and Adaptive Management

137. The numbers of kittiwake nests and breeding success achieved at these nests will be monitored. This will be carried out annually following standard monitoring procedure "Productivity-monitoring method 2" as recommended by Walsh *et al.* (1995)). This involves a count of AONs in late May or early June (when almost all pairs that are going to breed will have complete nests and most will be incubating eggs) and a count during the second week in July which allows numbers of chicks to be counted in each nest. The standard methodology recommended by Walsh *et al.* (1995) is followed throughout Britain and Ireland in monitoring kittiwake numbers and breeding success (JNCC 2022). Numbers of AONs tend to plateau in late May, by which time most nests should be at least partly constructed and attended, but a small number may be added during early June while some may be lost by then (Walsh *et al.* 1995, Coulson 2011). Timing of chick hatching and fledging can vary

slightly from year to year, and between locations, but visits in early July will normally be before any chicks have fledged but after most chick mortality has occurred (Coulson 2011), so provide the opportunity to measure breeding success.

138. Monitoring of numbers and breeding success will be continued at least until the success of the compensation has been demonstrated but potentially throughout the operational life-span of SEP and DEP. Monitoring will also include counts of breeding numbers at other sites in Lowestoft and/or Gateshead and breeding success achieved at those sites in order to permit comparison between the improved structures and performance elsewhere within the population. This will allow the gain achieved by compensation to be assessed with a high degree of precision and accuracy. That in turn would inform any need for adaptive management (which could involve further improvements to nest sites on other buildings/structures, or further updates to the modifications if for example other unforeseen issues arose).

139. As such, the monitoring programme would identify any sites that were not functioning as required (whether as a result of location or due to damage, wear and tear etc) and therefore requiring adaptive management. In the event that a nesting location was no longer providing, or able to provide, its expected contribution to the compensation requirement, the need for alternative site/s would be assessed and agreed with the KCSG (see below) and implemented accordingly.

140. The Tyne kittiwake colonies are already monitored annually by the local monitoring group, therefore there may be no need for any additional monitoring while that programme continues. As described in **Section 6.4.5**, it may be necessary to move the existing Saltmeadows tower slightly further back from the quay wall to ensure that visual monitoring observations are still able to be made following the alterations and that access is maintained for ringing purposes. Alternatively, it may be possible to construct a viewing platform and/or use a remotely operated video system to make the monitoring observations. These considerations will be further explored with Gateshead Council as the proposals are developed.

141. There is less existing monitoring being undertaken at Lowestoft but a programme of monitoring will be required by other developers who will be constructing new kittiwake towers, so the best approach to this would be integration of monitoring needs between developers to provide a coherent monitoring programme. The Applicant will engage with all relevant parties in the finalisation of the Kittiwake CIMP to agree the most suitable approach and the details of the monitoring programme.

142. In all cases monitoring results will be shared with the KCSG on an annual basis and any requirement for adaptive management measures will be agreed with the group.

143. There will also be a need for ongoing monitoring and maintenance of the new ledges. These are likely to require replacing after some years, the life-span of marine ply with kittiwake nests on it is uncertain but may need to be replaced after about ten years of use. Ongoing monitoring of their condition would therefore be undertaken. At Gateshead that might best be done through existing arrangements through Gateshead Council. Kittiwake nests sometimes wash away during autumn/winter, but some remain from one season to the next if in sheltered locations. There is no need to remove old nest material as kittiwakes will build new nests on top of old ones, but if it is preferred to clear old nest material away after the

breeding season that would not affect kittiwakes as they return to the same site year after year if breeding is successful and will build a new nest if the old structure is gone.

6.4.8 Outline Implementation and Delivery Roadmap

144. The steps that would be followed by the Applicant to implement and deliver the nest site improvements are as follows:

- Prior to the consent being granted, consultation will be undertaken as required with all relevant stakeholders who are expected to be participants of the KCSG. The KCSG will be formally established once consent has been granted to oversee the development, implementation, monitoring and reporting of the compensation. Core members of the KCSG will include the MMO and Natural England, as well as key local stakeholders including East Suffolk Council and/or Gateshead Council. The RSPB will also be invited to participate. The Lowestoft Kittiwake Partnership and/or the Tyne Kittiwake Partnership will be consulted throughout;
- As set out in **Section 6.4.6**, it is proposed to secure the nest site improvements (regardless of location) so that they are constructed and available for use to allow three full kittiwake breeding seasons prior to the operation of any turbine forming part of the authorised development. The exact timescale will be agreed with relevant stakeholders, including any implications for the scale of compensation required to account for when measures to increase breeding success are able to be put in place;
- Detailed design of the nest site improvements will be undertaken in line with the outline design information set out in **Section 6.4.5**. Consultation will be undertaken with relevant stakeholders to agree the design details including, in the case of Lowestoft, the number and location of buildings. The detailed design process would include consideration of the potential impacts from the implementation of the measure as set out in **Section 6.4.9**. Relevant stakeholders would be consulted on these, including how to avoid, reduce or mitigate any adverse impacts, and to maximise the beneficial impacts;

- If it is necessary to obtain planning consent for the nest site improvements, the application/s would be submitted to the appropriate planning authority. The Applicant's expectation based on consultation undertaken to date is that the nest site improvements in Lowestoft would most likely be possible as permitted development (depending on the site or building in question and so to be confirmed with East Suffolk Council). The Applicant intends to secure rights to install the nesting structures at Lowestoft through agreement with the owners of suitable buildings. The Applicant will progress discussions with those parties once a shortlist of preferred locations had been identified by the Applicant, in consultation with the Lowestoft Kittiwake Partnership and East Suffolk Council. Any agreement with third party landowners would include provision for the longer term maintenance of the structures;
- Modifications to the Saltmeadows tower would require a planning permission through Gateshead Council. The Applicant intends to secure the land at Gateshead via an options agreement with Gateshead Council, who is also the relevant local authority for the planning application, and discussions are underway between the Applicant and the council in this regard;
- The detailed delivery proposals for the agreed compensatory measures will be set out in the Kittiwake CIMP, which will be produced post-consent, based on the outline version provided with the DCO application (**Annex 3A Kittiwake Outline Compensation, Implementation and Monitoring Plan** (document reference 5.5.3.1)) and which must be submitted to the SoS for approval in accordance with the **Draft DCO** (document reference 3.1);
- The success of the compensatory measures will be monitored in line with the details described in **Section 6.4.7**, with the results provided to the KCSG on an annual basis to allow for discussion and feedback and to inform any requirement for adaptive management;
- Any amendments to or variations of the approved Kittiwake CIMP must be in accordance with the principles set out in this Kittiwake Compensation Document and may only be approved where it has been demonstrated to the satisfaction of the SoS that they are unlikely to give rise to any materially new or materially different environmental effects and that the required level of compensation will continue to be delivered; and

- The nest sites would remain in place and be maintained for the operational lifetime of the authorised development if they are colonised, and routine and adaptive management measures and monitoring will continue whilst the measures are in place. In practice, given the nature of the measure and the potential for significant benefits to be accrued from a reduction in nuisance (in Lowestoft) and in view of the fact that the proposal at Gateshead is to modify an existing structure, consultation will be undertaken with the KCSG to help determine the most appropriate course of action. As outlined in the **Draft DCO** (document reference 3.1), the compensation measures will not be decommissioned without written approval from the SoS in consultation with the relevant SNCB.

145. An outline roadmap for the implementation and delivery of the nest site improvements is provided in **Table 6-5** with the purpose of showing the key activities that would be undertaken and in what order. The dates provided are indicative at this stage as the timings of key project activities and milestones e.g. consent award, FID, construction and start of operation have not yet been set.

Table 6-5: Outline Roadmap for the Implementation and Delivery of the Nest Site Improvements

Year from consent	Indicative calendar year based on current project timeline	Activity	2022	2023	2024	2025	2026	2027	2028
Pre-consent	2022 – 2023	Development of compensation proposals in consultation with ETG and stakeholders, including options appraisal and site selection							
Pre-consent	Q3 2022	SEP and DEP DCO application submitted, including Kittiwake Compensation Plan (this document) and Outline Kittiwake CIMP							
Pre-consent	Q3/Q4 2022	Ongoing engagement with statutory and non-statutory stakeholders (who are expected to be participants of the future KCSG) to help mature proposals pre-consent e.g. short list building locations and agree other matters to feed into the concept design							
Pre-consent	2023	Progress concept design of nest site improvements (Lowestoft and/or Gateshead) in consultation with stakeholders							
Pre-consent	2023	- Selection of preferred location (Lowestoft and/or Gateshead) - If Lowestoft is taken forward, selection of buildings for installation of nest ledges							
Pre-consent	2023	Obtain necessary agreements with landowners, planning permissions, consents and licenses for the implementation of the measure/s							
Pre-consent	2023	Development of draft Kittiwake CIMP to enable consultation on the detailed proposals ahead of consent (anticipated 2024)							
Year 0	Q1 2024	Anticipated SEP and DEP consent granted							
Year 0	Q1 2024	Formally establish KCSG							
Year 0	2024	Submission to SoS of Kittiwake CIMP							

Year from consent	Indicative calendar year based on current project timeline	Activity	2022	2023	2024	2025	2026	2027	2028
Year 0	2024	Approval of Kittiwake CIMP							
Year 0 / Year 1	2024 – 2025	Detailed design and fabrication							
Year 1	Early 2025 (in advance of breeding season)	Installation							
Year 1	2025	- Compensation implementation – first year of compensation before operation of SEP and DEP - Implement annual programme of monitoring and adaptive management including annual review with KCSG							
Year 2	2026	Continue compensation and annual programme of monitoring and adaptive management – second year of compensation before operation of SEP and DEP							
Year 3	2027	Start of offshore construction at the wind farm sites							
Year 3	2027	Continue compensation and annual programme of monitoring and adaptive management – third year of compensation before operation of SEP and DEP							
Year 4	2028	- Earliest first power at SEP and DEP - Continue compensation and annual programme of monitoring and adaptive management – fourth year of compensation							

6.4.9 Consideration of Potential Impacts from Implementation of the Compensatory Measure

146. Consideration has been given to any potential impacts that might arise as a result of the implementation of nest site improvements to enhance breeding success, either in Gateshead or Lowestoft. The potential impacts identified are described in **Table 6-6** together with details, where relevant, of how these would be avoided, reduced or mitigated.

Table 6-6: Potential Impacts from Implementation of Nest Site Improvements

Potential impacts	Details	Measures required to avoid, reduce or mitigate
Impacts on other protected areas and features	The land on which Gateshead Saltmeadows tower is situated is a Local Nature Reserve (which is aimed at protecting the kittiwake tower and the kittiwakes that nest on it and which this proposal seeks to benefit). There are no protected area features nearby that are likely to be affected by an increase in numbers of nesting kittiwakes at Saltmeadows. Similarly, there are no protected area designations applying to the land on which kittiwake nests on artificial structures in Lowestoft are situated. There are no protected area features nearby that are likely to be affected by an increase in numbers of nesting kittiwakes at Lowestoft.	n/a
Disturbance of existing kittiwake nesting activity	If works to install new ledges or adjust existing structures were undertaken during the kittiwake breeding season existing nesting activity could be disturbed.	Implementation of the agreed compensatory measures at either site to be undertaken outside of the kittiwake breeding season (March to August inclusive).
Reduced nuisance and conflict issues with the local community in Lowestoft	Allowing increased breeding success on structures that avoid conflict with the local community where kittiwakes nest on buildings where they are not welcome could reduce nuisance and conflict issues by allowing birds to move off structures where they are being prevented from breeding successfully as a result of deliberate actions to deter or prevent kittiwakes from nesting.	The Applicant will develop the measures in consultation with key stakeholders in Lowestoft (where relevant), including ESC and LKP, to ensure that sites are chosen that help to maximise the benefits to the local community.
Visual impact of nest site improvements	The nest site improvements will be undertaken in the context of the existing built environment in Lowestoft, or in the case of the Saltmeadows tower, the existing structure.	Measures to minimise any potential visual impact will be discussed with the relevant local authority as part of the process of obtaining the necessary permissions and incorporated into the detailed design process.
Disturbance to local communities during installation	As above	Measures to minimise any potential disturbance to local communities will be discussed with the relevant local authority as part of the process of

Potential impacts	Details	Measures required to avoid, reduce or mitigate
		obtaining the necessary permissions and incorporated into the detailed design process.

6.5 Construction of New Artificial Breeding Sites for Kittiwake Onshore or Offshore

6.5.1 Overview

147. The most recent ecological evidence base underpinning the proposal of this compensatory measure has been discussed in detail in the Hornsea Project Four compensation submissions (Ørsted, 2021a; 2021b). Current ecological evidence suggests that construction of new artificial breeding sites onshore or particularly offshore would provide good prospects for establishing new breeding colonies and produce additional young that would become part of the wider Eastern Atlantic population of kittiwake. Thus, this measure could provide effective compensation for the predicted impacts of offshore wind development. However, Concerns have been raised by stakeholders around the potential for diminishing returns with an increasing number of new structures.

6.5.2 Delivery Mechanism

148. The Applicant is only proposing delivery of this measure as part of a collaborative delivery model, whereby the Applicant would seek to deliver as compensation or adaptive management through a partnership arrangement with one or more other OWF developers. This measure represents an alternative compensation option that would be delivered wholly or partly in place of the measures outlined in **Sections 6.3** and **6.4** above. To ensure this option is available to SEP and DEP, the Applicant has included wording within the **Draft DCO** (document reference 3.1) to this effect. Further details are set out in the **Strategic and Collaborative Approaches to Compensation and Measures of Equivalent Environmental Benefit** (document reference 5.8).

7 Summary

149. A range of compensatory measures for kittiwake from FFC SPA have been considered by the Applicant, with reference to the relevant guidance and informed through a detailed process of pre-application consultation with stakeholders. A package of compensation measures with two different delivery models is proposed including:

- Prey enhancement through sandeel stock recovery and ecosystem-based management (strategic delivery); and
- Nest site improvements to enhance breeding success (project-led delivery).

150. The inclusion of a package of measures, as advocated by stakeholders, helps to respond to any uncertainties in the delivery or implementation of each of the

proposed measures when considered on their own and therefore adds resilience to the overall approach.

151. In addition, construction of new artificial breeding sites for kittiwakes onshore or offshore has been identified by the Applicant as measures that could be taken forward as part of a collaborative delivery model, whereby the Applicant would seek to deliver compensation (or adaptive management) through a partnership arrangement with one or more other OWF developers.

152. A further option for a contribution to be made to a Strategic Compensation Fund (such as the Marine Recovery Fund) wholly or partly in place of the Applicant's proposed measures outlined above or as an adaptive management measure is also proposed.

153. The information provided demonstrates how the proposed measures can be secured and that the mechanism for delivery can be implemented. The Kittiwake CIMP will set out the detailed delivery proposals for the agreed compensatory measures based on those set out in this Kittiwake Compensation Document and will be produced by the Applicant and approved by the SoS prior to the start of construction.

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