Summary of Written Representations

for the

Royal Society for the Protection of Birds

Submitted for Deadline 2

10 December 2019

Planning Act 2008 (as amended)

In the matter of:

Application by Norfolk Boreas Limited for an Order Granting Development Consent for the Norfolk Boreas Offshore Wind Farm

Planning Inspectorate Ref: EN010087

Registration Identification Ref: 20022916

1. The RSPB's interest in offshore wind development

Faced with the threats of climate change to the natural world the RSPB considers that a low-carbon energy revolution is essential to safeguard biodiversity. However, inappropriately designed and/or sited developments can also cause serious and irreparable harm to biodiversity and damage the public acceptability of the necessary low-carbon energy transition technologies.

The UK is of outstanding international importance for its breeding seabirds, including northern gannet for which the UK supports over 50% of the world population and around 10% of the world populations of kittiwake and puffin. As with all Annex I and regularly migratory species, the UK has particular responsibility under the Birds Directive[1] to secure the conservation of this important seabird's population.

The available evidence suggests that the main risks of offshore wind farms for birds are collision, disturbance/displacement, barriers to movement (e.g. migrating birds, or disruption of access between the breeding areas and feeding areas), and habitat change particularly with associated changes in food availability and the cumulative and in-combination effects of these across multiple wind farms.

Such impacts are avoidable, and the RSPB has spent considerable time working with stakeholders in the UK offshore wind industry to ensure that decisions about deployment of renewable energy infrastructure take account of environmental constraints and seek to avoid or minimise impacts wherever possible. The RSPB therefore strongly advocates the use of rigorous, participative environmental assessments to inform the development of projects.

2. Offshore Ornithology

We have significant concerns regarding the findings of some of the impact assessments. As a result of the methodological concerns (set out below), the RSPB considers that the impacts have not been adequately assessed and, as such consider that an adverse effect on the integrity of the following SPAs and their species cannot be ruled out as follows:

[1] Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds (codified version) (the Birds Directive).

- The impact of collision mortality on the kittiwake population of the Flamborough and Filey Coast Special Protection Area (FFC SPA) in-combination with other plans and projects;
- The impact of collision mortality and operational displacement on the gannet population of the FFC SPA alone and in-combination with other plans and projects;
- The impact of collision mortality on the lesser black-backed gull population of the Alde-Ore Estuary SPA alone and in-combination with other projects;
- The impact of operational displacement on the razorbill population of the FFC SPA in-combination with other plans and projects;
- The impact of operational displacement on the guillemot population of the FFC SPA in-combination with other plans and projects;
- The impact of all potential effects on the breeding seabird assemblage feature of FFC SPA in combination with other plans and projects;
- Cumulative collision mortality to North Sea populations of kittiwake and great black-backed gull; and
- Cumulative operational displacement to North Sea populations of red-throated diver, guillemot and razorbill.

Our key methodological concerns are listed below:

- Approach to the apportioning of kittiwake collision mortality to Flamborough and Filey Coast SPA and of lesser black-backed gulls to the Alde-Ore Estuary SPA;
- Inclusion of unjustified criticisms of kittiwake tracking data;
- Breeding season gannet avoidance rate of 98.9%;
- Lack of assessment of breeding seabird assemblage feature of Flamborough and Filey Coast SPA; and
- Approach to consented capacity versus built-out capacity of other windfarms.

3. Overall Conclusion and Recommendations

Given the concerns outlined above, we do not agree that there is sufficient robust evidence available to support conclusions of no adverse effect on the integrity of the Flamborough and Filey Coast SPA or the Alde-Ore Estuary SPA, or to rule out significant effects on North Sea populations of kittiwake, great black-backed gull, red-throated diver, guillemot and razorbill.

The RSPB, having considered options to address the predicted impacts, does not consider mitigation measures will be possible to avoid the increased mortality that is predicted by Norfolk Boreas alone and in-combination with other projects. Therefore, we expect the Applicant to provide information to the examination that addresses Steps 6 and 7 in paragraph 3.2.2 above i.e.:

- No alternative solutions;
- Imperative reasons of overriding public interest; and
- Compensatory measures to protect the overall coherence of the Natura 2000 network.

We will review further information on these issues as it is presented and provide more detailed comments.

In this context, the RSPB draws the Examiners' attention to BEIS's decisions to delay determination of Hornsea Three[2] and Norfolk Vanguard[3] offshore wind farms. The delay on each scheme is to, among other things, seek the views of the Applicants and interested parties in respect of the in-combination impacts on the Flamborough to Filey Coast SPA (and in the case of Norfolk Vanguard, also the Alde-Ore Estuary SPA) and the implications of those impacts for the derogation tests set out in the Habitats and Offshore Regulations and summarised in paragraph 3.2.2 above. The RSPB considers such matters are directly relevant to examination of the Norfolk Boreas scheme.

In order to present robust evidence on which a sound assessment can be based, we consider that the Applicant should provide the following updates:

- Use of the standard breeding season in assessment of collision risk for kittiwake, gannet and lesser black-backed gull.
- Apportioning of impacts to lesser black-backed gull of the Alde-Ore Estuary SPA to be recalculated.
- Apportioning of impacts to kittiwake of the Flamborough and Filey Coast SPA to be recalculated and informed by recent tracking data.
- Use of a 98% avoidance rate for gannets in the breeding season.
- Consideration of displacement rates of up to 100% and mortality rates of up to 10% in assessments of displacement for auks and red-throated diver.

[2] BEIS letter dated 27 September 2019 to Orsted Hornsea Project Three (UK) Limited
[3] BEIS letter dated 6 December 2019 to Norfolk Vanguard Limited and others

We understand that further assessment may now have been undertaken by the Applicant concerning some of the above matters. The RSPB will consider any further information submitted to the Examination by the Applicant and review our position accordingly. However, on the basis of the information currently before the Examining Authority, it is our view that consent cannot be granted. We reserve the right to review and/or change our position in light of new information being submitted to the Examination.

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Table of Contents

1 Introduction

1.1.1 These representations have been prepared with Dr Aly McCluskie, whose qualifications and experience are provided in Annex 1.

1.2 The RSPB

1.2.1 The Royal Society for the Protection of Birds (the RSPB) was set up in 1889. It is a registered charity incorporated by Royal Charter and is Europe's largest wildlife conservation organisation, with a membership of 1.2 million (RSPB, 2019). The principal objective of the RSPB is the conservation of wild birds and their habitats. The RSPB therefore attaches great importance to all international, EU and national law, policy and guidance that assist in the attainment of this objective. It campaigns throughout the UK and in international fora for the development, strengthening and enforcement of such law and policy. In so doing, it also plays an active role in the domestic processes by which development plans and proposals are scrutinised and considered, offering ornithological and other wider environmental expertise. This includes making representations to, and appearing at, public inquiries and hearings during the examination of applications for development consents.

1.3 The RSPB's interest in offshore wind development

1.3.1 Faced with the threats of climate change to the natural world the RSPB considers that a low-carbon energy revolution is essential to safeguard biodiversity. However, inappropriately designed and/or sited developments can also cause serious and irreparable harm to biodiversity and damage the public acceptability of the necessary low-carbon energy transition technologies.

1.3.2 The UK is of outstanding international importance for its breeding seabirds, including northern gannet for which the UK supports over 50% of the world population and around 10% of the world populations of kittiwake and puffin (Table 1). As with all Annex I and regularly migratory species, the UK has particular responsibility under the Birds Directive[1] to secure the conservation of this important seabird's population.

[1] Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds (codified version) (the Birds Directive).

Table 1: Proportion of the world population of seabird species relevant to the Norfolk Boreas project that the UK supports

Species	% World population	Status
Northern gannet[2]	c.56	Most increasing, but a few colonies have declined
Black-legged kittiwake[3]	8	Declining
Guillemot[4]	c.13	Some colonies increasing but many declining
Razorbill[5]	c.22	A few colonies increasing but many declining
Atlantic puffin[6]	c.10	Declining

1.3.3 The available evidence suggests that the main risks of offshore wind farms for birds are collision, disturbance/displacement, barriers to movement (e.g. migrating birds, or disruption of access between the breeding areas and feeding areas), and habitat change particularly with associated changes in food availability and the cumulative and in-combination effects of these across multiple wind farms.

1.3.4 Such impacts are avoidable, and the RSPB has spent considerable time working with stakeholders in the UK offshore wind industry to ensure that decisions about deployment of renewable energy infrastructure take account of environmental constraints and seek to avoid or minimise impacts wherever possible. The RSPB therefore strongly advocates the use of rigorous, participative environmental assessments to inform the development of projects.

1.4 Summary of the RSPB's Position

1.4.1 The RSPB's primary concerns about the Norfolk Boreas proposal result from a number of methodological concerns about the assessment of various impacts and the implications those concerns have for the overall conclusions about the impacts of the Norfolk Boreas proposal. Our concerns focus on the following aspects:

- The impact of collision mortality on the kittiwake population of the Flamborough and Filey Coast Special Protection Area (SPA) in-combination with other plans and projects;

[2] https://jncc.gov.uk/our-work/northern-gannet-morus-bassanus/
[3] https://jncc.gov.uk/our-work/black-legged-kittiwake-rissa-tridactyla/
[4] https://jncc.gov.uk/our-work/guillemot-uria-aalge/
[5] https://jncc.gov.uk/our-work/razorbill-alca-torda/
[6] https://jncc.gov.uk/our-work/atlantic-puffin-fratercula-arctica/

- The impact of collision mortality and operational displacement on the gannet population of the Flamborough and Filey Coast SPA alone and in-combination with other plans and projects;
- The impact of collision mortality on the lesser black-backed gull population of the Alde-Ore Estuary SPA alone and in-combination with other projects;
- The impact of operational displacement on the razorbill population of the Flamborough and Filey Coast SPA in-combination with other plans and projects;
- The impact of operational displacement on the guillemot population of the Flamborough and Filey Coast SPA in-combination with other plans and projects;
- The impact of all potential effects on the breeding seabird assemblage feature of Flamborough and Filey Coast SPA in combination with other plans and projects;
- Cumulative collision mortality to North Sea populations of kittiwake and great black-backed gull; and
- Cumulative operational displacement to North Sea populations of red-throated diver, guillemot and razorbill.

1.4.2 Our key methodological concerns are listed below:

- Approach to the apportioning of kittiwake collision mortality to Flamborough and Filey Coast SPA and of lesser black-backed gulls to the Alde-Ore Estuary SPA;
- Inclusion of unjustified criticisms of kittiwake tracking data;
- Breeding season gannet avoidance rate of 98.9%;
- Lack of assessment of breeding seabird assemblage feature of Flamborough and Filey Coast SPA; and
- Approach to consented capacity versus built-out capacity of other windfarms.

1.4.3 We therefore do not agree that there is sufficient robust evidence available to support a conclusion of no adverse effect on the integrity of the Flamborough and Filey Coast SPA or the Alde-Ore Estuary SPA, or to rule out significant effects on North Sea populations of kittiwake, great black-backed gull, red-throated diver, guillemot and razorbill.

2 Protected Sites and Species

2.1 The Flamborough and Filey Coast SPA

2.1.1 The Flamborough Head and Bempton Cliffs SPA was designated under Article 4(2) of the Birds Directive as a SPA in 1993 due to the presence of 83,370 pairs of black-legged kittiwake (*Rissa tridactyla*), representing 4% of the Eastern Atlantic breeding population. In 2001, the UK SPA Review[7] found that it also qualified under Article 4(2) as a site regularly supporting at least 20,000 seabirds, due to at the time of designation, the site regularly supported 305,784 individual seabirds including: puffin (*Fratercula arctica*), razorbill (*Alca torda*), guillemot (*Uria aalge*), herring gull (*Larus argentatus*), gannet (*Morus bassanus*), and kittiwake. Kittiwake and the seabird assemblage are therefore the qualifying features of this SPA.

2.1.2 In January 2014, Natural England held a consultation on proposals to change the SPA. The proposals comprised changes to the designated site boundary including extending it to cover part of the Filey Coast (hence the change in its name) and changes to the numbers of qualifying species. This new site was formally designated in August 2018[8], incorporating the Flamborough Head and Bempton Cliffs SPA.

2.1.3 At the same time, Natural England also conducted a review of the seabird populations using contemporary data (Natural England Departmental Brief 2014[9]). A summary of Natural England's review of the ornithological interest of the SPA is as follows with the key species set out in more detail in Table 2.1 below:

> The application of the JNCC SPA selection guidelines to current data for this site confirm that it qualifies by regularly supporting internationally important numbers of breeding black-legged kittiwakes, northern gannet, common guillemot and razorbill and an assemblage of European importance of over 20,000 breeding seabirds. Black-legged kittiwake, northern gannet, common guillemot and razorbill are all main components of the assemblage and present in internationally important numbers. However, northern fulmar is also present in sufficient numbers to warrant being listed as main component species of the assemblage, since numbers exceed 2,000 individuals (10% of the minimum qualifying assemblage of 20,000 individuals). In addition, Atlantic puffin, herring gull, European shag (*Phalacrocorax*

[7] Stroud, DA, Chambers, D, Cook, S, Buxton, N, Fraser, B, Clement, P, Lewis, P, McLean, I, Baker, H & Whitehead, S (eds). 2001. The UK SPA network: its scope and content. JNCC, Peterborough.
[8] Flamborough and Filey Coast SPA citation: http://publications.naturalengland.org.uk/file/4690761199386624
[9] Natural England (2014) Proposed extension to Flamborough Head and Bempton Cliffs Special Protection Area and renaming as Flamborough and Filey Coast potential Special Protection Area. Departmental Brief. Natural England.

aristotelis) and great cormorant (*Phalacrocorax carbo)* are also part of the breeding seabird assemblage.

Table 2.1: Summary of Ornithological Interest of the SPAs

Species	**Count (period)**	**% of subspecies or population (pairs)**	**Interest Type**
Flamborough Head and Bempton Cliffs SPA			
Black-legged kittiwake *Rissa tridactyla*	83,700 pairs (1987)	4% Western Europe	Migratory
Flamborough and Filey Coast SPA			
Black legged kittiwake *Rissa tridactyla*	44,520 pairs 89,041 breeding adults (2008-2011)	2% North Atlantic	Migratory
Northern gannet *Morus bassanus*	8,469 pairs 16,938 breeding adults (2008-2012)	2.6% North Atlantic	Migratory
Common guillemot *Uria aalge*	41,607 pairs 83,214 breeding adults (2008-2011)	15.6% (*Uria aalge albionis*)	Migratory
Razorbill *Alca torda*	10,570 pairs 21,140 breeding adults (2008-2011)	2.3% (*Alca torda islandica*)	Migratory
	Count period	**Average number of individuals**	
Seabird assemblage	2008-2012	215,750	

2.1.4 The Conservation Objectives for the Flamborough and Filey Coast SPA are as follows:

Ensure that the integrity of the site is maintained or restored as appropriate, and ensure 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 population of each of the qualifying features, and,*

- *The distribution of the qualifying features within the site.*

2.1.5 Since this site was originally designated as a SPA, the national populations of both kittiwake and some assemblage species have suffered substantial declines. For example, the UK breeding kittiwake population has reduced by 70% since 1986 (State of the UK's Birds, 2017[10]). Within the SPA there has been a reduction from the 83,370 breeding pairs of kittiwakes (at time of designation, 1993) to an average of 44,520 breeding pairs between 2008 and 2011; a *c*.53% decline.

2.1.6 The current SPA citation does not reflect this substantial decline in the population of breeding kittiwake or other seabird species included under the assemblage feature. However, Natural England's Supplementary Advice on the Conservation Objectives for the Flamborough and Filey Coast SPA[11] sets out targets for each of the qualifying features necessary for the SPA to meet its conservation objectives. For kittiwake the target is to "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".

2.2 The Alde-Ore Estuary SPA

2.2.1 The main feature of the Alde-Ore Estuary SPA affected by the Application is the breeding lesser black-backed gull population, the majority of which breed at Havergate Island (which is a RSPB reserve) and Lantern Marshes on Orfordness (a National Trust reserve).

2.2.2 The Alde-Ore Estuary SPA was classified in 1996[12] on the basis of supporting an average of 14,070 lesser black-backed gull Apparently Occupied Nests (AONs) between 1994 and 1998, or 12% of the biogeographic population. Following classification, the lesser black-backed gull population experienced a rapid increase in the late 1990s, peaking in 2000. This is reflected in the population

[10] Hayhow D.B., Ausden M.A., Bradbury R.B., Burnell D., Copeland A.I., Crick H.Q.P., Eaton M.A., Frost T., Grice P.V., Hall C., Harris S.J., Morecroft M.D., Noble D.G., Pearce-Higgins J.W., Watts O., Williams J.M. (2017) State of the UK's Birds 2017. The RSPB, BTO, WWT, DAERA, JNCC, NE and NRW, Sandy, Bedfordshire. https://www.bto.org/research-data-services/publications/state-uk-birds/2017/state-uk-birds-2017

[11] Supplementary Advice on the Conservation Objectives for the Flamborough and Filey Coast SPA, Natural England, 13 September 2019:https://designatedsites.naturalengland.org.uk/Marine/SupAdvice.aspx?SiteCode=UK9006101&SiteName=&SiteNameDisplay=Flamborough+and+Filey+Coast+SPA&countyCode=&responsiblePerson=

[12] Alde-Ore Estuary SPA citation: http://publications.naturalengland.org.uk/file/6296068417388544

of 21,700 pairs described in the Alde-Ore Estuary SPA site account in the JNCC UK SPA Review 2001[13]). Since this time, the population has experienced a severe decline, such that in 2018 there were only 1,424 breeding pairs recorded in the Alde-Ore Estuary SPA; a *c*.93% decline from peak counts. Further details of population figures can be found in Annex 2.

2.2.3 The Conservation Objectives for the Alde-Ore Estuary SPA are as follows:

Ensure that the integrity of the site is maintained or restored as appropriate, and ensure 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 population of each of the qualifying features, and,*
- *The distribution of the qualifying features within the site.*

2.2.4 In addition, Natural England's Supplementary Advice on the Conservation Objectives for the Alde-Ore Estuary SPA[14] has determined that the target population of the SPA is 14,074 pairs of lesser black-backed gulls if the SPA is to meet its conservation objectives. This still means the current population is *c*.90% below its target population.

2.2.5 The Alde-Ore Estuary is the only SPA for lesser black-backed gull on the east coast of England. As such it plays an important role with respect to the UK population of this species. Even at its now much reduced size the most recent population estimate (1,424 pairs) represents 1.27% of the UK population of 112,000 AON (JNCC, 2019[15]).

[13] Stroud, DA, Chambers, D, Cook, S, Buxton, N, Fraser, B, Clement, P, Lewis, P, McLean, I, Baker, H & Whitehead, S (eds). 2001. The UK SPA network: its scope and content. JNCC, Peterborough.

[14] Supplementary Advice on the Conservation Objectives for the Alde-Ore Estuary SPA, Natural England, 13 September 2019: https://designatedsites.naturalengland.org.uk/Marine/SupAdvice.aspx?SiteCode=UK9009112&SiteName=alde-ore&SiteNameDisplay=Alde-Ore+Estuary+SPA&countyCode=&responsiblePerson=&SeaArea=&IFCAArea=&NumMarineSeasonality=8

[15] Latest population trends: lesser black-backed gull, JNCC, Published 17 April 2019: https://jncc.gov.uk/our-work/lesser-black-backed-gull-larus-fuscus/

3 Legislation and Policy Background

3.1 Introduction

3.1.1 The suite of Energy National Policy Statements (NPSs) set out the Government's approach to ensuring the security of energy supplies and the policy framework within which new energy infrastructure proposals are to be considered. The presumption in favour of granting consent, as identified in NPS EN-1, *Overarching National Policy Statement for Energy*[16], is subject to the tests set out below in section 104 of the Planning Act 2008[17] (see NPS EN-1 paragraphs 4.1.2 and 1.1.2).

3.1.2 Section 104 of the Planning Act provides that an application for development consent for energy infrastructure must be decided in accordance with the relevant NPS except where in doing so it would lead to the UK:

- being in breach of its international obligations;
- being in breach of any statutory duty that applies to the Secretary of State;

or would:

- be unlawful;
- result in adverse impacts which would outweigh the benefits; or
- be contrary to regulations about how decisions are to be taken.

3.1.3 The statutory duties include the Conservation of Habitats and Species Regulations 2017[18] (the Habitats Regulations) (NPS EN-1 paragraph 4.3.1) and the wider objective of protecting the most important biodiversity conservation interests (see NPS EN-1 section 5.3 generally). It notes the Habitats Regulations' statutory protection for important sites including Ramsar sites, listed under the Ramsar Convention[19], SPAs designated under the Birds Directive and Special Areas of Conservation (SACs) designated under the Habitats Directive[20].

[16] Overarching National Planning Policy Statement for Energy (EN-1): https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/47854/1938-overarching-nps-for-energy-en1.pdf

[17] Planning Act, 2008: http://www.legislation.gov.uk/ukpga/2008/29/contents

[18] The Conservation of Habitats and Species Regulations 2017: https://www.legislation.gov.uk/uksi/2017/1012/contents/made

[19] The Convention on Wetlands of International Importance 1971. Para 5.3.9 of the NPS EN-1 confirms that for the purposes of considering development proposals affecting them, listed Ramsar sites should also, as a matter of policy, receive the same protection.

[20] Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora.

3.1.4 NPS EN-3, *National Policy Statement for Renewable Energy Infrastructure*, specifically identifies birds as a biodiversity concern to be taken into account (paragraph 2.6.59 and 2.6.68). Whilst it is stated that the designation of an area as a protected European site does not necessarily restrict the construction or operation of offshore wind farms (paragraph 2.6.69), the legislative requirements identified above are still to be met. The protection afforded by legislation, to which the 2008 Act and the NPSs refer, are addressed briefly below.

3.2 The Conservation of Habitats and Species Regulations 2017 and the Conservation of Offshore Marine Habitats and Species Regulations 2017

3.2.1 SACs and SPAs are protected as "European sites" in inshore waters (up to 12 nautical miles from the baselines) under provisions within the Conservation of Habitats and Species Regulations 2017 (Habitats Regulations); and in offshore waters (i.e. from 12-200 nautical miles) under provisions within the Conservation of Offshore Marine Habitats and Species Regulations 2017 (Offshore Regulations).

3.2.2 The Habitats & Offshore Regulations set out the sequence of steps to be taken by the competent authority (here the Secretary of State for Business, Energy and Industrial Strategy (BEIS)) when considering authorisation for a project that may have an impact on a European site and its species before deciding to authorise that project. These are as follows:

a. Step 1: consider whether the project is directly connected with or necessary to the management of the SPA and its species (regulation 63 (1)). If not –
b. Step 2: consider, on a precautionary basis, whether the project is likely to have a significant effect on the SPA and its species, either alone or in combination with other plans or projects (the Likely Significance Test) (regulation 63 (1)).
c. Step 3: make an appropriate assessment of the implications for the SPA and its species in view of its conservation objectives. There is no requirement or ability at this stage to consider extraneous (non-conservation e.g. economics, renewable targets, public safety etc) matters in the appropriate assessment (regulation 63 (1)).
d. Step 4: consider whether it can be ascertained that the project will not, alone or in combination with other plans or projects, adversely affect the integrity of the SPA and its species, having

regard to the manner in which it is proposed to be carried out, and any conditions or restrictions subject to which that authorisation might be given (the Integrity Test) (regulation 63 (6)).

e. Step 5: In light of the conclusions of the assessment, the competent authority shall agree to the project only after having ascertained that it will not adversely affect the integrity of the SPA, alone or in combination with other plans or projects (regulation 63 (5)).
f. Step 6: only if the competent authority is satisfied that, there being no alternative solutions and the plan or project must be carried out for imperative reasons of overriding public interest (which, subject to (regulation 64(2)), may be of a social or economic nature), they may agree to the plan or project notwithstanding a negative assessment of the implications for the European site (regulation 64 (1)).
g. Step 7: in the event of the no alternative solutions and imperative reasons of overriding public interest tests being satisfied, the Secretary of State must secure that any necessary compensatory measures are taken to ensure that the overall coherence of the Natura 2000 network is protected (regulation 68).

3.2.3 It is important to add that in addition to the requirements set out above, in relation to both inshore area and the offshore marine area, any competent authority must exercise its functions so as to secure compliance with the requirements of the Habitats Directive and the Birds Directive; and in particular to take such steps as it considers appropriate to secure the preservation, maintenance and re-establishment of a sufficient diversity and area of habitat for wild birds[21], having regard to the requirements of Article 2 of the Birds Directive.[22] And for offshore SPAs and SACs regulation 26, Offshore Regulations requires competent authorities to exercise their functions (as far as possible) to secure steps to avoid the disturbance of species and the deterioration of habitats or habitats of species within those sites.

3.3 Appropriate assessment

3.3.1 As part of the assessment requirements, regulation 63, Habitats Regulations (regulation 28, Offshore Regulations) require the application of the precautionary principle. Meaning that if it

[21] As required by Article 3, Birds Directive

[22] See regulation 9(1) and 10(1)(2)(3) and (8) of the Habitats Regulations and regulation 6 of the Offshore Regulations. Article 2 Birds Directive imposes a requirement on Member States to maintain all wild bird populations at a level which corresponds in particular to ecological, scientific and cultural requirements, while taking account of economic and recreational requirements, or if necessary, to restore the population of these species to that level (Article 2).

cannot be excluded, on the basis of objective scientific information, that it is likely to have a significant effect on a SPA or SAC and its species an appropriate assessment will be required: see *Waddenzee*.[23]

3.3.2 Following that appropriate assessment, a project may only be granted consent if the competent authority is convinced that it will not have an adverse effect on the integrity of the European site(s) and their species of concern, having applied the precautionary principle and taken account of the conservation objectives for those sites and their habitats and species. *Waddenzee* confirmed that where doubt remains as to the absence of adverse effects on the integrity of the site, approval should be refused[24] (subject to the considerations of alternative solutions, imperative reasons of overriding public interest and the provision of compensatory measures as set out in regulations 64 & 68).

3.3.3 An appropriate assessment requires all aspects of the project which could affect the site, its species and its conservation objectives to be identified in the light of the best scientific knowledge in the field.[25] The competent authority,

"taking account of the conclusions of the appropriate assessment of the implications…for the site concerned, in the light of the conservation objectives, are to authorise such activity only if they have made certain that it will not adversely affect the integrity of the site. That is the case where no reasonable scientific doubt remains as to the absence of such effects"[26].

3.3.4 Defra Circular 01/2005 states at page 20, that the 'integrity of the site' should be defined as 'the coherence of the site's ecological structure and function, across its whole area, or the habitats, complex of habitats and/or populations of species for which the site is or will be classified'.[27] A site can be described as having a high degree of integrity where the inherent potential for meeting site conservation objectives is realised, the capacity for self-repair and self-renewal under

[23] CJEU Case-127/02; [2004] ECR-7405 at [45].
[24] [56]-[57].
[25] [61].
[26] [59].
[27] Please note the Defra Circular 01/2005 is also titled ODPM Circular 6/2005.

dynamic conditions is maintained, and a minimum of external management support is required. When looking at the 'integrity of the site', it is therefore important to take into account a range of factors, including the possibility of effects manifesting themselves in the short, medium and long-term".[28]

3.3.5 As is clear from the requirements of the Habitats and Offshore Regulations, the assessment of integrity is to be considered by reference to the impact of the project alone and in-combination with other plans and projects, taking account of the site(s) conservation objectives. As clearly set out in *Waddenzee*, para 61:

> **61** In view of the foregoing, the answer to the fourth question must be that, under Article 6(3) of the Habitats Directive, **an appropriate assessment of the implications for the site concerned of the plan or project implies that, prior to its approval, all the aspects of the plan or project which can, by themselves or in combination with other plans or projects, affect the site's conservation objectives must be identified in the light of the best scientific knowledge in the field**. The competent national authorities, taking account of the appropriate assessment of the implications of mechanical cockle fishing for the site concerned in the light of the site's conservation objectives, are to authorise such an activity only if they have made certain that it will not adversely affect the integrity of that site. That is the case where no reasonable scientific doubt remains as to the absence of such effects. (emphasis added)

3.4 Environmental Impact Assessment

3.4.1 The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017[29] state that development consent cannot be granted for Environmental Impact Assessment (EIA) development unless the decision-maker has taken into account environmental information including an environmental statement which describes the significant effects, including cumulative effects, of the development on the environment. This will include effects on all wild bird species whether SPA species or not.

[28] See too the European Commission Guidance; Wind Energy Developments and Natura 2000, 2011, page 82-83, paragraph 5.5.3.
[29] The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017: http://www.legislation.gov.uk/uksi/2017/572/contents/made

3.4.2 Offshore wind farms have the potential to impact on birds through collision with rotating blades, direct habitat loss, disturbance from construction activities, displacement during the operational phase (resulting in loss of foraging/roosting area) and impact on bird flight lines (i.e. barrier effect) and associated increased energy use by birds for commuting flights between roosting and foraging areas. This is acknowledged in NPS EN-3[30]. These potential impacts have been taken into account by the RSPB and its remaining concerns with the applications are set out below, in the context of the legislative provisions summarised above, in particular those relating to appropriate assessment.

[30] Paragraph 2.6.101; see paragraphs 2.6.100-110 and 2.6.58-71 generally. Effects on foraging areas outside a SPA are to be taken into account when assessing the effects on bird populations of the SPA: see *Hargreaves v Secretary of State for Communities and Local Government* [2011] EWHC 1999 (Admin), which concerned effects on pink-footed geese which commuted inland from their roosting sites in the SPA to feed on grain and winter cereal crops on fields adjacent to the proposed development site.

4 Offshore Ornithology

4.1 Introduction

4.1.1 Our comments in this section relate primarily to the following documents:

- Environmental Statement (ES), Ch. 13 Offshore Ornithology doc. 6.1.13, APP-226)
- ES Appendix 13.1 Ornithology Technical Appendix Annex 3 (doc. 6.3.13.1, APP-566)
- Information for Habitats Regulations Assessment (doc. 5.3, App 201)

Note that our comments refer to both the original application documents and the updated information provided in the Applicant's Response to S51 Advice.

4.1.2 We have significant concerns regarding the findings of some of the impact assessments. As a result of the methodological concerns (set out below), the RSPB considers that the impacts have not been adequately assessed and, as such consider that an adverse effect on the integrity of the following SPAs and their species cannot be ruled out as follows:

- The impact of collision mortality on the kittiwake population of the Flamborough and Filey Coast Special Protection Area in-combination with other plans and projects;
- The impact of collision mortality and operational displacement on the gannet population of the Flamborough and Filey Coast Special Protection Area alone and in-combination with other plans and projects;
- The impact of collision mortality on the lesser black-backed gull population of the Alde-Ore Estuary SPA alone and in-combination with other projects;
- The impact of operational displacement on the razorbill population of the Flamborough and Filey Coast Special Protection Area in-combination with other plans and projects;
- The impact of operational displacement on the guillemot population of the Flamborough and Filey Coast Special Protection Area in-combination with other plans and projects;
- The impact of all potential effects on the breeding seabird assemblage feature of Flamborough and Filey Coast Special Protection Area in combination with other plans and projects;

4.1.3 In addition, we consider that insufficient evidence has been provided to rule out potential significant impacts on the following North Sea populations:

- Cumulative collision mortality to North Sea populations of kittiwake and great black-backed gull; and

- Cumulative operational displacement to North Sea populations of red-throated diver, guillemot and razorbill.

4.2 Overarching Concerns Regarding the Assessment of Collision Risk

4.2.1 In this section, we describe our overarching methodological concerns with the Applicant's assessment of collision risk. Later in the document, we explain how this has affected the outcomes for individual species.

(a) *Apportioning of kittiwake collision mortality to Flamborough and Filey Coast SPA*

4.2.2 We have concerns about the figures used for apportioning of collision mortality to the Flamborough and Filey Coast SPA and the evidence used to support this. The estimated proportion of kittiwake from the Flamborough and Filey Coast SPA used in the HRA is 26.1%, despite a recommendation from Natural England that apportioning should be 86% during the Norfolk Vanguard examination. Notwithstanding the Applicant's unfounded criticisms of the FAME and STAR[31] tracking of kittiwakes, which is dealt with below, the assessment does not fully take into account more recent tracking of kittiwakes from the Flamborough and Filey Coast SPA carried out in 2017, using lighter tags (<3% bodyweight) and following the birds for a longer period due to a novel attachment method (Wischnewski *et al*., 2018)[32]. We therefore do not agree with the value used for apportioning kittiwake collision mortalities to the Flamborough and Filey Coast SPA as it will considerably underestimate the actual impact. We recommend adoption of Natural England's recommendation at Norfolk Vanguard that apportioning to the Flamborough and Filey Coast SPA should be 86%. However, we welcome the more recent advice from Natural England that a range of apportioning rates are presented to reflect the large extent of the uncertainty inherent in the apportioning exercise.

(b) *Criticisms of kittiwake tracking data*

4.2.3 The Applicant raises a number of issues with regard to the suitability of tracking data obtained as part of the FAME and STAR projects for use in the assessment. However, the Applicant's report contains a number of misinterpretations and erroneous assertions. In particular:

[31] Future of the Atlantic Marine Environment (FAME) and Seabird Tracking and Research (STAR).

[32] Wischnewski, S., Fox, D.S. McCluskie, A. & Wright, L.J. (2018) Seabird tracking at the Flamborough & Filey Coast: Assessing the impacts of offshore wind turbines. RSPB Centre for Conservation Science Report to Ørsted.

- It is claimed that the longest foraging trips from FAME/STAR kittiwake data were largely from colonies where the breeding success was zero or close to zero. This is incorrect. The longest trips were recorded from Flamborough and Filey, where breeding success was comparatively high over the time of tracking.
- The claim that tagged birds were more likely to have failed is also incorrect. For the FAME and STAR data, where remote download tags were used, birds had to be re-caught when on the nest so were required to be successful, at least up until the point of recapture, in order to obtain the data.
- Tagging conducted in 2017 used tags that were less than 3% of the birds' body weight and observed longer foraging ranges.

4.2.4 For context, many seabird tracking studies fail to adequately assess the presence or magnitude of any negative effects that tagging may have (e.g. on behaviour, physiology, breeding success or survival), despite a general awareness of the potential issue (Barron *et al*. 2010[33]; Vandenabeele *et al*. 2011[34]). Several recent papers specifically address the issue of tag effects in seabirds (e.g. Chivers *et al*. 2016[35]; Thaxter *et al*. 2016[36]; Schacter & Jones 2017[37]; Kurten *et al*. 2019[38]) and a 2015 meta-analysis across avian bio-logging studies found small but significant negative effects of tagging on survival, reproduction and parental care, as well as tagging being associated with longer foraging trip durations (Bodey *et al*. 2015[39]). It also found that effects may be cumulative, with the effects of tagging not necessarily apparent in studies assessing effects based only on single traits. In certain cases, tag effects were correlated across different metrics e.g. survival and reproduction so the effects of tagging might be greater than that shown if only one measure is

[33] Barron, D. G., Brawn, J. D., & Weatherhead, P. J. (2010). Meta-analysis of transmitter effects on avian behaviour and ecology. *Methods in Ecology and Evolution*, *1*(2), 180-187.

[34] Vandenabeele, S. P., Wilson, R. P., & Grogan, A. (2011). Tags on seabirds: how seriously are instrument-induced behaviours considered?. *Animal Welfare-The UFAW Journal*, *20*(4), 559.

[35] Chivers, L.S., Hatch, S.A. and Elliott, K.H. (2016) Accelerometry reveals an impact of short-term tagging on seabird activity budgets. Condor, 118, 159-168.

[36] Thaxter, C. B., Ross-Smith, V. H., Clark, J. A., Clark, N. A., Conway, G. J., Masden, E. A., ... & Booth, C. (2016). Contrasting effects of GPS device and harness attachment on adult survival of Lesser Black-backed Gulls Larus fuscus and Great Skuas Stercorarius skua. *Ibis*, *158*(2), 279-290.

[37] Schacter, C. R., & Jones, I. L. (2017). Effects of geolocation tracking devices on behavior, reproductive success, and return rate of Aethia auklets: An evaluation of tag mass guidelines. *The Wilson Journal of Ornithology*, *129*(3), 459-468

[38] Kürten, N., Vedder, O., González-Solís, J., Schmaljohann, H., & Bouwhuis, S. (2019). No detectable effect of light-level geolocators on the behaviour and fitness of a long-distance migratory seabird. *Journal of Ornithology*, 1-9

[39] Bodey, T. W., Cleasby, I. R., Bell, F., Parr, N., Schultz, A., Votier, S. C., & Bearhop, S. (2018). A phylogenetically controlled meta-analysis of biologging device effects on birds: Deleterious effects and a call for more standardized reporting of study data. *Methods in Ecology and Evolution*, *9*(4), 946-955.

considered. There is therefore increasing evidence that tagging can have some negative effects across many species. However, several factors can affect the likelihood and extent of tag effects on birds, including (but not limited to) the weight of the tag relative to the bird, the attachment method, the length of deployment, handling time and time of year. These factors vary between species. Tag effects may be subtle, may act on a variety of difficult-to-measure parameters (e.g. bird behaviour) and can therefore be difficult to detect. Many of these parameters are also impossible to measure on control birds as they require data from tags.

4.2.5 For these RSPB studies, experienced and well-trained staff carried out the tagging using precise protocols designed to incorporate all known methods to minimise the potential disturbance caused by tagging seabirds. Colonies or species where potential disturbances could not be minimised where not included in the general program of tracking. Handling time, known to be an important factor in causing stress in wild birds was kept to a minimum (around six minutes). Tag attachments were made using the least invasive methods known; temporary attachment with waterproof cloth-backed Tesa tape to the feathers on the mantle or glue mounted onto the bird's back. After release all nests were watched from a suitable vantage point so that the observer was hidden from returning birds but to be able to defend nests from avian predators if required.

4.2.6 During the Fame/Star programme, the RSPB monitored breeding success of tagged birds, untagged birds whose nests neighboured a tagged nest, and controls at all tagging locations where researchers were based at a site over the breeding season (Fair Isle, Orkney, Colonsay and Bempton). Of these four sites the data from Colonsay are the most complete and analysis of those data only found effects of tagging on breeding success for kittiwakes, and here the effect was actually higher productivity. Data from Bempton in 2010 have also been analysed to assess potential effects of tags as part of a Master's thesis. Here, data on breeding success and changeover rates (a proxy for trip duration) were collected for a sample of tagged (n=28) and control (n=113) nests of kittiwakes. There were no significant differences in these metrics between the tagged and control nests (J. Gough, unpubl Masters thesis).

4.2.7 We deal with the Applicants arguments and misinterpretations under the kittiwake species account below.

(c) *Gannet avoidance rate*

4.2.8 Whilst the RSPB accepts the SNCBs' recommended amendment[40] to the gannet avoidance rate (AR) from 98% to 98.9% for non-breeding birds, we do not agree that this figure should be applied to the breeding season due to the lack of available evidence relating to breeding birds. During the breeding season there are significant time and energy constraints imposed on foraging birds by the requirement to return to the nest to incubate eggs or brood and provide food for chicks. As such, the response of foraging and commuting birds to the presence of a windfarm is likely to be different during the breeding season and so the avoidance rate, which incorporates such reactive behaviour, is also likely to be different. As acknowledged in the BTO Review, the SNCB advice is drawn from[41,42] the majority of evidence for avoidance behaviour of gannet is from non-breeding birds, (the BTO review makes this clear, saying: "*it should be noted that this figure is based on data that are most representative of the non-breeding season*"). Breeding birds, under the constraints outlined above, will behave differently and potentially be subject to greater impacts from developments[43]. As such, we recommend a more precautionary AR of 98% for the breeding season to account for this uncertainty regarding breeding bird behaviour around windfarms.

(d) *Lack of assessment of breeding seabird assemblage feature of Flamborough and Filey Coast SPA*

4.2.9 Potential impacts on the breeding seabird assemblage feature of Flamborough and Filey Coast SPA have not been assessed, noting that Natural England advised that this should have been assessed for Norfolk Vanguard and concluded that AEOI cannot be ruled out. We note that revised assessments are being undertaken and will review the updated findings once these are made available.

(e) *Consented capacity of windfarms*

4.2.10 The Applicant refers to projects in the in-combination assessment that have been built out to a

[40] Joint Nature Conservation Committee (JNCC), Natural England (NE), Natural Resource Wales (NRW), Northern Ireland Environment Agency (NIEA), Scottish Natural Heritage (SNH) (2014). Joint Response from the Statutory Nature Conservation Bodies to the Marine Scotland Science Avoidance Rate Review

[41] Cook, A.S.C.P., Humphreys, E.M., Masden, E.A. & Burton, N.H.K. (2014) The Avoidance Rates of Collision between Birds and Offshore Turbines. *Scottish Marine and Freshwater Science Volume 5 Number 16*, Report Published by Marine Scotland Science

[42] Cook, A. S., Humphreys, E. M., Bennet, F., Masden, E. A., & Burton, N. H. (2018). Quantifying avian avoidance of offshore wind turbines: current evidence and key knowledge gaps. *Marine environmental research*, *140*, 278-288.

[43] Masden, E. A., Haydon, D. T., Fox, A. D., & Furness, R. W. (2010). Barriers to movement: modelling energetic costs of avoiding marine wind farms amongst breeding seabirds. *Marine Pollution Bulletin*, *60*(7), 1085-1091.

lower capacity than that consented as a source of precaution within the assessments. This is an acceptable point for windfarms where the Development Consent Order (DCO) has been amended and therefore there is legal certainty regarding the reduction. However, where windfarms still have their original DCOs and therefore the ability to construct more wind turbines, it is not appropriate to do anything less than consider the full extent of those DCOs when considering in-combination/cumulative effects.

(f) *Mitigation of collision risk through raising turbine draught height*

4.2.11 As noted above, the RSPB recommends that mitigation is provided through raising the turbine draught height for the purposes of reducing the project's collision risk when considered alone, and its contribution to in-combination collision risk. We therefore request that collision risk to key species for height rises up to and including 35m are modelled.

Density dependent outputs of PVA

4.2.12 We do not accept the arguments for the use of PVA outputs incorporating compensatory density dependence, although acknowledge that both density dependent and independent formulations are presented. The reasons for this are outlined in Green *et al*. (2016)[44] and the reviews by Cook and Robinson (2015)[45] and O'Brien *et al*. (2017)[46] and are not that density dependence does not exist, but rather that we do not have the means to accurately quantify the strength and form of it in a biologically meaningful way in order to incorporate it into PVA. Whilst we accept that density dependence is likely to exist in seabird populations, precise species and colony specific knowledge of its size and shape are needed to correctly parameterise the population models. This is important to acknowledge because density dependence is not always compensatory, but can also be depensatory, slowing the rate of population growth at lower population densities. In other words, a population decline arising from an offshore wind farm could have larger consequences

[44] Green, R. E., Langston, R. H. W., McCluskie, A., Sutherland, R. and Wilson, J. D. (2016), Lack of sound science in assessing wind farm impacts on seabirds. J Appl Ecol. doi:10.1111/1365-2664.12731

[45] Cook, A.S.C.P. and Robinson, R.A. (2015) The scientific validity of criticisms made by the RSPB of metrics used to assess population level impacts of offshore windfarms on seabirds. BTO Research Report No. 665. https://www.bto.org/sites/default/files/publications/rr665.pdf

[46] O'Brien, S.H, Cook, A.S.C.P., Robinson, R.A. (2017) Implicit assumptions underlying simple harvest models of marine bird populations can mislead environmental management decisions. J Env Man 201: 163-171 https://doi.org/10.1016/j.jenvman.2017.06.037

on the population than are predicted by the compensatory density dependent or even density independent models. Horswill and Robinson (2015)[47] identified depensation occurring in three gull species (black-legged kittiwake, black-headed gull and herring gull). As such it would be very wrong to simply assume that density independent outputs are highly precautionary, rather that density independent outputs are the most sensible to use for assessment.

Reductions in windfarm capacity post-consent

4.2.13 It is stated that many of the collision estimates for other windfarms are based on higher numbers of turbines than were actually installed. Based on a method of updating collision estimates presented by EATL (2016)[48] this is stated to overestimate in-combination mortality by 400 for gannets of Flamborough and Filey Coast SPA and 550 for kittiwakes of Flamborough and Filey Coast SPA and Flamborough Head and Bempton Cliffs SPA, and 20 for lesser black-backed gulls of the Alde-Ore Estuary SPA. This is an acceptable point for windfarms where the DCO has been amended and therefore there is legal certainty regarding the reduction, but where windfarms still have their original DCOs, it is not appropriate to do anything less than assess the full extent of those DCOs when considering in-combination/cumulative effects, as the final layout and therefore required assessment parameters will not be known.

4.3 Collision Risk to Kittiwakes of Flamborough and Filey Coast SPA

Breeding season definitions

4.3.1 We have concerns about the manner in which the Applicant has presented biological seasons for kittiwake, although we acknowledge that the Applicant has presented both their preferred definition and the more correct definition advocated by Natural England. The use of the Applicants preferred 'migration-free breeding season' means that months where breeding and migration can overlap are excluded from the analysis of breeding season impacts, which artificially reduces the duration of the breeding season and hence risks underestimating collision mortality of breeding birds.

[47] Horswill, C. & Robinson R. A. (2015). Review of seabird demographic rates and density dependence. JNCC Report No. 552. Joint Nature Conservation Committee, Peterborough.
[48] EATL (2016) Revised CRM. Submitted for Deadline 5: Available online at: https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010056/EN010056-001644-EA3%20-%20Revised%20CRM.pdf

4.3.2 For kittiwake, the migration-free breeding season excludes March-April and August, which again reduces the number of collisions. The first kittiwakes arrive at the Flamborough and Filey Coast colony in February, with most birds back by March and remaining until August, hence there is a strong argument for considering March, April and August to be part of the breeding season.

4.3.3 Given that recent tracking data (Wischnewski *et al*., 2018)[49] shows connectivity of breeding kittiwakes from that colony with the project site, the definition of 'breeding season' as presented in Furness (2015)[50], should be used in the assessment.

Apportioning of mortality to Flamborough and Filey Coast SPA

4.3.4 We have concerns about some of the figures used for apportioning of collision mortality to SPAs and the evidence used to support this. The estimated proportion of kittiwakes from Flamborough and Filey Coast SPA used in the HRA is 26.1% and is not based on site-specific historical estimates. We have seen no evidence presented to support the figure selected.

4.3.5 Notwithstanding the Applicant's criticisms of the FAME and STAR tracking of kittiwakes, which are dealt with below, the assessment does not take into account more recent tracking data. This means we cannot agree with the assertions in para. 276 of the Information for HRA (doc. 5.3; APP-201) that only a very small percentage of breeding adults from the SPA will be at risk of collision at the Norfolk Boreas site and we consider that the value used for apportioning kittiwake collision mortalities to the Flamborough and Filey Coast SPA will considerably underestimate the actual impact.

4.3.6 Tracking of kittiwake from the Flamborough and Filey Coast SPA has been carried out from 2010 to 2015 and 2017-2018. The tags used between 2010 and 2015 were GPS tags that required recapturing of the birds and typically were only able to collect data for a period of a few days, around the time of late incubation and early hatching when the birds are likely to remain closest to the nest. The tags used in 2017-2018 were very lightweight tags that allowed for remote downloading of data so there was no need to recapture the birds. A different attachment method

[49] Wischnewski, S., Fox, D.S. McCluskie, A. & Wright, L.J. (2018) Seabird tracking at the Flamborough & Filey Coast: Assessing the impacts of offshore wind turbines. RSPB Centre for Conservation Science Report to Ørsted.
[50] Furness, R. (2015) Non-breeding season populations of seabirds in UK waters: populations sizes for Biologically Defined Minimum Population Scales (BDMPS). Natural England Commissioned Report No. 164. 389pp

was also used which meant that the tags remained on for longer, between 20 and 29 days. This means that kittiwakes were tracked for a longer part of the breeding season including when adults were provisioning large chicks (that can be left for longer than small chicks). The tracking data for 2017 are presented in Wischnewski *et al*. (2018)[51] and have been made available to the Applicant. The foraging ranges recorded during 2017 were greater than those previous recorded, with a maximum foraging range of 324km, and this is most likely to be a function of the longer tracking period. The tracking in 2017 also showed a degree of overlap with Norfolk Boreas. Data from 2018 have been analysed and are under review.

4.3.7 We therefore recommend that the Applicant, in discussion with NE and the RSPB, revise and recalculate the apportioning value for kittiwake using the amended SNH method which takes into account these recent tracking data. This value is likely to be much higher than the current arbitrary suggested value. We also note that due to the high level of uncertainty inherent in the apportioning calculation, that Natural England currently advocate the presentation of a range of apportioning values, and we are entirely supportive of this approach.

4.3.8 Marine Scotland have been developing a tool that uses the information from Wakefield *et al*., (2017)[52] to apportion birds to colonies. This is currently under internal review at Marine Scotland and is likely to be available soon. Once available it is likely to provide the best method for apportioning, for some species, including kittiwake.

Kittiwake productivity at Flamborough and Filey Coast SPA

4.3.9 Para. 290 of the Information to Support HRA, (doc. 5.3; App-201) refers to the "continued relatively high breeding success" of the Flamborough and Filey Coast SPA colony. However, recent census data (Aitken *et al*., 2017 – see Fig.3 from the report which is reproduced below) has shown that kittiwake productivity has declined rapidly at the SPA and this will have severe long-term impacts on the population growth. This means that it may no longer be appropriate to apply the outputs from PVAs produced for historic projects without revision of the parameters employed.

[51] Wischnewski, S., Fox, D.S. McCluskie, A. & Wright, L.J. (2018) Seabird tracking at the Flamborough & Filey Coast: Assessing the impacts of offshore wind turbines. RSPB Centre for Conservation Science Report to Ørsted.

[52] Wakefield, E.D., Owen, E., Baer, J., Carroll, M.J., Daunt, F., Dodd, S.G., Green, J.A., Guilford, T., Mavor, R.A., Miller, P.I. and Newell, M.A., (2017) Breeding density, fine-scale tracking, and large-scale modeling reveal the regional distribution of four seabird species. *Ecological Applications*, *27*(7), pp.2074-2091.

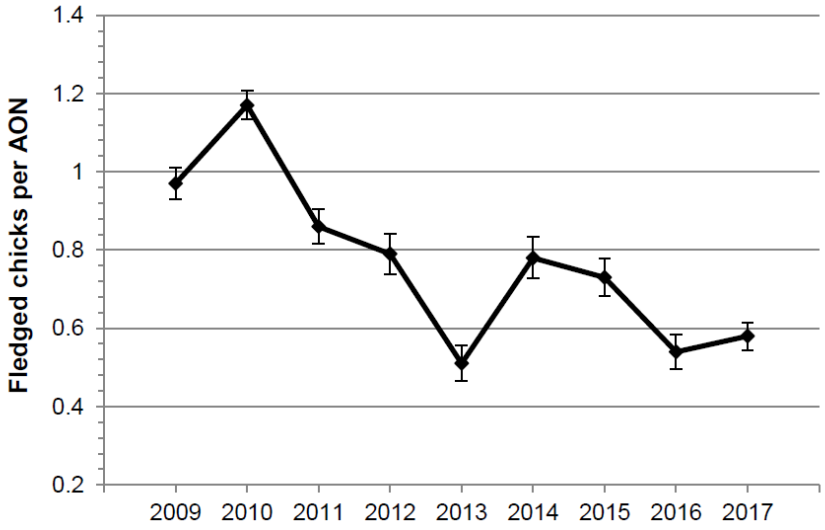


Fig. 3: Flamborough/Bempton Black-legged Kittiwake productivity 2009 – 2017, mean of plot results plus/minus SE.

Population modelling

4.3.10 The Applicant's Information for HRA (doc. 5.3, APP-201) paras. 248-249 discuss the outputs of population modelling for the Flamborough and Filey Coast SPA kittiwake population carried out for the Hornsea Project Three offshore windfarm. Whilst we welcome the inclusion of the outputs of the density independent version of the model, the concerns above regarding more recent changes to demographic rates may apply. We welcome that these outputs have been presented in the form of counterfactuals of population size, as advocated by the RSPB[53]. These are a robust and informative metric which indicate the percentage difference between the population with or without additional mortality at the end of the lifetime of the wind farm.

Criticisms of kittiwake tracking data

4.3.11 The Applicant raises a number of issues with regard to the suitability of tracking data obtained as part of the FAME and STAR projects for use in the assessment. However, the Applicant's Information for the Habitats Regulations Assessment (doc. 5.3; APP-201) contains a large number of misinterpretations and erroneous assertions.

4.3.12 In para. 260 it is claimed that the longest foraging trips from FAME/STAR kittiwake data were

[53] Green, R. E., Langston, R. H. W., McCluskie, A., Sutherland, R. and Wilson, J. D. (2016), Lack of sound science in assessing wind farm impacts on seabirds. J Appl Ecol. doi:10.1111/1365-2664.12731

largely from colonies where the breeding success was zero or close to zero. This is stated without reference and is incorrect. The longest trips were recorded from Flamborough and Filey, where breeding success was comparatively high over the time of tracking.

4.3.13 It is true, as stated in para. 260, that study birds tend to be reachable. This could be from the top of a cliff, or the bottom. This, however, does not necessarily mean that the birds are at the periphery of the colony. In some colonies all birds are reachable, especially with the long pole used at Flamborough and Filey. The periphery problem is true for Bempton due to accessibility issues at the high cliff sections and there have been studies showing lower breeding success at the edge of colonies, which is why we are currently trying to tag birds at the centre of the colony. However, an examination of breeding success in 2017 found that it was generally low and breeding success at the tagging site in Flamborough is similar to the average for the whole SPA (Wischnewski *et al.,* 2018)[54]. In addition, there are no studies that we are aware of which demonstrate the effect of colony position on the foraging behaviour of seabirds, since the uncatchable birds cannot be tested. We agree that it is plausible that there is an effect, but whether the effect is larger than other factors determining where these birds are feeding (food availability, competition from conspecifics, seabird type etc.) is doubtful.

4.3.14 The further claim in para. 260 that tagged birds were more likely to have failed is also incorrect. For the FAME and STAR data, where remote download tags were used, birds were re-caught, in order to retrieve the tag, on the nest, so it is impossible to re-catch tagged birds if they have failed breeding as they would not return to their nest, or sit tight on the nest, if they were not protecting chicks. Ponchon *et al*. (2015)[55], cited in para 260, did show prospecting movements in birds that fail early during the breeding season (during incubation). However, citing this incorrectly implies that FAME/STAR birds were unsuccessful breeders. Furthermore, the 2017 tagging work at Flamborough and Filey coast SPA, using tags weighing less than 3% body weight, did include failed birds, as there was no need to recapture due to different tag technology, and it was possible to compare these with successful breeding birds. The comparison showed that failed breeders made

[54] Wischnewski, S., Fox, D.S. McCluskie, A. & Wright, L.J. (2018) Seabird tracking at the Flamborough & Filey Coast: Assessing the impacts of offshore wind turbines. RSPB Centre for Conservation Science Report to Ørsted.

[55] Ponchon, A., Chambert, T., Lobato, E., Tveraa, T., Gremillet, D. and Boulinier, T. (2015) Breeding failure induces large scale prospecting movements in the black-legged kittiwake. Journal of Experimental Marine Biology and Ecology, 473, 138-145.

offshore trips to similar foraging areas to the ones visited by actively breeding birds[56]

4.3.15 With reference to para. 260-264, it is true that the potential for tag effects on birds deserve the utmost attention. This is why the RSPB conducted trials in the first year of tagging kittiwakes and these trials found no effect on foraging trip duration or breeding success. However, the references presented by the Applicant to support their arguments are misleading. For example, the reference in para 263 to adverse effects from devices weighing more than 3% of a bird's body weight (Phillips *et al*, 2003)[57] was from a study of procellarids (petrels, prions and shearwaters) using long term deployments. In a study on kittiwakes, Chivers *et al*. (2016)[58], where birds were shown having a 30% reduction in flight activity with tags fitted, the birds were equipped with two devices at once - a GPS tag of the same type used in FAME/STAR, plus an additional accelerometer. The paper does not give the weights of the devices separately, but the tags are significantly larger than those used in FAME and STAR, so a comparison is not entirely valid. Furthermore, while it is true that Chivers *et al*. (2016) found that there was a reduction in flight behaviour in tagged kittiwakes carrying very heavy tags of more than five grams compared to birds carrying tags of only a gram, they also found that there was no difference in trip duration or the number of trips in 24 hours. They also suggested that birds with heavier tags actually travelled shorter distances rather than longer ones (which is a more intuitive effect). Therefore, tag effects do not explain longer ranging trips in tagged kittiwakes.

4.3.16 Other studies cited also are misleading. For example, the study by Heggøy *et al*. (2015)[59] (referred to in para. 261) showing increased stress hormone in kittiwakes carrying loggers is potentially not comparable with RSPB tracking, as it used tail attachments that have potential to increase flight costs by shifting the centre of gravity.

4.3.17 Kidawa *et al*. (2012)[60] found a reduction in body mass of chicks from birds that had been tagged

[56] Wischnewski, S., McCluskie, A.E. Sansom, A. and Wright, L. (2018) Seabird tracking and windfarms: The role of behavioural specificity and deployment length. Oral Presentation to BOU conference

[57] Phillips, R.A., Xavier, J.C. and Croxall, J.P. (2003) Effects of satellite transmitters on albatrosses and petrels. Auk, 120, 1082-1090.

[58] Chivers, L.S., Hatch, S.A. and Elliott, K.H. (2016) Accelerometry reveals an impact of short-term tagging on seabird activity budgets. Condor, 118, 159-168.

[59] Heggøy, O., Christensen-Dalsgaard, S., Ranke, P.S., Chastel, O. and Bech, C. (2015) GPS-loggers influence behaviour and physiology in the black-legged kittiwake Rissa tridactyla. Marine Ecology Progress Series, 521, 237-248.

[60] Kidawa, D., Jakubas, D., Wojczularis-Jakubas, K., Iliszko, L. and Stempniewicz, L. (2012) The effects of loggers on the foraging

and also recorded longer lasting trips, but not longer distance ones, as claimed by the Applicant. Importantly, this study was of little auks, which are a diving seabird species similar to penguins and for which some studies indicated that dorsal tag attachment increased drag and reduced their diving efficiency, thus increasing potential tag effects (i.e. Ballard *et al*. 2001[61], Hamel *et al*. 2004[62]).

4.3.18 It is also important to note that foraging trip duration is not the same as trip range. Birds going on longer lasting trips are not necessarily travelling to more distant sites; it is only known that they are away from the colony for longer. Therefore, trip duration does not give any insight into the birds' distribution.

4.3.19 Finally, the citation of Passos *et al*. (2010)[63] is also misleading. This study looked at the effect of additional weight on Cory's shearwater trip characteristics using geolocators. However, shearwaters are, from a flight energetics perspective, very different from kittiwakes. They use dynamic soaring a lot in order to cover large distances without expending much energy, similar to albatrosses. This means they have regular foraging ranges that are more than four times larger (in this case) than foraging ranges of kittiwakes. Furthermore, geolocators can have errors of around 200 km, therefore, the conclusion drawn from this that attaching loggers increases the duration of foraging trips is unlikely to be applicable to kittiwakes.

4.3.20 Clearly there is a need for the scientific community to better understand and minimise device effects, however tagging represents the best way to determine foraging locations of birds from a specific colony. The tagging conducted in 2017 from Flamborough and Filey Coast SPA used tags that were less than 2.5% of the birds' body weight, and observed even longer foraging ranges with multiple actively breeding birds visiting the Norfolk Boreas site (Wischnewski *et al*., 2018)[64].

effort and chick-rearing ability of parent little auks. Polar Biology, 35, 909-917.

[61] Ballard, G., Ainley, D.G., Ribic, C.A. and Barton, K. R. (2001) Effect of Instrument Attachment and Other Factors on Foraging Trip Duration and Nesting Success of Adelie Penguins. The Condor 103 (3): 481-490 https://doi.org/10.1650/0010-5422(2001)103[0481:EOIAAO]2.0.CO;2

[62] Hamel, N.J., Parrish, J.K. and Conquest, L.L. (2004) Effects of Tagging on Behaviour, Provisioning and Reproduction in the Common Murre (*Uria aalge*), a Diving Seabird. The Auk 121 (4): 1161-1171. https://doi.org/10.1642/0004-8038(2004)121[1161:EOTOBP]2.0.CO;2

[63] Passos, C., Navarro, J., Giudici, A. and Golzalez-Solis, J. (2010) Effects of extra mass on the pelagic behaviour of a seabird. Auk, 127, 100-107.

[64] Wischnewski, S., Fox, D.S. McCluskie, A. & Wright, L.J. (2018) Seabird tracking at the Flamborough & Filey Coast: Assessing the impacts of offshore wind turbines. RSPB Centre for Conservation Science Report to Ørsted.

4.3.21 In quoting Natural England's advice on kittiwake foraging ranges, para. 265, the Applicant neglects to mention that this guidance predates the more recent tagging studies and that current advice for apportioning Kittiwake at Norfolk Vanguard and Boreas is for a range of apportioning values to be presented, up to 100%. It is therefore entirely misleading for the Applicant to state that Natural England guidance suggests only a small percentage of breeding kittiwake from the SPA will be at risk of collision at the Norfolk Boreas site.

4.3.22 The Applicant cites Carroll *et al.* (2017)[65] as evidence of limited connectivity between Flamborough and Filey Coast SPA and Norfolk Boreas. Carroll *et al.* (2017) used data from the tracking of kittiwake from the Flamborough and Filey Coast SPA from 2010 to 2015. Subsequent tracking was carried out in 2017 and 2018. The tags used between 2010 and 2015 were GPS tags that required recapturing of the birds and typically were only able to collect data for a period of a few days, around the time of late incubation and early hatching when the birds are likely to remain closest to the nest. The tags used in 2017-2018 were very lightweight tags that allowed for remote downloading of data so there was no need to recapture the birds. A different attachment method was also used which meant that the tags remained on for longer, between 20 and 29 days. This means that kittiwakes were tracked for a longer part of the breeding season including when adults were provisioning large chicks (that can be left for longer than small chicks). The tracking data for 2017 are presented in Wischnewski *et al.* (2018)[66] and have been made available to the Applicant. The foraging ranges recorded during 2017 were greater than those previously recorded, with a maximum foraging range of 324km, and this is most likely to be a function of the longer tracking period. Furthermore, the tracking in 2017 showed a degree of overlap with Norfolk Boreas. These more recent data should be used in the assessment of connectivity. Data from 2018 have been analysed and are currently being reviewed.

4.3.23 In summary, we do not consider that the Applicant has presented information which justifies the exclusion of the FAME/STAR (or subsequent) tracking data from that used to inform consideration

[65] Carroll, M.J., Bolton, M., Owen. E., Anderson, G., Mackley, E., Dunn, E. & Furness R. (2017) Kittiwake breeding success in the southern North Sea correlates with prior sandeel fishing mortality. Aquatic Conserv: Mar Freshw Ecosyst. 27:1164–1175. https://doi.org/10.1002/aqc.2780

[66] Wischnewski, S., Fox, D.S. McCluskie, A. & Wright, L.J. (2018) Seabird tracking at the Flamborough & Filey Coast: Assessing the impacts of offshore wind turbines. RSPB Centre for Conservation Science Report to Ørsted.

of kittiwake foraging range and connectivity with the Norfolk Boreas site. Therefore, our recommendation that apportioning is revisited using these data still applies.

Conclusions regarding kittiwake collision mortality and adverse effects on the integrity of the Flamborough and Filey Coast SPA

4.3.24 The Applicant concludes that there will no adverse effect on the integrity of the Flamborough and Filey Coast SPA as a result of collision mortality to kittiwakes alone (para. 253 of the Information for HRA (doc. 5.3; APP-201)) or in-combination (para. 254 of the Information for HRA (doc. 5.3; APP-201)). However, for the in-combination assessment, the Applicants own calculations indicate that there will be a decrease in the SPA kittiwake population of around 16% in the lifetime of the project. We therefore find it impossible to conclude no adverse effect on integrity as a result of collision mortality through the project in combination.

4.4 Collision Risk to Gannets of Flamborough and Filey Coast SPA

Breeding season definitions

4.4.1 We have concerns about the manner in which the Applicant has defined biological seasons for gannet. The use of the 'migration-free breeding season' means that months where breeding and migration can overlap are excluded from the analysis of breeding season impacts, artificially reducing the duration of the breeding season and hence risks underestimating collision mortality of breeding birds. However, we acknowledge that the Applicant has also presented to more correct "full migration" breeding season, as advocated by Natural England.

4.4.2 For gannet, the migration-free breeding season excludes March and September, which reduces the number of predicted collisions. However, gannets start arriving at the Flamborough and Filey Coast colony in January and establishing their nest sites in March. Whilst peak fledging is in August, some birds are still fledging in September, hence there is a strong argument for considering March and September to be part of the breeding season.

4.4.3 Given that Norfolk Boreas is within the mean-maximum foraging range of gannets from Flamborough and Filey Coast SPA, the definition of 'breeding season' as presented in Furness

(2015), should be used, except where colony specific evidence clearly suggests otherwise. If figures for the migration-free breeding season are to be presented, we consider that it would be necessary to attribute birds in the crossover months to breeding and dispersal in order to ensure collision risk to breeding birds is not underestimated.

Gannet avoidance rate

4.4.4 We maintain our position that, whilst we agree with the use of a 98.9% avoidance rate for non-breeding gannets, in the breeding season, a 98% avoidance rate is appropriate. Cleasby *et al*., (2015)[67], while not discussing avoidance rates, demonstrated that foraging birds are at more risk of collision than commuting birds. In order to provision chicks, gannets will need to forage more during the breeding season and will also be constrained by central place foraging. Such behavioural differences are likely to result in changes in avoidance behaviour (Cook *et al*., 2018)[68], and since the figures used for the calculation of avoidance rates advocated by the SNCBs are largely derived from the non-breeding season for gannet (Cook *et al.*, 2014[69] and Cook *et al*., 2018) we recommend a more precautionary avoidance rate of 98% should be presented for the breeding season. The current SNCB advice also highlights that due consideration should be given to uncertainty in collision risk estimates, including the use of confidence intervals around the avoidance rates and flight height estimates.

Effects of harvesting on gannet populations

4.4.5 Para. 244 of the Information for HRA (doc. 5.3; APP-201) use harvesting at Sula Sgeir to argue that gannet populations are robust to human impacts. The effect of harvesting by humans would be dependent on demographic rates of the individual colony and we therefore do not agree that such generalisations are robust.

[67] Cleasby, IR, Wakefield, ED, Bearhop, S, Bodey, T W, Votier, SC and Hamer, KC (2015), Three-dimensional tracking of a wide-ranging marine predator: flight heights and vulnerability to offshore wind farms. J Appl Ecol, 52: 1474–1482. http://onlinelibrary.wiley.com/doi/10.1111/1365-2664.12529/full

[68] Cook, A., Humphreys, E., Bennet, F., Masden, E. & Burton, N. (2018) Quantifying avian avoidance of offshore windfarms: Current evidence and key knowledge gaps. Marine Environmental Research 140:278-288 https://doi.org/10.1016/j.marenvres.2018.06.017

[69] Cook, A., Humphreys, E., Masden, E. & Burton, N. (2014) The avoidance rates of collision between birds and offshore turbines. BTO Research Report No. 656. http://www.gov.scot/resource/0046/00464979.pdf

Population modelling

4.4.6 Paras. 213-216 of the Information for HRA (doc. 5.3; APP-201) discuss the outputs of population modelling for the Flamborough and Filey Coast SPA gannet population carried out for the Hornsea Project Two offshore windfarm. We welcome the presentation of the outputs of the density independent version of the model, and these outputs presented in the form of counterfactuals of population size. These are a robust and informative metric which indicate the percentage difference between the population with or without additional mortality at the end of the lifetime of the wind farm.

Conclusions regarding gannet collision mortality and adverse effects on the integrity of Flamborough and Filey Coast SPA

4.4.7 The Applicant concludes that there will be no adverse effect on the integrity of the Flamborough and Filey Coast SPA as a result of collision mortality and displacement to gannets from the Norfolk Boreas project alone (para. 220 of the Information for HRA (doc. 5.3; APP-201)) or in-combination with other projects (para. 221 of the Information for HRA (doc. 5.3; APP-201)). We do not agree there can be sufficient confidence in these conclusions. The Applicant's own calculations indicate that there will be a decrease in the SPA population of around **40%** in the lifetime of the project. We therefore find it impossible to conclude no adverse effect on integrity of the Flamborough and Filey Coast SPA as a result of collision mortality through the project in combination. We also consider that it is not currently possible to rule out an adverse effect on integrity of the Flamborough and Filey Coast SPA arising from the project alone as the Applicant's own calculations, with adjusted Avoidance Rate in the breeding season to RSPB preferred value, indicate a decline in the SPA population of up to 18% as a result of the project alone.

4.5 Collision Risk to Lesser Black-backed Gulls of the Alde-Ore Estuary SPA

Apportioning of mortality to SPAs

4.5.1 The methods used for apportioning collision mortality of lesser black-backed gulls to the Alde-Ore Estuary SPA are inadequately explained, with insufficient reference to current knowledge and a lack of precaution. Such precaution is a fundamental necessity of the assessment given the considerable uncertainty inherent in the apportioning exercise

4.5.2 JNCC (2018b)[70] discuss the growth rate of lesser black-backed gull colonies since the Seabird 2000 census, and conclude that there is insufficient evidence to allow a trend to be identified. Colonies display differing trends, due to differing in factors affecting their growth rate. Many large coastal colonies have undergone significant declines, including that of Orfordness, whilst some urban colonies, particularly in the south-east and north-west are known to have increased significantly. Given that JNCC (2018b) cannot specify trend figures, and that the non-SPA population for Norfolk and Suffolk includes both urban colonies (likely to have increased) and rural coastal colonies (may have decreased), we therefore do not consider it safe to propose an overall level of population change for the non-SPA population since the Seabird 2000 census.

4.5.3 There is also no discussion of the differences in foraging behaviour between urban and inland colonies and rural, coastal colonies. Whilst the evidence available is limited, some studies of lesser black-backed gull diet are available. Coulson and Coulson (2008)[71] found no offshore marine component (i.e. fish or fish offal) in the diet of the lesser black-backed gull colony in Dumfries, in an analysis of regurgitated pellets. Food sources were predominantly agricultural (55% of pellets), from landfill sites (23%) or intertidal habitats (12%). Similarly, at an inland colony in the Netherlands (c.30km from the North Sea), Gyimesi *et al*. (2016)[72] found no marine remains in an analysis of pellets and boluses and found only 2 of 710 trips recorded by GPS tags visited the North Sea. Conversely, at two rural island colonies in the south-eastern North Sea, Kubetzki and Garthe (2003)[73] found that 80% of lesser black-backed gull pellets contained prey from coastal waters. Given this difference, we do not consider it safe to assume that birds from urban colonies will forage at sea to the same extent as those birds from rural coastal colonies, including the Alde-Ore Estuary SPA. There is an argument therefore, to exclude urban populations when considering apportioning to the SPA.

[70] JNCC (2018b) Latest population trends: lesser black-backed gull. Available at: http://jncc.defra.gov.uk/page-2886)
[71] Coulson, J.C. & Coulson, B.A. (2008) Lesser Black-backed Gulls Larus fuscus nesting in an inland urban colony: the importance of earthworms (Lumbricidae) in their diet, Bird Study, 55:3, 297-303, DOI: 10.1080/00063650809461535
[72] Gyimesi, A., Boudewijn, T.J., Buijs R-J., Shamoun-Baranes, J.Z., de Jong, J.W., Fijn, R.C., van Horssen, P.W. & Poot, M.J.M. (2016) Lesser Black-backed Gulls Larus fuscus thriving on a non-marine diet, Bird Study, 63:2, 241-249, DOI: 0.1080/00063657.2016.1180341
[73] Kubetzki, U. & Garthe, S. (2003) Distribution, diet and habitat selection in four sympatrically breeding gull species in the south-eastern North Sea. Marine Biology 143: 199-207 DOI 10.1007/s00227-003-1036-5

4.5.4 Using the Applicant's calculation of 6,700 birds of all ages associated with the SPA, the apportioning to the Alde-Ore SPA would therefore be between 24.1% if urban birds are included (6700/21093 + 6700) and 38.8% when urban birds are excluded (6700/10555 + 6700). Given the discussion above, the lower figure (which is close to the Applicant's proposed 25%) is clearly unrealistic, and a figure likely to be at least 35% would be more appropriate.

Potential for mitigation of impacts on the Alde-Ore Estuary SPA

4.5.5 The RSPB are concerned at the Applicant's interest in improving the conservation status of lesser black-backed gull through predator management at the Alde-Ore Estuary SPA, as outlined in Information for HRA (doc. 5.3; APP-201).

4.5.6 The consenting of the Galloper offshore windfarm in 2013 included provision for a fund to provide mitigation measures for mortality of lesser black-backed gulls on the Alde-Ore Estuary SPA. The RSPB raised concerns about the principle of and likely success of this approach to mitigation during the examination. Since 2013, Natural England have been unable to identify and deliver measures that could provide successful mitigation by raising productivity, mainly because there is uncertainty as to the relative importance of factors affecting this population. As yet therefore, it has not been possible to implement the required mitigation.

4.5.7 Due to the uncertainty around the relative importance of the various factors affecting this population, we consider the Applicant's assertion that one of the main drivers affecting gull numbers at the colony is management of predation to be an oversimplification. Whilst this does undoubtedly affect productivity, given the current levels of predator control across the SPA (carried out as part of normal site management), it is unlikely that further predator control alone would lead to sufficient further increases in productivity.

Conclusions regarding lesser black-backed gull collision mortality and adverse effects on the integrity of the Alde-Ore Estuary SPA

4.5.8 The Applicant concludes no adverse effects on the integrity of the Alde-Ore Estuary SPA as a result of collision mortality to lesser black-backed gulls from Norfolk Boreas alone is predicted (para. 203 of the Information for HRA (doc. 5.3; APP-201)) or arising from collision mortality in-

combination with other projects (para. 216 of the Information for HRA (doc. 5.3; APP-201)). This does not demonstrate the required level of confidence that adverse effects on the integrity can be excluded, as it does not meet the standard from the *Waddenzee* Judgement that "no reasonable scientific doubt remains as to the absence of an adverse effect". As stated above, we do not consider that the method of apportioning birds present on the development site to the SPA is correct and it is likely to underestimate the number of SPA individuals affected. As such we do not think, on the basis of this evidence, that it is possible to rule out an adverse effect, from the project alone, on the integrity of the Alde-Ore Estuary SPA.

4.5.9 Furthermore, on the basis of the Applicant's figures (which we consider likely underestimates for the reasons explained above), the in-combination mortality will result in a population decrease of around 25% in the lifetime of the development arising through collision mortality in-combination with other projects. We consider such a high decrease in an already declining population to be a clear adverse effect on site integrity and disagree with the Applicants conclusion.

4.6 Cumulative Collision Risk to Kittiwakes

Kittiwake population changes

4.6.1 Para. 369 of ES, Ch. 13 (doc. 6.1.13; APP-226) to discusses the changes in the UK kittiwake population over three 15-year periods and use this as evidence that a decline of up to nearly 11% due to windfarm mortality over 25 years would be undetectable against this level of natural change.

4.6.2 JNCC (2018a)[74] discusses the rapid decline in the UK kittiwake population observed since the early 1990s and link this to declining productivity and adult survival, with declines in sandeel prey and the effects of climate change on sea surface temperatures noted as likely contributory factors. Frederiksen *et al*. (2004)[75] also demonstrated the vulnerability of kittiwake populations to human activities through a study based on the Isle of May. Their population modelling showed that this

[74] JNCC (2018a) Latest population trends: black-legged kittiwake. Available at: http://jncc.defra.gov.uk/page-2889#2
[75] Frederiksen, M., Harris, M.P., Daunt, F., Rothery, P. and Wanless, S. 2004. The role of industrial fisheries and oceanographic change in the decline of North Sea black-legged kittiwakes. Journal of Applied Ecology 41: 1129-1139.

population was unlikely to increase should the local sandeel fishery remain active and would be likely to decline further if sea surface temperature also increased, due to effects on both productivity and adult survival.

4.6.3 Given this context of continued declines in the UK population since the early 1990s and the effect of anthropogenic impacts on adult survival and productivity, we strongly disagree with the Applicant's assertion that declines of the level predicted by the PVA due to offshore windfarm mortality alone would be undetectable against these background changes. Rather, we consider that this could add significantly to the multiple stressors affecting this population and reduce the likelihood of population recovery.

Conclusions regarding cumulative kittiwake collision mortality

4.6.4 The density independent outputs of the East Anglia THREE PVA raise significant concerns regarding the impact of offshore windfarm mortality on the kittiwake population, with a decline of 10.3-10.9% predicted over 25 years, less than the lifetime of the proposed Development. Given the sensitivity of the kittiwake population to human impacts, we cannot agree that this magnitude of effect is low (as stated in para. 463 of ES, Ch. 13 (doc. 6.1.13; APP-226)) nor that this would equate to impacts of minor adverse significance. Natural England were unable to rule out significant adverse effect on kittiwake arising through cumulative collisions by the conclusion of the Norfolk Vanguard examination and as the current proposal will increase those predicted mortalities, consequently we cannot rule out adverse effects.

4.7 Cumulative Collision Risk to Great Black-backed Gulls

4.7.1 In their assessment of cumulative collision risk to Great black-backed gull, the Applicant cites instances where they argue the approach has been over-precautionary. These are nocturnal activity rates, density dependent PVA outputs and differences between as built and consented wind farms. The RSPB disagrees on these points as follows.

Nocturnal activity rate

4.7.2 Although presenting a range of values, the Applicant argues for a lowering of Nocturnal Activity Factors. However, for large gulls, there is no peer-reviewed evidence for a change in the factor

that is being used. The current factor is derived from the expert opinion collected by Garthe and Hüppop (2004)[76] and this use is endorsed by Band (2012)[77]. A review of seabird vulnerability to offshore wind farms (Furness *et al*., 2013)[78] recommended that no changes be made to the nocturnal activity scores for these species, and an update, including the same authors (Wade *et al*., 2016)[79] maintained this recommendation. Partial analysis of data from thermal imaging cameras was carried out in the Skov *et al*. (2018)[80] ORJIP Bird Collision Avoidance report, but was incomplete and did not fully account for the distinction between the definition of daylight as used in the Band model and with the official concept of 'twilight' and 'night'. This is an issue as the Band (2012) model considers the nocturnal period as between sunset to sunrise and so treats flight activity that occurs at twilight as being within the nocturnal flight period. Evidence from tagging shows that a number of seabirds actively forage at twilight. We therefore do not consider that any change should be made to the recommended nocturnal activity rates.

Density dependent outputs of PVA

4.7.3 The Applicant presents the density dependent outputs of a great black-backed gull PVA produced for East Anglia THREE in para. 479-480 of ES, Ch. 13 (doc. 6.1.13; APP-226). As explained in section 2, we do not accept the arguments for including compensatory density dependence put forward by the Applicant, as we do not have the means to accurately quantify the strength and form of density dependence in a biologically meaningful way in order to incorporate it into PVA. Furthermore, density dependence is not always compensatory, as implied by the Applicant, but can also be depensatory, slowing the rate of population growth at lower population densities. In other words, a population decline arising from an offshore wind farm could have larger consequences on the population than are predicted by the compensatory density dependent or even density independent models. Horswill and Robinson (2015)[81] identified depensation

[76] Garthe, S. & Hüppop, O. (2004) Scaling possible adverse effects of marine wind farms on seabirds: developing and applying a vulnerability index. Journal of Applied Ecology 41: 724-734.
[77] Band, W (2012) Using a collision risk model to assess bird collision risks for offshore windfarms. SOSS02 Project Report to The Crown Estate
[78] Furness, R, Wade, H & Masden, E (2013). Assessing vulnerability of seabird populations to offshore wind farms. Journal of environmental management. 119C. 56-66. 10.1016/j.jenvman.2013.01.025
[79] Wade, H, Masden, E, Jackson, A.C. & Furness, R. (2016). Incorporating data uncertainty when estimating potential vulnerability of Scottish seabirds to marine renewable energy developments. Marine Policy. 70. 108-113. 10.1016/j.marpol.2016.04.045.
[80] Skov, H., Heinänen, S., Norman, T., Ward, R.M., Méndez-Roldán, S. & Ellis, I. (2018) ORJIP Bird Collision and Avoidance Study. Final report – April 2018. The Carbon Trust. United Kingdom
[81] Horswill, C. & Robinson R. A. (2015). Review of seabird demographic rates and density dependence. JNCC Report No. 552. Joint Nature Conservation Committee, Peterborough

occurring in three gull species. As such we agree with Natural England's position, that the density independent outputs are those that should be considered in the assessment of impact significance.

Reductions in windfarm capacity post-consent

4.7.4 It is stated that many of the collision estimates for other windfarms are based on higher numbers of turbines than were actually installed. Based on a method of updating collision estimates presented by EATL (2016)[82] this is stated to overestimate cumulative mortality of Great black-backed gull by some 30%. This is an acceptable point for windfarms where the DCO has been amended and therefore there is legal certainty regarding the reduction, but where windfarms still have their original DCOs, it is not appropriate to do anything less than assess the full extent of those DCOs when considering in-combination/cumulative effects, as the final layout and therefore required assessment parameters will not be known.

Conclusions regarding great black-backed gull cumulative collision mortality

4.7.5 The Applicant's assessment of cumulative collision risk to Great black-backed gull indicates an annual mortality of 1118 birds (table 13.54 ES Ch. 13 (doc. 6.1.13; APP-226)). The density independent outputs of the East Anglia THREE PVA para. 394-395 of ES Ch. 13 (doc. 6.1.13; APP-226)) raise significant concerns regarding the impact of offshore windfarm mortality on the great black-backed gull population, with a decline of 22.6-23% predicted over 25 years (not the lifetime of the project) based on an additional mortality of 1000 per year. We cannot agree that this magnitude of effect is low nor that this would equate to impacts of minor adverse significance.

4.8 Cumulative Operational Displacement of Red-throated Divers

Displacement and mortality rates

4.8.1 For red-throated diver, a range of displacement and mortality rates have been used in the assessment. As there are few robust studies of displacement, results differ, and we do not know the consequences for mortality or population trajectories, it is appropriate to consider a range of

[82] EATL (2016) Revised CRM. Submitted for Deadline 5: Available online at: https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010056/EN010056-001644-EA3%20-%20Revised%20CRM.pdf

putative displacement and mortality rates. We therefore agree with Natural England that displacement of up to 100% and mortality of up to 10% represents an appropriate level of precaution and should be used in the final assessment.

Use of 4km buffer

4.8.2 Para. 189 of ES, Ch. 13 (doc. 6.1.13; APP-226) states that the inclusion of the 4km buffer in the assessment is a source of precaution as evidence suggests that displacement decreases with distance, in some cases reaching zero by 2km. However, we highlight that there is increasing evidence to show that divers can be displaced from a greater distance, not only from operational wind farms but also from the associated boat traffic (e.g. Mendel *et al*., 2019)[83]. We therefore consider that a 4km buffer is an absolute minimum rather than representing a precautionary approach and that impacts are possible over an even greater scale.

Conclusions regarding cumulative operational displacement of red-throated divers

4.8.3 In Table 13.41 of the ES many of the wind farms are listed as having no red-throated diver displacement assessments or qualitative assessments with no numbers available. In these circumstances we agree with the approach advocated by Natural England to use the method applied to the Thanet extension, and, eventually, at Norfolk Vanguard.

4.8.4 The assessment concludes that there is a "highly precautionary assessment approach", and we disagree as this negates the purpose of the precautionary approach to assessment. At Norfolk Vanguard, Natural England were unable to rule out a significant adverse effect for cumulative operational displacement on Red Throated Diver. The proposed development at Norfolk Boreas adds additional mortality to this and therefore the impact cannot be concluded to be of negligible magnitude.

[83] Mendel, B., Schwemmer, P., Peschko, V., Müller, S., Schwemmer, H., Mercker, M., & Garthe, S. (2019). Operational offshore wind farms and associated ship traffic cause profound changes in distribution patterns of Loons (Gavia spp.). Journal of environmental management, 231, 429-438.

4.9 In-combination Operational Displacement of Guillemots

Displacement and mortality rates

4.9.1 There are few robust studies of displacement, results differ, and we do not know the consequences for mortality or population trajectories, hence it is appropriate to consider a range of putative displacement and mortality rates. We agree with Natural England that displacement of up to 100% and mortality of up to 10% represents an appropriate level of precaution and should be used in the assessment and welcomes the Applicant's presentation of a full range of displacement and mortality rates for guillemot, in accordance with SNCB advice However we do not agree with the Applicant that rates of 50% displacement and 1% mortality are precautionary. In the context of the considerable uncertainty inherent in the assessment, the upper range advocated by Natural England, 70% displacement and 10% mortality, can be considered *realistic* rather than over-precautionary.

4.9.2 A number of sites are missing from the assessment of cumulative/in-combination mortality for guillemot. These are Beatrice Demonstrator, Gunfleet Sands, Kentish Flats, Kentish Flats Extension, Methil, Rampion and Scroby Sands. Although the RSPB acknowledge that these are likely to result in only a few additional mortalities, without them the assessment is incomplete and likely to underestimate the number of resultant mortalities.

Conclusions regarding in-combination operational displacement of guillemots

4.9.3 The assessment concludes that the magnitude of effect is negligible and that there will be no adverse effect on integrity of the Flamborough and Filey Coast SPA population. However, the Applicants own calculations show an in-combination mortality of up to 1635 individuals apportioned to the Flamborough and Filey Coast SPA in the lifetime of the wind farm. The results of the PVA carried out to explore the population scale consequences of this displacement (table 6.26 of Information to inform HRA, document 5.3) show a potential **decrease** of **43%** in the guillemot population of the SPA. It is therefore not possible to avoid an adverse impact on the integrity of the SPA.

4.10 In-combination Operational Displacement of Razorbills

Displacement and mortality rates

4.10.1 There are few robust studies of displacement, results differ, and we do not know the consequences for mortality or population trajectories, hence it is appropriate to consider a range of putative displacement and mortality rates. We agree with Natural England that displacement of up to 100% and mortality of up to 10% represents an appropriate level of precaution and should be used in the assessment and welcomes the Applicant's presentation of a full range of displacement and mortality rates for razorbills, in accordance with SNCB advice However we do not agree with the Applicant that rates of 50% displacement and 1% mortality are precautionary. In the context of the considerable uncertainty inherent in the assessment, the upper range advocated by Natural England, 70% displacement and 10% mortality, can be considered *realistic* rather than over-precautionary.

4.10.2 A number of sites are missing from the assessment of cumulative/in-combination mortality for razorbill. These are Beatrice Demonstrator, Gunfleet Sands, Kentish Flats, Kentish Flats Extension, Methil, Rampion and Scroby Sands. Although the RSPB acknowledge that these are likely to result in only a few additional mortalities, without them the assessment is incomplete and likely to underestimate the number of resultant mortalities.

Conclusions regarding cumulative operational displacement of razorbills

4.10.3 The assessment concludes that the magnitude of effect is negligible and that there will be no adverse effect on integrity of the Flamborough and Filey Coast SPA razorbill population. However, the Applicants own calculations show an in-combination mortality of up to 419 individuals apportioned to the Flamborough and Filey Coast SPA in the lifetime of the wind farm. The results of the PVA carried out to explore the population scale consequences of this displacement (table 6.23 of Information to inform HRA, document 5.3) show a potential **decrease** of **43%** in the razorbill population of the SPA. It is therefore not possible to avoid an adverse impact on the integrity of the SPA.

5 Comments on the Draft DCO – Provisions for Post-construction Monitoring

5.1.1 The In Principle Monitoring Plan - Offshore (doc. 8.12; APP-703) explains that project level monitoring is not proposed for offshore ornithology. Whilst the RSPB welcomes the Applicant's inclusion of strategic offshore monitoring within its proposals, we are concerned that provision for project-level monitoring has not been included.

5.1.2 The current lack of empirical evidence of the scale of impact on bird populations from offshore wind farms means the high levels of uncertainty in the conclusions of predicted population-level impacts used for the decision-making process remain. Post-consent monitoring would help address and reduce these uncertainties for future deployment of offshore renewables, and is needed to validate the conclusions reached by the various assessments that have been undertaken.

5.1.3 To provide this required empirical evidence, monitoring must include both strategic monitoring at a large spatial scale (e.g. biogeographic, regional or country-level) and project-level monitoring, although it is likely that there will be significant overlap between activities needed to deliver these elements.

5.1.4 The resources required must be made available for this monitoring and should be directed to two main tasks, surveillance (to observe and react to population scale impacts) and targeted monitoring (aimed at investigating focused questions, understanding impacts and their mitigation (and whether that migration is effective) and informing future planning).

5.1.5 It is crucial that the questions to be answered are clearly defined from the start. This will allow debate as to the practicality of different means of answering the questions and in particular:

- **Focus effort to make efficient use of limited resources.** A tailored approach is required to single out specific species and/or impacts. This is in preference to generic monitoring across all receptors;
- **Ensure change can be detected.** Power analysis should be undertaken to gauge level of effort against likelihood of detecting an effect; and

- **Align methodologies to gain consistency and comparability.** Consistency of approach will build the empirical dataset and enable analysis at regional and bio-geographic scales to detect population level effects. Seeking early dialogue between developers, government, agencies and stakeholders (including the RSPB) is recommended to define approaches.

Strategic Monitoring

5.1.6 In those instances where the expected impact is collision (and therefore direct mortality), monitoring, notably of breeding adults, should be possible through annual colony counts. More detailed information about individual mortality events may be provided for example by regular abundance estimates through the breeding season (which would be akin to observing nest desertions in productivity monitoring).

5.1.7 In those instances where displacement or barrier effects from the windfarm footprint and buffers zones are expected, the population level impact will derive from poorer foraging success and reduced breeding productivity, through for example reduced clutch sizes or fledging success. Productivity monitoring will therefore be required for these populations.

Project Level Monitoring

5.1.8 Beyond strategic monitoring, project level monitoring is needed to understand the impact pathways, test hypotheses that have been used in planning decisions, such as avoidance and collision rates, to seek approaches to mitigate impacts and to improve marine planning for future applications.

5.1.9 Novel approaches may be required to address these questions. As a first step there must be discussion, justification and decisions made on the study objectives and the most appropriate methods of data collection. These approaches themselves will likely require testing and validation. Operators with suitable expertise will be required to deliver the most effective studies.

5.1.10 The focal issues and species have been identified during baseline data collection. The main topics for post-construction monitoring and research are collision risk and displacement/barrier effects. Studies benefit from before/after comparison, whilst data collection during construction is also

helpful to identify whether construction per se is the cause of observed changes and whether effects persist during the operational phase. Reference site(s) help to interpret any changes observed in the wind farm. Gradient studies enable assessment of the effects of increasing distance away from wind turbines.

5.1.11 Post-construction studies need to be of sufficient duration to permit the distinction between short-term and longer-term effects attributable to the presence of the wind farm. Reviews at pre-determined time intervals will enable decisions to be taken with respect to any necessary refinements of the study methods (bearing in mind the problems associated with changing methodology), as well as reviewing the results and whether there are indications of adjustments in behaviour.

5.1.12 The RSPB will discuss these requirements (particularly the need to include project level monitoring) with the Applicant and we request that a Scientific Steering Group is established to determine the details of the monitoring methods. However, we wish to highlight at this stage that monitoring cannot be regarded as a mitigation measure since it has no ability to reduce or offset possible adverse effect on the SPAs nor their species.

6 Overall Conclusion and Recommendations

6.1.1 Given the concerns we have discussed in the preceding sections, we do not agree that there is sufficient robust evidence available to support conclusions of no adverse effect on the integrity of the Flamborough and Filey Coast SPA or the Alde-Ore Estuary SPA, or to rule out significant effects on certain North Sea seabird populations.

6.1.2 The RSPB considers that, for the project alone, adverse effects on the integrity of the Flamborough and Filey Coast SPA cannot be ruled out, due to impact of collision mortality and operational displacement on gannet. In addition, we consider that adverse effects on the integrity of the Alde-Ore Estuary SPA from this project alone cannot be ruled out due to the impact of collision mortality on lesser black-backed gull.

6.1.3 The RSPB also considers that, in-combination with other projects, it is not possible to rule out adverse effects on the integrity of the Flamborough and Filey Coast SPA, due to impacts on its designation species gannet, kittiwake, guillemot, razorbill, and the breeding bird assemblage, nor for the Alde-Ore Estuary SPA due to impacts on its designation species lesser black-backed gull. We further consider that it is not possible to rule out cumulative impacts for the North Sea populations of kittiwake, great black-backed gull, red-throated diver, guillemot and razorbill.

6.1.4 The RSPB, having considered options to address the predicted impacts, does not consider mitigation measures will be possible to avoid the increased mortality that is predicted by Norfolk Boreas alone and in-combination with other projects. Therefore, we expect the Applicant to provide information to the examination that addresses Steps 6 and 7 in paragraph 3.2.2 above i.e.:

- No alternative solutions;
- Imperative reasons of overriding public interest; and
- Compensatory measures to protect the overall coherence of the Natura 2000 network.

We will review further information on these issues as it is presented and provide more detailed comments.

6.1.5 In this context, the RSPB draws the Examiners' attention to BEIS's decisions to delay determination of Hornsea Three[84] and Norfolk Vanguard[85] offshore wind farms. The delay on each scheme is to, among other things, seek the views of the Applicants and interested parties in respect of the in-combination impacts on the Flamborough to Filey Coast SPA (and in the case of Norfolk Vanguard, also the Alde-Ore Estuary SPA) and the implications of those impacts for the derogation tests set out in the Habitats and Offshore Regulations and summarised in paragraph 3.2.2 above. The RSPB considers such matters are directly relevant to examination of the Norfolk Boreas scheme.

6.1.6 In order to present robust evidence on which a sound assessment can be based, we consider that the Applicant should provide the following updates:

- Use of the standard breeding season in assessment of collision risk for kittiwake, gannet and lesser black-backed gull.
- Apportioning of impacts to lesser black-backed gull of the Alde-Ore Estuary SPA to be recalculated.
- Apportioning of impacts to kittiwake of the Flamborough and Filey Coast SPA to be recalculated and informed by recent tracking data.
- Use of a 98% avoidance rate for gannets in the breeding season.
- Consideration of displacement rates of up to 100% and mortality rates of up to 10% in assessments of displacement for auks and red-throated diver.

6.1.7 We understand that further assessment may now have been undertaken by the Applicant concerning some of the above matters. The RSPB will consider any further information submitted to the Examination by the Applicant and review our position accordingly. However, on the basis of the information currently before the Examining Authority, it is our view that consent cannot be granted. We reserve the right to review and/or change our position in light of new information being submitted to the Examination.

[84] BEIS letter dated 27 September 2019 to Orsted Hornsea Project Three (UK) Limited
[85] BEIS letter dated 6 December 2019 to Norfolk Vanguard Limited and others

Annex I - Qualifications and Experience of the RSPB's Expert

Dr. Aly McCluskie

Dr. Aly McCluskie is a Senior Conservation Scientist in the RSPB He has worked for the RSPB for 10 years, focussing on predator and human conflict and understanding the potential environmental consequences of the development of renewable energy. He now works within the small team that provides scientific support for site conservation. This involves both active research and review in order to provide the science required to underpin policy and casework specifically in relation to the effective conservation of protected sites. In particular this examines the interactions between wind farms, both terrestrial and offshore, and birds.

This work involves working with a range of statutory conservation bodies, government agencies and developers as well as the RSPB's own casework team in attempt to best facilitate potential wind farm developments. Previously he has assessed and trained environmental consultancy field workers, acted as a scientific advisor for BBC wildlife films, and as an ecologist for CEH, SNH, Natural Research and the University of Oxford WildCRU

He has sat on a variety of scientific steering and advisory groups and the expert panels including:

- Vattenfall European Offshore Wind Development Centre Scientific research programme, including expert sub-group for Bird Collision Avoidance study
- Joint Natural Conservation Council, *Bird Collision Avoidance: Empirical evidence and impact assessments*
- Marine Scotland Science *Testing and validating metrics of change produced by Population Viability Analysis (PVA)*
- Offshore Renewables Joint Industry Programme (ORJIP) *Bird avoidance behaviour and collision impact monitoring at offshore wind farms*
- Natural England and the Crown Estate *Seabird Flight Height Comparability Project*
- University of Highlands and Islands, *Incorporating Variability and Uncertainty into Collision Risk Modellin*g
- Marine Scotland Science, *The avoidance rates of collision between birds and offshore turbines*
- German Federal Ministry for Economic Affairs and Energy*: PROGRESS, (Prognosis and Assessment of Bird Collision Risks at Wind Turbines)*
- Moray Offshore Windfarm Limited, *Large Gulls Foraging Behaviour Study*
- Marine Scotland Science, *Strategic assessment of collision risk of offshore wind farms to migrating birds*
- Marine Scotland Science, *Statistical modelling of bird and cetacean distributions in offshore renewables development areas*

Recent relevant publications:

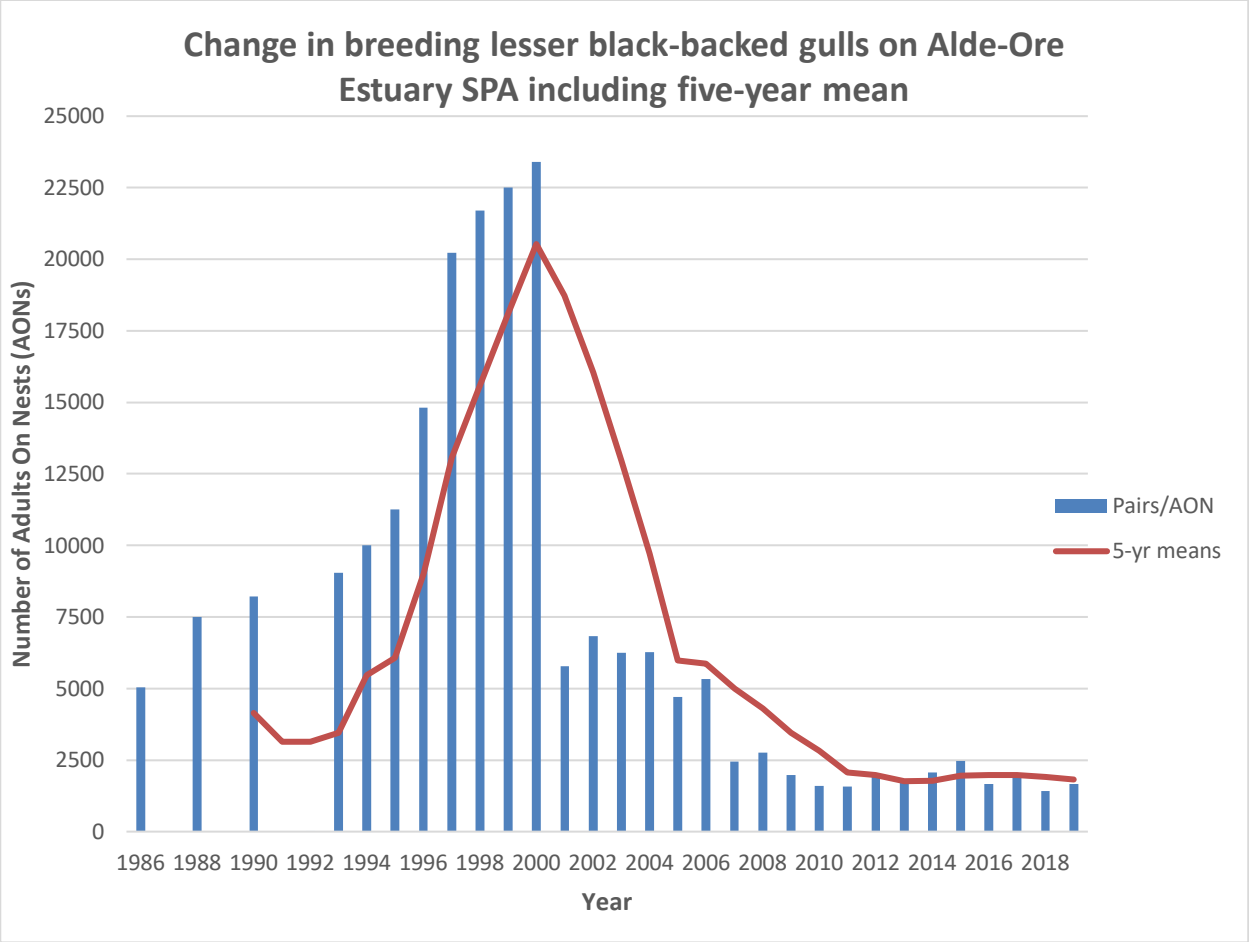
- Wischnewski, S., Fox, D.S. McCluskie, A. & Wright, L.J. (2018) Seabird tracking at the Flamborough & Filey Coast: Assessing the impacts of offshore wind turbines. RSPB Centre for Conservation Science Report to Ørsted.

- Green, R. E., Langston, R. H., McCluskie, A., Sutherland, R., & Wilson, J. D. (2016). Lack of sound science in assessing wind farm impacts on seabirds. Journal of Applied Ecology, 53(6), 1635-1641.
- Masden, E A., McCluskie, A., Owen, E. and Langston R.H.W (2015) Renewable energy developments in an uncertain world: The case of offshore wind and birds in the UK. Marine Policy 51, 169-172
- McCluskie, A. Raptors and wind farms in Scotland. In Conflicts in Conservation (2015): Stephen M. Redpath, R. J. Gutiérrez, Kevin A. Wood Juliette C. Young (eds). Cambridge University Press
- Maclean, Ilya, et al. (2014) "Resolving issues with environmental impact assessment of marine renewable energy installations." Frontiers in Marine Science 1: 75.
- Arroyo, B., Leckie, F., Amar, A., McCluskie, A., & Redpath, S. (2014). Ranging behaviour of hen harriers breeding in Special Protection Areas in Scotland. Bird Study, 61(1), 48-55.
- Gove, B., Langston, RHW., McCluskie, A., Pullan, JD. & Scrase, I. "Wind farms and birds: an updated analysis of the effects of wind farms on birds, and best practice guidance on integrated planning and impact assessment." RSPB/BirdLife in the UK. Technical document T-PVS/Inf 15 (2013).
- McCluskie, A. E., R. H. W. Langston, and N. I. Wilkinson. "Birds and wave & tidal stream energy: an ecological review." RSPB Res. Report 42 (2012): 1-120.

Annex II - The Alde-Ore Estuary SPA Species of Concern

Table 1: Lesser black-backed gull breeding population at the Alde-Ore Estuary SPA

	SPA Total
Year	Pairs/AON
1986	5043
1987	
1988	7500
1989	
1990	8223
1991	
1992	
1993	9050
1994	10008
1995	11256
1996	14817
1997	20218
1998	21704
1999	22514
2000	23400
2001	5790
2002	6838
2003	6249
2004	6264
2005	4708
2006	5325
2007	2446
2008	2769
2009	1974
2010	1603
2011	1580
2012	1907
2013	1747
2014	2070
2015	2459
2016	1668
2017	1914
2018	1424
2019	1665



Note: Varying data sources are available – figures in blue are based on reserve records and figures in black are from the JNCC SMP database. It should also be noted that methods used between years and between sources may not be strictly comparable.