Written Representation

for the

Royal Society for the Protection of Birds

Annex A

Offshore Ornithology

Comments on selected Deadline 5 and Deadline 5a submissions

Submitted for Deadline 6

27 July 2022

Planning Act 2008 (as amended)

In the matter of:

Application by Hornsea Project Four Limited for an Order

Granting Development Consent for the Hornsea Project Four Offshore Wind Farm

Planning Inspectorate Ref: EN010098

RSPB Registration Identification Ref: 20029909

Contents

1. Introduction

Scope of submission

1.1. Below, the RSPB sets out its comments on the following documents submitted by the Applicant and Natural England at Deadlines 5 and 5a:

- REP5-065: G4.7 Ornithological Assessment Sensitivity Report - Revision: 02
- REP5a-010: G5.9 Revised Ornithology Baseline (Tracked) - Revision: 02
- REP5a-024: G5.40 Clarification Note Revised Ornithology Baseline - Revision: 01
- REP5a-012: G5.25 Ornithology Environmental Impact Assessment and Habitats Regulations Assessment Annex (Tracked) - Revision: 02
- REP5-078: G5.25 Ornithology Environmental Impact Assessment (EIA) and Habitats Regulations Assessment (HRA) Annex- Revision: 01
- REP1-069: G1.47 Auk Displacement and Mortality Evidence Review Revision: 01
- AS-048: Natural England: Additional submission, accepted at the discretion of the Examining Authority. Written submission in lieu of attendance at Issue Specific Hearing (ISH) 10, ISH11 and ISH12

2. Update on RSPB position

2.1. The RSPB has reviewed the updated MRSea approach and modelling (REP5a-010 and REP5a-024) and agree that the baseline data are now fit for purpose. However, we agree with Natural England (AS-048 dated 19 July 2022) that there are inconsistencies in the Revised Ornithology baseline (REP5a-010) and the data used for collision risk modelling (REP5a-012). We understand that the Applicant will provide clarification on this matter, but until this is provided we are unable to come to conclusions as to adverse impacts on kittiwake and gannet populations. As such, in this document we will deal exclusively with impacts on guillemot and razorbill.

2.2. For **guillemot**, the displacement assessment shows that the Flamborough and Filey Coast SPA population is likely to be **13.9 -20.6%** lower after the lifetime of Hornsea Project Four wind farm than it would be without the development, and **24.0-41.7%** lower in-combination with other developments. As such, it is impossible to rule out an Adverse Effect on the Integrity of the Flamborough and Filey Coast SPA guillemot population for the project alone and in-combination.

2.3. For **razorbill**, the displacement assessment shows that the Flamborough and Filey Coast SPA population is likely to be **11.1-21.9%** lower after the lifetime of Hornsea Project Four wind farm, in combination with other developments, than it would be without the developments. As such, it is impossible to rule out an Adverse Effect on the Integrity of the Flamborough and Filey Coast SPA razorbill population for the project in-combination.

2.4. For gannet and kittiwake, the impacts arising from existing consented developments, without the inclusion of those arising from Hornsea Project Four, are already so large as to make it impossible to rule out an Adverse Effect on the Integrity of the Flamborough and Filey Coast SPA populations.

2.5. Below we have set out the RSPB's current position with respect to adverse effects on the integrity of the FFC SPA from the project alone and in-combination with other projects.

Project alone – RSPB AEOI conclusions

2.6. For the species where it has been possible to reach a conclusion on adverse effect on the integrity of the FFC SPA from the project alone, the RSPB's conclusions are::

- **Guillemot:** cannot rule out adverse effect on site integrity due to the impact of displacement mortality.

2.7. Because of problems with how the assessment has been presented it is impossible to reach conclusions as to adverse impacts on the following features of the Flamborough and Filey Coast SPA for the project alone:

- **Kittiwake:** the impact of collision mortality on the kittiwake population;
- **Gannet:** the impact of combined collision and displacement mortality on the gannet population;
- **Seabird assemblage:** the impact of combined collision and displacement mortality on the seabird assemblage.

Project in combination with other plans and projects – RSPB AEOI conclusions

2.8. The RSPB's conclusions for each feature of the FFC SPA from Hornsea Four in-combination with other projects are:

- **Kittiwake:** adverse effect on site integrity exists due to the impact of collision mortality on the kittiwake population;
- **Gannet:** adverse effect on site integrity exists due to the impact of combined collision and displacement mortality on the gannet population;
- **Guillemot:** adverse effect on site integrity exists due to the impact of displacement mortality on the guillemot population;
- **Razorbill:** cannot rule out adverse effect on site integrity due to the impact of displacement mortality on the razorbill population;
- **Seabird assemblage:** adverse effect on site integrity exists due to the impact of combined collision and displacement mortality on the seabird assemblage.

3. A note on Precaution

3.1. The Applicant has argued in its Ornithological Assessment Sensitivity Report (REP5-065) that they consider that the recommended approach to the assessment of offshore wind farm developments is overly precautionary. In contrast, the RSPB considers its approach, and that of Natural England, is a measured and reasonable response to the considerable uncertainty inherent in the assessment procedure and is entirely in line with the precautionary principle.

3.2. The precautionary principle exists for situations where scientific data does not exist or is incomplete and therefore it is not possible to complete a full evaluation of the possible risks a plan, project or activity may cause to the environment. This includes possible danger to humans, animal or plant health, or to the environment in general. The European Commission's Precautionary Principle guidance[1] states that it should apply when; a phenomenon, product or process, may have a dangerous effect, identified by a scientific and objective evaluation, if this evaluation does not allow the risk to be determined with sufficient certainty. As such, the degree of precaution applied to an evaluation, or assessment, can be seen to be directly proportional to the extent of scientific uncertainty inherent in that assessment. As the guidance goes on to recommend, "The implementation of an approach based on the precautionary principle should start with a scientific evaluation, as complete as possible, and where possible, identifying at each stage the degree of scientific uncertainty."

3.3. As there can be "almost as many definitions of uncertainty as there are treatments of the subject", following Masden *et al*., (2015)[2], the RSPB defines it as a lack of knowledge, or incomplete information about a particular subject. Masden *et al*. identified a hierarchy of uncertainty in offshore wind farm assessment. This included not only the uncertainty arising from scientific knowledge, as argued by the Applicant, but uncertainty arising more strategically from the process of assessment itself, such as uncertainty within language and decision-making. Included within this process, uncertainty can be considered as anything that increases the difficulty in reaching firm and robust conclusions. For example, a lack of clarity and error in modelling approaches, the lack of inclusion of barrier effects in the displacement analysis, important information submitted at a late stage of the inquiry, overly complicated language, mislabeling of tables, and unsupported arguments put forward as evidence. As such, the approach taken by the Applicant to date, and as evidenced below, is one of increasing uncertainty rather than reducing it. As the degree of precaution is proportional to the degree of uncertainty, such an approach increases the need for precaution in the assessment.

3.4. In the absence of reliable collision risk estimates, we discuss below how the Applicant's approach, outlined in the Sensitivity Report, to displacement and barrier effects, is not, as is argued, suitably precautionary or a realistic scenario. The RSPB acknowledge that some aspects of the below, such as displacement of kittiwake, are not included in statutory

[1] Communication from the commission on the precautionary principle (2000) Commission of the European Communities, Brussels, COM (2000) 1 final.
[2] Masden, E. A., McCluskie, A., Owen, E., & Langston, R. H. (2015). Renewable energy developments in an uncertain world: the case of offshore wind and birds in the UK. Marine Policy, 51, 169-172.

guidance, however we include them to highlight that their omission from the assessment guidance means the guidance cannot be considered overly precautionary.

3.5. As discussed below, the standard method for acknowledging and incorporating this uncertainty in displacement and barrier effects is by presenting a range of values for both displacement and mortality rates. The Applicant appears to agree that the use of ranges is appropriate, although advocate, based on their own "Scientific Report" (REP1-069), a lower range than Natural England. However, in their presented results, apportioned to the Flamborough and Filey Coast SPA, these are only given as single displacement and mortality values, (see REP5-078, paras 2.3.2.5 and 2.3.26). While the RSPB acknowledge that other displacement rates are also presented, the spurious accuracy of single estimates of displacement mortality is contrary to the European Commission's Precautionary Principle guidance; that the degree of scientific uncertainty should be identified at each stage of the assessment, through the false implication that there is no uncertainty around these values.

3.6. A revised displacement analysis has been carried out by the Applicant, subsequent to the comments from Natural England and the RSPB that the previous analysis had not included barrier effects, and so underestimated the scale of impact and had not been precautionary. This analysis used the abundances of birds within the array area plus 2 km buffer, as recommended in the SNCBs (2022)[3] guidance note on displacement. However, while this approach to displacement distance follows advice, it cannot be considered overly precautionary. In a large-scale study covering 14 years before, and 3 years after, the construction of wind farms in the southern North Sea, Peschko *et al*., (2020)[4] reported significant displacement of guillemots in spring with a response radius of ~9 km. In this context, the assessment of guillemot displacement restricted to only a 2km buffer may underestimate the extent of displacement effects and therefore cannot be seen as overly precautionary.

3.7. Further discussion of displacement and mortality rates is provided below in sections 6 and 7.

3.8. Despite advice from both Natural England and the RSPB, the Applicant has only presented a single output metric of Population Viability Analysis (PVA), the Counterfactual of Population Growth Rate (CPGR), and omitted the Counterfactual of Population Size (CPS). As described below and in our Written Representation, a key utility of the Counterfactual of Population Size is its ease of comprehension. The British Trust for Ornithology, in their review of PVA metrics[5], alongside the specific recommendation to include both in offshore wind farm assessment, included recommendations on how to use each metric most effectively. They highlight that the CPS should be used, to provide "an easily understandable context". This is of relevance to the inherent uncertainty in the assessment, as providing understandable

[3] Joint Statutory Nature Conservation Bodies. (2022). *Joint SNCB Interim Displacement Advice Note*

[4] Peschko, V., Mendel, B., Müller, S., Markones, N., Mercker, M., & Garthe, S. (2020). Effects of offshore windfarms on seabird abundance: Strong effects in spring and in the breeding season. *Marine Environmental Research*, *162*, 105157

[5] Cook, A.S.C.P. & Robinson, R.A. (2016) Testing sensitivity of metrics of seabird population response to offshore wind farm effects, JNCC Report No. 553, JNCC, Peterborough, ISSN 0963-8091.

context is key to reducing linguistic and decision-making uncertainty (Masden et al., 2015[6], Searle et al., 2021[7]). As such, in omitting the Counterfactual of Population Size, the Applicant is actually increasing uncertainty and the consequent need for precaution.

[6] Masden, E. A., McCluskie, A., Owen, E., & Langston, R. H. (2015). Renewable energy developments in an uncertain world: the case of offshore wind and birds in the UK. Marine Policy, 51, 169-172.

[7] Searle, K.R., Jones, E.L., Trinder, M., McGregor, R., Donovan, C., Cook, A., Daunt, F., Humphries, L., Masden, E., McCluskie, A. & Butler, A. 2021. JNCC Report on the Correct treatment of uncertainty in ornithological assessments. JNCC Report No. 677, JNCC, Peterborough, ISSN 0963-8091

4. Highly Pathogenic Avian Influenza (HPAI)

4.1. A new virulent form of bird flu, Highly Pathogenic Avian Influenza (HPAI), that originated in poultry in east Asia has now killed tens of thousands of wild birds in the UK and around the world. First confirmed in Britain during winter 2021/22, it has had major impacts on populations of seabirds across Scotland, and there have been an increasing number of confirmed cases appearing across England, including east coast seabird colonies. At the Farne Islands in Northumberland, thousands of seabirds have died. The disease is now strongly suspected to be the cause of death of seabirds at the Flamborough and Filey Coast SPA, awaiting post-mortem confirmation from DEFRA. Current ongoing monitoring is recording dead and symptomatic birds and includes affected gannet, kittiwake, guillemot and razorbill.

4.2. It is currently unclear what the population scale impacts of the outbreak will be, but it is likely that they will be severe. This year's outbreak at the Bass Rock gannetry has coincided with, and is the likely cause of, greater than 90% nest failure. This scale of impact means that seabird populations will be much less robust to any additional mortality arising from offshore wind farm developments. It also means that there may need to be a reassessment of whether SPA populations are in Favourable Conservation Status. With such uncertainty as to the future of these populations, there is the need for a high level of precaution to be included in examination of impacts arising from the proposed development of Hornsea Project Four.

5. Counterfactual metrics

5.1. The RSPB has argued in its main Written Representation (REP2-089) why it is wrong for the Applicant to only have presented a single output metric of Population Viability Analysis (PVA), the Counterfactual of Population Growth Rate (CPGR), and omitted the Counterfactual of Population Size (CPS). This is contrary to a specific recommendation of a review of output metrics, following work by the RSPB[8], commissioned by the Joint Nature Conservation Committee (JNCC) and carried out by the British Trust for Ornithology (BTO)[9]. That review recommended the ratio of growth rates are presented to quantify the consequence of impacts at a population level and the ratio of population sizes to present these impacts in an easily understandable context. A further review was commissioned by Marine Scotland Science and carried out by the Centre for Ecology and Hydrology[10], and the conclusions as to utility of output metrics was similar.

5.2. As we argued previously, the ease of understanding of the CPS is crucial to its utility; the numbers given by the CPGR are less understandable outwith a population modelling context. To use the theoretical example quoted by the BTO, a CPS of 0.515 means the population size of a breeding colony is expected to be 51.5% (i.e. half) of what it would have been in the absence of the development after 25 years, which is easy to understand. Whereas the corresponding CPGR, 0.973, means that the annual population growth rate at the breeding colony declines from 0.994 to 0.967. The actual scale of the consequence of this is hard for a non-specialist to comprehend, that of the CPS is not. This issue of comprehension is crucial in reducing uncertainty, as lack of clarity in presenting results acts to increase uncertainty, and the consequent need for precaution (Masden *et al*., 2015[11], Seale *et al*., 2021[12]).

5.3. The Applicant is incorrect in disassociating the two metrics, arguing that this is necessary because of the use of density independent formulations. However, the two metrics are very similar, the only key difference is that CPGR does not include the length of time that the wind farm will be operational. They are both outputs of the same modelling process and will therefore both be equally affected if density dependence is included or not in the formulation. The only difference is that because CPGR is a smaller number, the relative change between density independent and density dependent formulations will appear to be small. The consequent change to the impacted population will be identical with both metrics.

[8] Green, R. E., Langston, R.H. W., 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

[9] Cook, A.S.C.P. & Robinson, R.A. (2016) Testing sensitivity of metrics of seabird population response to offshore wind farm effects, JNCC Report No. 553, JNCC, Peterborough, ISSN 0963-8091

[10] Jitlal, M., Burthe, S., Freeman S. and Daunt, F. (2017) Testing and Validating Metrics of Change Produced by Population Viability Analysis (PVA). Scottish Marine and Freshwater Science Vol 8 No 23, 210pp. DOI: 10.7489/2018-1

[11] Masden, E. A., McCluskie, A., Owen, E., & Langston, R. H. (2015). Renewable energy developments in an uncertain world: the case of offshore wind and birds in the UK. Marine Policy, 51, 169-172

[12] Searle, K.R., Jones, E.L., Trinder, M., McGregor, R., Donovan, C., Cook, A., Daunt, F., Humphries, L., Masden, E., McCluskie, A. & Butler, A. 2021. JNCC Report on the Correct treatment of uncertainty in ornithological assessments. JNCC Report No. 677, JNCC, Peterborough, ISSN 0963-8091

6. Displacement rates

6.1. Displacement arises when there is a significant reduction in the density of birds within the wind farm footprint and the surrounding area (the buffer zones), which may be partial or total displacement, compared with the baseline situation. Displacement is equivalent to habitat loss and may be temporary or permanent, depending on whether or not there is habituation, i.e. adjustment to the presence of the wind farm and a resumption of use of the area. It may be triggered during construction, or during operation, depending on the direct cause.

6.2. In order to justify their proposed rates of displacement, the Applicant draws on the evidence reviewed in their own "Scientific Report", Auk Displacement and Mortality Evidence Review G1.47 REP1-069. As highlighted in this report, there is a wide range of responses to wind farms reported. Despite this, in their presented results, apportioned to the Flamborough and Filey Coast SPA, are only given as a single displacement rate, (see REP5-078, paragraphs 2.3.2.5 and 2.3.26), although they do present wider ranges elsewhere. This single rate is justified by arguments presented in the review, mainly that the majority of studies are not statistically robust enough to be reliable.

6.3. Key to this robustness is the problem of zero inflation in at sea surveys, whereby large numbers of zero counts can make modelled predictions unreliable. This is particularly an issue with studies that report high rates of displacement, as these have few records of auks within the wind farm therefore higher zero counts. The Applicant argues because of this, these studies should not be presented as strong evidence of high displacement effects. However, this results in a circular argument; these studies have problems with zero inflation precisely because there have been high levels of displacement. Rather than simply dismiss these studies, they should be seen as indicative of the high levels of uncertainty inherent in displacement responses and a suitable level of precaution should consequently be applied in assessment.

6.4. Overcoming the issues with zero inflation and at sea surveys, it is more statistically robust to use GPS tracking data to derive displacement rates (Searle et al., 2018[13]). This approach has been taken by Peschko *et al*., (2020)[14] to examine displacement of guillemot breeding at Heligoland in the German North Sea. Analysis of these data revealed a 63% reduction in the resource selection of the wind farm areas, which increased to 79% when the blades were rotating. While these results are limited to a small number of individual birds (12) over a relatively short time period, the results are strong enough to indicate a large response to the presence of turbines, and to indicate that the Applicant's suggested 50% displacement rate is not suitable precautionary.

6.5. To aid the examination, the RSPB has presented the results in section 8 derived from three sets of displacement rates, the 50% rate favoured by the Applicant, a *plausible* range of 30-

[13] Searle, K.R., Mobbs, D.C., Butler, A., Furness, R.W., Trinder, M.N. and Daunt, F. (2018). Finding out the Fate of Displaced Birds. Scottish Marine and Freshwater Science Vol 9 No 8

[14] Peschko, V., Mercker, M., & Garthe, S. (2020). Telemetry reveals strong effects of offshore wind farms on behaviour and habitat use of common guillemots (Uria aalge) during the breeding season. Marine Biology, 167(8), 1-13.

70% advocated by Natural England and what can be considered a *probable* value of 60%, as reflected in advice to offshore wind farm developments in Scottish waters. This latter value, in combination with the range of mortality rates described below will give a range of mortalities to reflect the uncertainty in displacement assessment.

7. Mortality rates

7.1. In order to justify their proposed rates of mortality arising from displacement and barrier effects, the Applicant draws on the evidence reviewed in their own "Scientific Report", Auk Displacement and Mortality Evidence Review G1.47 REP1-069. The section of the review reports on two studies (Searle *et al*., 2014[15] and van Kooten *et al*., 2019[16]) and one piece of anecdotal evidence.

7.2. The van Kooten *et al*. study takes a modelling approach to look at the population scale impacts of displacement on five seabird species, including guillemot and razorbill. Unfortunately, the study only looks at the effects of habitat loss through displacement, it does not look at all at the energetic impacts of barrier effects. Barrier effects arise when an obstacle, such as a wind farm, causes birds to divert from their intended path in order to reach their original destination. It is generally considered to act mainly on birds in flight (SNCBs 2022[17]). As such they are similar, though not the same, as displacement effects. In practical terms it is currently not possible to disentangle the two and so barrier and displacement effects should be considered together in impact assessment, as per SNCB advice (*Ibid*.) The van Kooten *et al.* study does not consider these impacts together, rather focuses on displacement alone. As such, it cannot be seen as a reliable source of information regarding the mortality arising from displacement and barrier effects combined. Furthermore, other work suggest that barrier effects may have a greater mortality consequence than displacement.

7.3. A more comprehensive modelling approach was taken by Searle *et al*., 2014, cited by the reviewer as the most comprehensive assessment of the effects of displacement and barrier effects from offshore wind farms on breeding seabirds. However, there is a further extension to the model, SeaBORD (Searle *et al*., 2018[18], (incorrectly cited in the body text by the reviewer as Daunt *et al*., (2020), and not included in the reference list) which represented a significant improvement on the previous model (Searle *et al*., 2014). Crucially the model incorporates both displacement and barrier effects and translates these into projections of adult annual survival and productivity (i.e., chick survival/mortality). Including a measure of chick mortality is a great improvement on the matrix approach, which only accounts for adult mortality. Intuitively it makes far more biological sense for nest failure to be the consequence of the additive energetic costs of barrier and displacement effects, rather than direct mortality of the adult.

7.4. The Applicant claims that the SeaBORD model outputs "suggest additional mortality rates for displaced auks are unlikely to exceed 1% for SPA birds at the limit of their foraging range."

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[15] Searle, K., Mobbs, D., Butler, A., Bogdanova, M., Freeman, S., Wanless, S. and Daunt, F. 2014. Population consequences of displacement from proposed offshore wind energy developments for seabirds breeding at Scottish SPAs (CR/2012/03). CEH Report to Marine Scotland Science.

[16] van Kooten, T., Soudijn, F., Tulp, I., Chen, C., Benden, D., & Leopold, M. (2019). *The consequences of seabird habitat loss from offshore wind turbines, version 2: Displacement and population level effects in 5 selected species* (No. C063/19). Wageningen Marine Research.

[17] SNCBs (2022) Joint SNCB1 Interim Displacement Advice Note. https://data.jncc.gov.uk/data/9aecb87c-80c5-4cfb-9102-39f0228dcc9a/joint-sncb-interim-displacement-advice-note-2022.pdf

[18]Searle, K.R., Mobbs, D.C., Butler, A., Furness, R.W., Trinder, M.N. and Daunt, F. (2018). Finding out the Fate of Displaced Birds. Scottish Marine and Freshwater Science Vol 9 No 8

This is contrary to what is presented in the model report, where auks from one of the SPAs considered show mean increases to adult mortality for birds that were affected by both barrier and displacement effects of between 0.33% and 5.66%. This demonstrates that the 1% mortality rate suggested by the Applicant is not precautionary.

7.5. Finally in the Applicant's review there is discussion of the population trends at a German seabird colony, Heligoland, where the population of guillemots has grown for over 20 years. This is despite evidence (acknowledged by the reviewer) of displacement rates of 44% during the breeding season and 63% during the non-breeding season. However, implying that additional mortality will halt an upward population trajectory is overly simplistic; other factors can be acting on the population, such as immigration, regardless of loss. This is part of the justification for using Counterfactual outputs metrics for PVA; these outputs are robust regardless of other influences acting on the population.

7.6. To aid the examination, in section 8 the RSPB has presented the results derived from three sets of mortality rates:

- the 1% rate favoured by the Applicant;
- a *plausible* range of 1-10% advocated by Natural England; and
- what can be considered a *probable* range of 3-5% for the breeding season and 1-3% for the non-breeding season, as reflected in advice to offshore wind farm developments in Scottish waters.

8. Impact predictions

8.1. In order to aid the examination, the RSPB presents here the mortalities and consequent Counterfactual of Population Size apportioned to the guillemot and razorbill populations of the Flamborough and Filey Coast SPA. These have been calculated from the values presented by the Applicant in the tables in sections 5 and 6 of the Ornithology EIA and HRA Annex REP5-078.

8.2. We present them as derived from three sets of displacement and mortality rates:

- **For displacement**, we have used:
    - the 50% rate favoured by the Applicant;
    - a *plausible* range of 30-70% advocated by Natural England; and what can be considered
    - a *probable* value of 60%, as reflected in advice to offshore wind farm developments in Scottish waters.
- **For mortality**, we have used:
    - the 1% rate favoured by the Applicant;
    - a *plausible* range of 1-10% as advocated by Natural England; and what can be considered
    - a *probable* range of 3-5% for the breeding season and 1-3% for the non-breeding season, as reflected in advice to offshore wind farm developments in Scottish waters.

8.3. The Counterfactuals of Population Size, that is the percentage decrease in impacted population size relative to unimpacted population size, have been taken from Population Viability Analysis run using the Natural England PVA tool, mirroring the original model logs used by the Applicant.

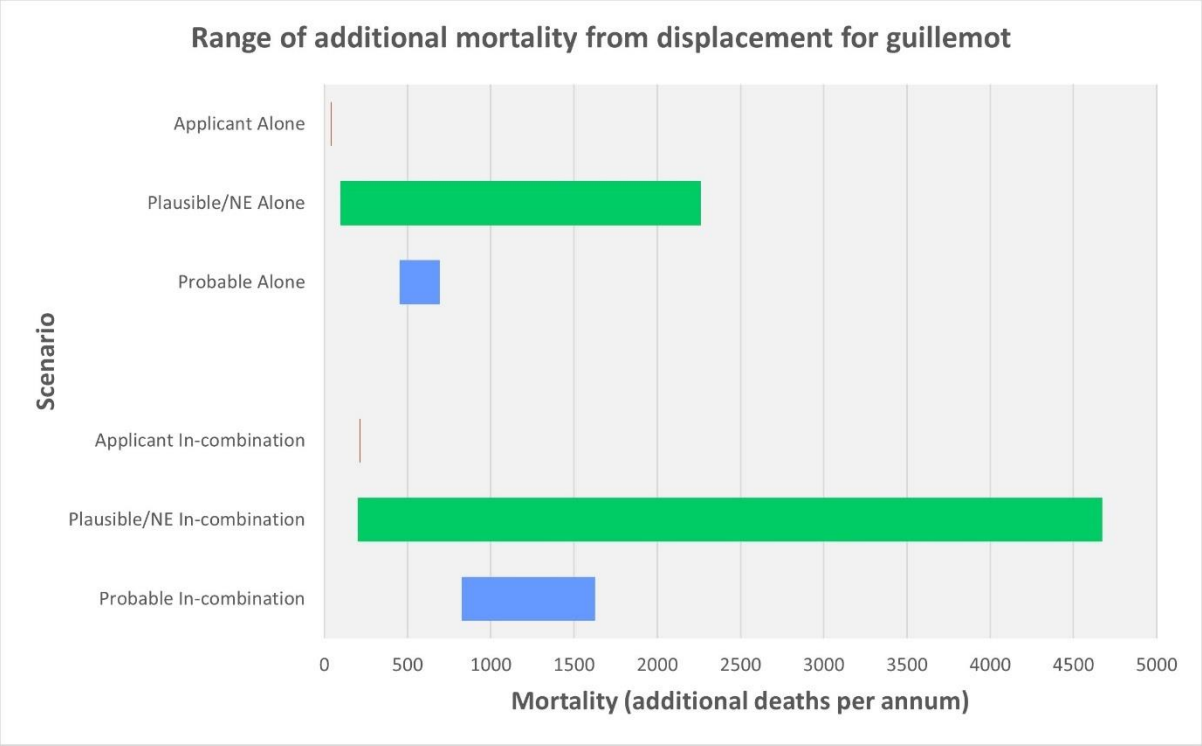
8.4. The predicted annual mortalities and CPS values arising from displacement of guillemot and razorbill apportioned to the Flamborough and Filey Coast SPA are presented below, both in tabular and in graphic form. The source tables in REP5-078 that the figures were derived from are listed in the table legend

Guillemot

Table 1. The predicted annual mortality of guillemot apportioned to the Flamborough and Filey Coast SPA arising from Hornsea Project Four alone and in-combination and the consequent percentage decrease in impacted population size relative to unimpacted population size (CPS) presented as ranges using the Applicant's approach, the plausible range and the probable range of displacement and mortality rates. Derived from tables 72, 78, 106 and 108 of REP5-078 (Ornithology EIA and HRA Annex)[19].

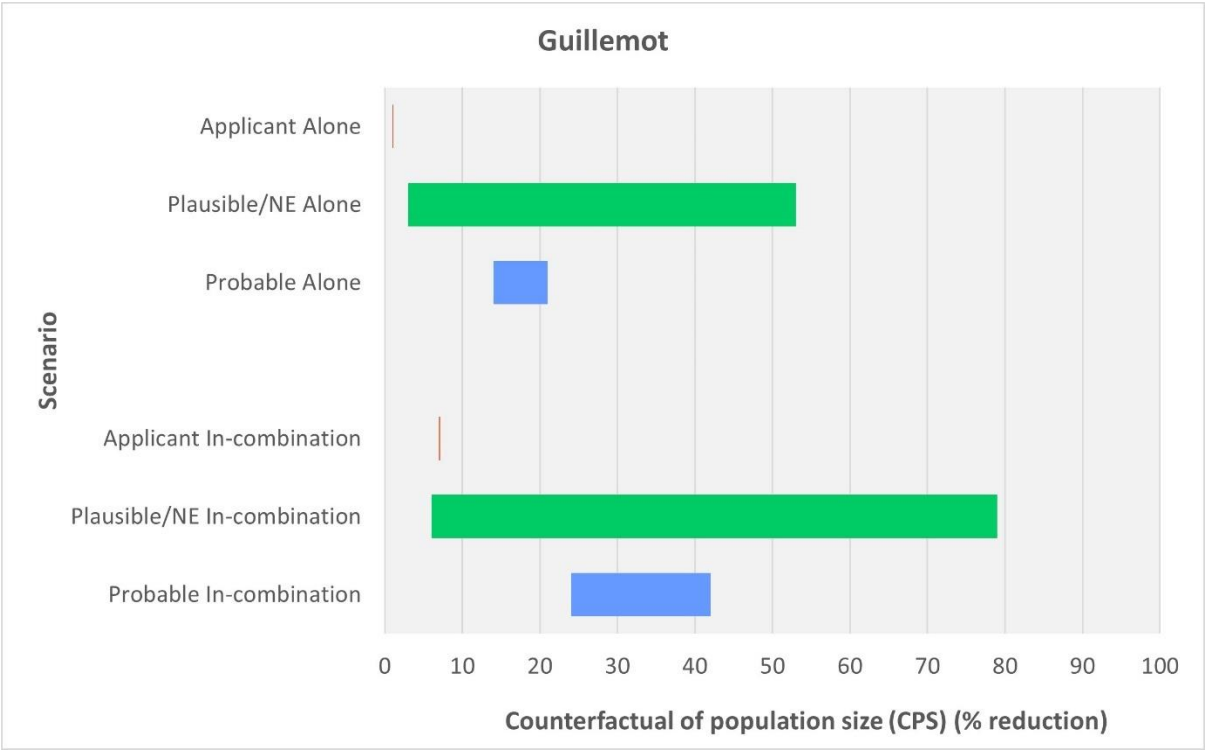
	Project alone						In combination					
	Applicant		Plausible/NE		Probable		Applicant		Plausible/NE		Probable	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Mortality	39.5	39.5	96.9	2261.6	450.3	694.1	211.7	211.7	200.2	4672.0	824.5	1625.4
CPS (%)	1.3	1.3	3.2	53.1	13.9	20.6	6.8	6.8	6.4	79.4	24.0	41.8

Figure 1. The predicted annual mortality of guillemot apportioned to the Flamborough and Filey Coast SPA arising from Hornsea Project Four alone and in-combination presented as ranges using the Applicant's approach, the plausible range and the probable range of displacement and mortality rates



[19] Please note the tables are mis-labelled 71, 77, 105 and 107 in the List of Tables at the beginning of REP5-078.

Figure 2. The predicted percentage reduction in impacted population size relative to unimpacted population size (CPS) of guillemot apportioned to the Flamborough and Filey Coast SPA arising from Hornsea Project Four alone and in-combination, over the lifetime of the development, presented as ranges using the Applicant's approach, the plausible range and the probable range of displacement and mortality rates.



Razorbill

Table 2. The predicted annual mortality of razorbill apportioned to the Flamborough and Filey Coast SPA arising from Hornsea Project Four alone and in-combination and the consequent percentage decrease in impacted population size relative to unimpacted population size (CPS) presented as ranges using the Applicant's approach, the plausible range and the probable range of displacement and mortality rates. Derived from tables 81, 86, 113 and 115 of REP5-078 Ornithology EIA and HRA Annex[20]

	Project alone						In combination					
	Applicant		Plausible/NE		Probable		Applicant		Plausible/NE		Probable	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Mortality	1.9	1.9	9.8	228.1	24.2	63.3	37.0	37.0	30.8	718.5	111.6	234.8
CPS (%)	0.2	0.2	1.0	21.4	2.5	6.4	3.8	3.8	3.2	53.4	11.1	21.9

Figure 3. The predicted annual mortality of razorbill apportioned to the Flamborough and Filey Coast SPA arising from Hornsea Project Four alone and in-combination presented as

[20] Please note the tables are mis-labelled 80, 85, 112 and 114 in the List of Tables at the beginning REP5-078.

ranges using the Applicant's approach, the plausible range and the probable range of displacement and mortality rates.

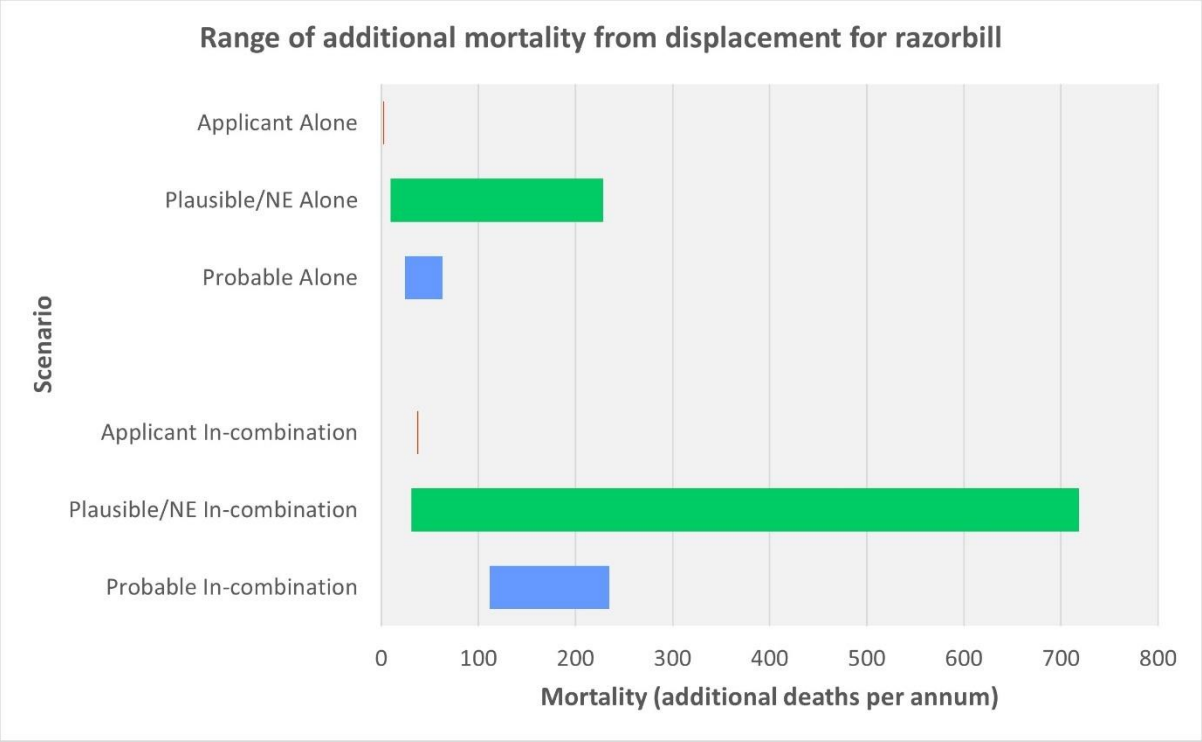
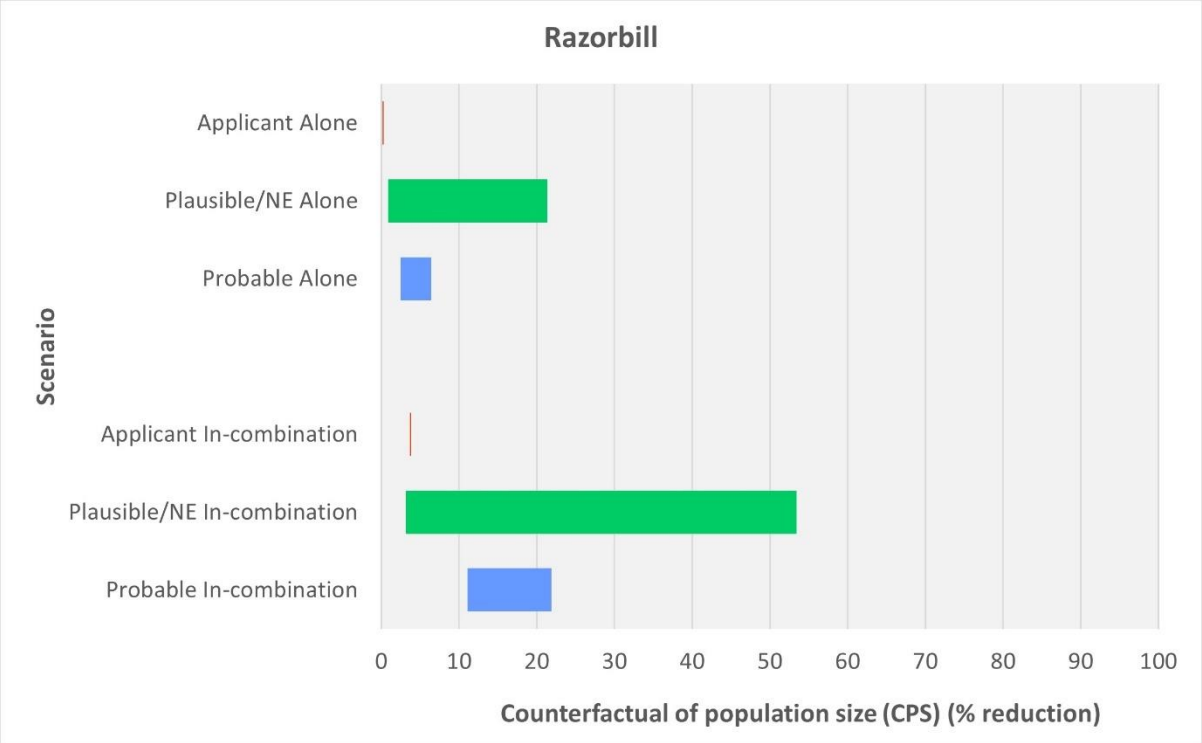


Figure 4. The predicted percentage reduction in impacted population size relative to unimpacted population size (CPS) of razorbill apportioned to the Flamborough and Filey Coast SPA arising from Hornsea Project Four alone and in-combination, over the lifetime of the development presented as ranges using the Applicant's approach, the plausible range and the probable range of displacement and mortality rates.



8.5. These figures show, that for **guillemot**, the additional mortality predicted to arise through displacement will result in the Flamborough and Filey Coast SPA population being a probable **13.9 -20.6%** lower after the lifetime of Hornsea Project Four wind farm than it would be without the development, and **24.0-41.7%** lower in-combination with other developments, although plausibly it could be as much as 53.1% lower through the project alone, and 79.4% in combination.

8.6. For **razorbill**, the additional mortality predicted to arise through displacement will result in the Flamborough and Filey Coast SPA population being a probable **2.5-6.4%** lower after the lifetime of Hornsea Project Four wind farm than it would be without the development, and **11.1-21.9%** lower in-combination with other developments, although plausibly it could be as much as 21.4% lower through the project alone, and 53.4% in combination.

8.7. The magnitude of these figures, in comparison to those suggested by the Applicant, has implications for any resulting compensation requirements, and whether the currently proposed measures are capable of meeting this scale of impact (see section 3 of Annex B for further discussion on this matter).