From: Brown, Emma
To: Hornsea Project Three
Subject: EN010080 Hornsea Project 3: Deadline 7 Submission from Natural England
Date: 15 March 2019 00:02:45
Attachments: EN010080 Hornsea Project Three Deadline 7 - Natural England - ANNEX C - Cable Protection Advice Note.pdf
EN010080 Hornsea Project Three Deadline 7 - Natural England - ANNEX D - Note on Small Scale Impact.pdf
EN010080 Hornsea Project Three Deadline 7 - Natural England - ANNEX E - Ornithology Response.pdf
EN010080 Hornsea Project Three Deadline 7 - Summary of Natural England''s Advice on Cromer Shoal MCZ.pdf
EN010080 Hornsea Project Three Deadline 7 - Summary of Natural England''s Advice on Markham''s Triangle pMCZ.pdf
EN010080 Hornsea Project Three Deadline 7 - Summary of Natural England''s Advice on North Norfolk Sandbanks and Saturen Reef SAC.pdf
EN010080 Hornsea Project Three Deadline 7 Natural England''s comments on the RIES .pdf
JNCC Report_598_Revised-2018_WEB - Monitoring guidance for marine benthic habitats.pdf
Natural England and JNCC joint Technical Guidance Note - Marine Buffers and Margins - Final.pdf
NECR164 Non-breeding season populations of seabirds in UK waters.pdf
SNCB response to MSS avoidance rate report_FINAL_251114.pdf
EN010080 Hornsea Project Three Deadline 7 - Natural England - ANNEX A - Further Advice on PTA REP5 - 010.pdf
EN010080 Hornsea Project Three Deadline 7 - Natural England - ANNEX B - Sabellaria Spinulosa Advice Note.pdf
EN010080 Hornsea Project Three Deadline 7 - Natural England - Rule 17 Response.pdf
Natural England and JNCC joint Technical Guidance Note - Marine Buffers and Margins - Final.pdf

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Good Evening,

Please find attached Natural England's Deadline 7 Response.

This includes:

- Comments on the RIES
- Rule 17 Response
- ANNEX A: Further Advice on PTA REP 5 – 010
- ANNEX B: Sabellaria Spinulosa Advice Note
- ANNEX C: Cable Protection Advice Note
- ANNEX D: Note on Small Scale Impact
- ANNEX E: Ornithology Response
- Summary of Natural England's Advice on Cromer Shoal MCZ
- Summary of Natural England's Advice on Markham's Triangle pMCZ
- Summary of Natural England's Advice on The Wash and North Norfolk Coast SAC
- Summary of Natural England's Advice on North Norfolk Sandbanks SAC
- Natural England & JNCC joint Technical Guidance Note – Marine Buffers and Margins
- SNCB response to MSS Avoidance Rate Report
- NERC164
- JNCC Report 598

Please note that Natural England has reviewed the MMO's draft Response to the ExA dDCO/DML and are in agreement with their comments. Therefore we will not be providing a separate response on this occasion.

Kind regards,

Emma

Joint Response from the Statutory Nature Conservation Bodies to the Marine Scotland Science Avoidance Rate Review

25th November 2014

1. Summary of recommendations

This joint response from the Statutory Nature Conservation Bodies (SNCBs)[1] is intended to provide recommendations on how the Offshore Wind Farm (OWF) industry could appropriately apply findings from the Marine Scotland Science Avoidance Rate Review[2] (hereafter 'the report') to the impact assessment process. This section provides a summary of our recommendations on best practise impact assessment using Collision Risk Modelling (CRM) in light of the report. The rationale for these recommendations is outlined within the main body of the paper.

Basic Band model (Options 1 and 2) recommendations

Whenever the Basic Band model (Options 1 or 2) are used for collision mortality estimation:

- Collision mortality estimates should be presented using the mean total avoidance rate (as detailed in Table 1 below) as well as a range of avoidance rates that reflects the variability and uncertainty linked to it (i.e. ±2SD).

Basic Band model (Option 2) recommendations

Whenever the Basic Band model (Option 2) is used for collision mortality estimation:

- Collision mortality estimates should be presented using the mean total avoidance rate (as detailed in Table 1 below) as well as a range of avoidance rates that reflects the variability and uncertainty linked to it (i.e. ±2SD).

Furthermore, the following information should also be provided:

- Presentation and comparison of both site-specific and generic flight height data (including median and confidence limits).
- A range of collision mortality estimates using the lower and upper confidence limits of the generic modelled flight distribution.

Extended Band model (Option 3) recommendations

It is <u>**not**</u> **appropriate** to use the **Extended Band model** in predicting collisions for **northern gannet** or **black-legged kittiwake**, at the current time.

Whenever the Extended Band model (Option 3) is used for **large gull** collision mortality estimation:

- Collision mortality estimates should be presented using the mean total avoidance rate (as detailed in Table 2 below) as well as a range of avoidance rates that reflects the variability and uncertainty linked to it (i.e. ±2SD).

[1] To be read as comprising the Joint Nature Conservation Committee (JNCC), Natural England (NE), Natural Resource Wales (NRW), Northern Ireland Environment Agency (NIEA), Scottish Natural Heritage (SNH).
[2] Cook, A.S.C.P., Humphries, E.M., Masden, E.A., and Burton, N.H.K. 2014. The avoidance rates of collision between birds and offshore turbines. BTO research Report No 656 to Marine Scotland Science.

Furthermore, the following information should also be provided:

- Presentation and comparison of both site-specific and generic flight height data (including median and upper and lower confidence limits).
- Presentation of both Basic Band model outputs (Options 1 and 2) with the measures of confidence outlined in **Section 3.4**, in addition to Extended Band model outputs.
- A range of Extended Band model collision mortality estimates using lower and upper confidence limits of the generic flight distribution.

2. Introduction

The SNCBs welcome this important piece of work and congratulate Marine Scotland Science (MSS) for taking the initiative to commission this report and the British Trust for Ornithology (BTO) for conducting such a thorough review.

We note that a key finding of the report is the absence of studies of collision mortality and avoidance rates at offshore wind farms. The report concludes that the bulk of avoidance rate studies are from onshore or coastal wind farms. Having reviewed this body of work the report concludes that for many species (or groups of species) there are insufficient empirical data to derive meaningful avoidance rates at micro-, meso- or macro-scales. To a large degree, this inability to quantify these separate components of overall avoidance rates was due to lack of spatial resolution in empirical data and/or technical capacity to separate these components of overall avoidance.

The lack of empirical data from offshore wind farms contributing to the report's conclusions must be considered in the future applicability of recommended avoidance rates in an offshore context. Nevertheless, with many offshore projects at critical junctures in the decision-making process, we support some of the report's findings for use in offshore wind farm collision risk modelling, until such time as more empirical data are available.

This joint SNCB position represents a considerable shift in advice on avoidance rates for use with collision risk modelling in light of the report. This reflects the obligation on SNCBs to amend their advice as the best available evidence continues to evolve. However, it must be recognised that further empirical data on bird avoidance, flight heights and activity at offshore wind farms will continue to accrue and may alter our understanding of the likelihood of seabird collisions in the future. Therefore, the SNCBs position on avoidance rates may, as the current response bears testimony, be subject to change as more empirical data become available, e.g. ORJIP study (refer to section 6).

The following advice is applicable only to collision risk modelling for the five priority species and other gull species covered by the report. For other seabirds (e.g. skuas) and waterbirds (e.g. divers, seaducks, etc.) the report does not conduct an analysis or provide recommended avoidance rates for any version of the Band model. In light of this, the SNCBs continue to recommend the basic Band model, in conjunction with a default 98% avoidance rate, for predicting collisions of species other than those detailed here, until such time as further species-specific work has been undertaken.

3. General Statements of Agreement

3.1 Avoidance rates for use with the Basic Band model

The SNCBs support the recommended avoidance rates (AR) presented in the report in relation to four of the five priority species (the exception being black-legged kittiwake) as we consider these rates to be the best available evidence regarding the average avoidance rates for use with these species (Table 1 below). However, it should be noted that in several instances these are not derived from species-specific information and as such represent avoidance rates for species groupings (e.g. 'large gulls') rather than for an individual species.

The SNCBs also recommend that the estimated variance in empirically derived estimates of within windfarm avoidance rates, as presented within the report, be acknowledged and explored in any application of these total avoidance rates in future collision risk modelling.

Collision mortality estimates should be presented using the mean total avoidance rate as well as a range of avoidance rates that reflects the variability and uncertainty linked to it (i.e. ±2SD).

Table 1. Basic Band avoidance rates derived from MSS avoidance rate report Table 7.2. This table represents new avoidance rates (± 2SD) supported by the SNCBs for use in impact assessment collision risk modelling.

Species (rate used)	Basic Band model avoidance rate (2SD)
Northern gannet (all gull avoidance rate)	**0.989** (± 0.002)
Black-legged kittiwake (~~small~~ all gull avoidance rate)	~~0.992~~ **0.989** (± 0.002)*
Lesser black-backed gull (large gull avoidance rate)	**0.995** (± 0.001)
Herring gull (species-specific avoidance rate)	**0.995** (± 0.001)
Great black-backed gull (large gull avoidance rate)	**0.995** (± 0.001)

** Note: 'strike-through' data as presented in Table 7.2 of the report; data in 'bold' as recommended by SNCBs (see section 4.1 below for further explanation).*

3.2 Northern Gannet avoidance rates for Basic Band model

We note that the northern gannet avoidance rate represents, in reality, an 'all gull' avoidance rate, due to the absence of species-specific within windfarm avoidance data. We agree it is inappropriate to combine a within wind farm avoidance rate for this species based on the rates established for gulls with the gannet-specific macro-avoidance rate of 0.64, as this would result in a non-evidence based total avoidance rate higher than for any of the other groups considered. However, we agree that, without a within windfarm avoidance component for gannets, and acknowledging their more marked tendency to exhibit macro-avoidance behaviour; it is reasonable to ascribe to gannets the lowest of the total avoidance rates determined for any of the other groups (i.e. the 'all gull' category). In the absence of gannet-specific data for all elements of avoidance, this is also appropriately precautionary.

3.3 Use of avoidance rates to 3 decimal places

The SNCBs advise that, following recommendations in the report, practitioners of collision risk modelling now use avoidance rates to three decimal places as outlined above rather than rounding figures to two as typically done previously (e.g. 0.98). The report presents within windfarm avoidance rates to 4 decimal places (Table 7.1) but given the inherent uncertainty in the data the final recommended total avoidance rates are presented to only 3 decimal places (Table 7.2). The SNCBs agree with the recommendation in the report to use avoidance rates to three decimal places, until such time as improvements are made to the characterisation of uncertainty within the models, avoidance rates and flight height distributions used.

3.4 Recommended avoidance rates for use with Band model Option 2

We acknowledge that Options 1 and 2 of the Band model are mathematically identical (the Basic Band model) and consequently that it is appropriate to use the same predictive avoidance rate for both options. But the estimates of avoidance rates within section 5.4 of the report derived using Option 2 were in every case lower than using Option 1.

The SNCBs accept that this reflects the mismatch between the observed site-specific values of the proportion of birds recorded flying at predicted collision risk height (PCH) and the equivalent values derived using generic modelled flight height distribution data, and hence that the lower avoidance rates derived under Option 2 are anomalous.

We accept the recommendation that the higher avoidance rates derived using Option 1 should be used with the Basic Band model. For any future application of these recommended Basic Band model avoidance rates in combination with generic modelled flight height distribution data (i.e. use of Option 2), we advise the following is included:

- Presentation and comparison of both site-specific and generic flight height data (including median and confidence limits).
- A range of collision mortality estimates using the lower and upper confidence limits of the generic modelled flight distribution.
- A range of collision mortality estimates reflecting the empirically derived range of uncertainty around the mean avoidance rate (as detailed in Table 1 above).

This is to ensure due consideration is given to the uncertainty surrounding the generic flight height distribution and its applicability to the wind farm in question and the uncertainty around the avoidance rate itself.

4. Areas of Disagreement or Uncertainty

4.1 Kittiwake avoidance rates for Basic Band model

The SNCBs consider that the principles applied to northern gannet avoidance rate recommendations in the face of lack of species-specific data (i.e. application of the lowest “all gull” alternative rate derived by the review) should also be applied to black-legged kittiwake avoidance rates. The report includes kittiwake within the ‘small gull’ category, the data for which are predominantly derived from common gulls and black-headed gulls. Indeed, no species-specific data for kittiwakes are represented within the ‘small gull’ category at all.

While the report provides a theoretical argument towards the inclusion of kittiwakes within the ‘small gull’ category, there are equally arguments that could be put forward in support of their treatment as part of the ‘large gull’ category (i.e. typical flight speeds and generally more marine behaviour). Consequently, we feel these somewhat subjective arguments should be discounted in favour of a more consistent and precautionary approach with regards the treatment of other species lacking species-specific within windfarm avoidance rate data (namely gannets).

Therefore, we recommend that, until such time as it is possible to calculate a species-specific avoidance rate for kittiwakes, they are classed under the more generic (and precautionary) ‘all gull’ category.

4.2 Applicability of Extended Band model avoidance rates

The SNCBs highlight that the report makes no recommendation regarding avoidances rates for use with the Extended Band model for northern gannets and black-legged kittiwakes due to a lack of species-specific data.

This means it is not appropriate to use the Extended Band model in predicting collision figures for these species at the current time.

For the other three priority species covered by the report (see Table 2 below), we note that while we accept the work undertaken to derive avoidance rates for use with Option 3; we remain concerned over the use of the Extended Band model. In particular, we have concerns regarding its sensitivity to flight height distribution data, and the uncertainty this component introduces to variation in estimates of collision.

Table 2. Extended Band avoidance rates taken from MSS avoidance rate report Table 7.2.

Species (rate used)	**Extended Band model avoidance rate (2SD)**
Northern gannet	Not available
Black-legged kittiwake	Not available
Lesser black-backed gull (large gull avoidance rate)	**0.989** (± 0.002)
Herring gull (species-specific avoidance rate)	**0.990** (± 0.002)
Great black-backed gull (large gull avoidance rate)	**0.989** (± 0.002)

We advise those wishing to present Extended Band model predictions for those species/groupings where sufficient data on appropriate avoidance rates has been compiled within the report (i.e. those noted in Table 2 above), that the following information must also be provided:

- Presentation and comparison of both site-specific and generic flight height data (including median and upper and lower confidence limits).
- Presentation of both Basic Band model outputs (Options 1 and 2) with the measures of confidence outlined in **Section 3.4**, in addition to Extended Band model outputs.
- A range of collision mortality estimates reflecting the empirically derived range of uncertainty around the mean avoidance rate applicable to the output of the extended Band model (as detailed in Table 2 above).
- A range of Extended Band model collision mortality estimates using lower and upper confidence limits of the generic flight distribution.

Presentation of uncertainty around both flight heights and avoidance rates and incorporation into the analysis in this way, will provide clarity over the range of possible collision mortality outcomes and which collision risk model outputs are most appropriate for the assessment of the wind farm(s) in question.

5. Further Detailed Explanation of SNCB Positioning

5.1 Constraints on the wider applicability of Extended Band model avoidance rates

The report highlights, in many instances, significant differences between the observed proportion of birds at PCH (within the studies used to derive the avoidance rate estimates) and the proportion predicted to be at collision risk height derived from generic modelled distributions of flight heights. The latter estimates are almost invariably lower than the former.

In the case of 'small gulls' this discrepancy is so great that the report concludes it would be inappropriate to use avoidance rates derived for the Extended Band model for this group. Similar discrepancies, although less marked, also occur in the case of 'all gulls', 'large gulls' and 'herring gull'. Therefore, while accepting that the greater discrepancy in the case of 'small gulls' is such that the resultant extended model avoidance rate for that group (0.9027) and for 'all gulls' (which includes small gulls) (0.9672) are so unreliable as to be of no practical use, we can accept the use of the Extended Band model ARs derived for herring gulls and the other two larger species of gulls (Table 2 above), provided this is accompanied by acknowledgement of uncertainty around the underlying flight height data, and provided that equivalent Basic Band model AR outputs are presented for consideration alongside those from the extended Band model.

5.2 Need for on-going exploration of other aspects of uncertainty within the collision risk modelling framework

The SNCBs acknowledge that the Extended Band model is a more refined mathematical model than the Basic Band model in that it allows consideration of the fine-scale variation in the distribution of flight heights of birds flying within the rotor swept height band, and the variation as a function of height within that risk band in the probability of: i) passing within the perimeter of the rotating disc and ii) being hit during that passage. This Extended Band model is therefore a more advanced tool with which to derive estimates of the non-avoidance collision mortality.

However, the use of Option 3 in collision risk modelling is dependent upon; i) the availability of appropriate non-avoidance rates to apply to its non-avoidance estimate of collision mortality and ii) the degree of uncertainty around and confidence in the general applicability of the modelled flight height distribution on which it is based.

The report presents two pieces of evidence that highlight the significance of having robust estimates of the proportion of birds at PCH. These are:

- Deriving an Extended Band model AR for 'small gulls' was thwarted by the consistent mismatch between generic modelled flight height distributions and the observed proportion of birds flying at PCH in the empirical studies from which ARs were being derived. This may be because the empirical studies used within the report to derive ARs were all onshore, while the suite of studies used to model generic flight height distributions included more offshore data. In any event, this mismatch indicates extreme caution is needed when applying the generic flight height distribution required of the Extended Band model.

- The exploration of the sensitivity of the non-avoidance rate to variation in several key parameters indicates that the non-avoidance rate predicted by the Extended Band model can be highly sensitive to variation in the simulated flight height distribution. Although this appears not to be a consistent issue, it occurs sufficiently often to support the assertion above that extreme caution is needed in application of the generic flight height distributions to different sites.

Finally, there remains the issue of whether the derivation of collision mortality estimates using the Extended Band model is or is not more sensitive to errors in the attribution of birds to differing flight height bands in the field. Irrespective of the relative sensitivity of the Basic Band model and the Extended Band model in this respect, it is clear that errors in height estimation is another factor which needs to be considered in applying any estimate of flight height in collision risk modelling.

5.3 Issues limiting applicability of the correction factor g

The SNCBs note that the report shows in Annex 1 how the avoidance rates for use with the Basic and Extended Band models are related. The Basic model gives an estimate of no avoidance collision mortality, if information is available on turbine and bird parameters and the number of bird flights at risk height. The Extended model refines this estimate to take account of the distribution of flight heights, if detailed information on the latter is also available. The ratio between the Extended Band model estimate of collision rate and that from the Basic Band model, **if the same height distribution data are used in the latter to calculate the proportion of flights at collision risk height**, is termed the *g* factor.

Annex 1 of the report shows that if both models are applied to a reference windfarm, working back from an observed collision rate such as to derive the avoidance rate appropriate for each model, the non-avoidance rate for use with the Extended model **must be** *1/g* times the non-avoidance rate for the Basic model. This non-avoidance rate may then be used in estimating collision mortality at any new windfarm, using the Extended model, **if the flight height distribution at the new windfarm site is known**. **Thus to make use of the Extended model requires knowledge of the flight height distribution at both the reference site and at the new windfarm site**.

g factors have been estimated in Appendix 7 of the report, by comparison of the non-avoidance collision mortality estimates from the Basic and Extended Band models, both being based on assumed generic flight height distributions. It is clear, though, that there is a substantial mismatch between the observed values of the proportion of birds at collision risk height (PCH) and the proportion at risk height calculated from the generic modelled flight height distributions. The SNCBs consider it likely that estimates based on the latter are in many cases unreliable. The current review indicates that there is very little site-based information on the flight height distribution at the 'reference' windfarms reviewed, such as to enable *g* factors to be derived at each of these reference sites on the basis of site-specific data.

Until detailed flight height distributions are derived on a site-specific basis for a reference windfarm (or the applicability of a generic flight height distribution confirmed), the **SNCBs advise that the *g* factors presented in Appendix 7 should not be used to derive a windfarm avoidance rate for use with the Extended model at any new offshore windfarm**. In particular it would be wholly wrong to use avoidance rates appropriate for the Basic Band model, but based on observed values of the proportion of flights at risk, in conjunction with the *g* factors in Appendix 7 of the report which are calculated based on the generic flight distributions.

Where the report recommends use of avoidance rates for use with the Extended Band model, these are based on the assumed generic flight height distributions and hence may also be inaccurate. However, for these reference windfarms, the generic flight height distributions almost always predict a substantially smaller proportion of bird flights at risk height than have been observed in the site data. A correspondingly greater proportion of birds must be deemed not to take avoiding action in order to match the observed rate of collision at each reference windfarm. Hence the avoidance rates so calculated are precautionary, that is to say the true avoidance rates are most likely to be greater. **For those species for which they are quoted, the SNCBs accept the use of these avoidance rates with the Extended Band model (Table 2 above), subject to the qualifications set out in the report and presentation of the additional information as set out in section 4.2 above.**

The SNCBs acknowledge that as more detailed flight height information is acquired, it may prove possible to derive more reliable estimates of the non-avoidance rates for use with the Extended Band model, and the associated *g* factors. Nonetheless we advise that even then, any future application of the Extended Band model in collision risk mortality estimation should take account of the degree of uncertainty in all aspects of the underlying flight height data used, and present a range of possible outputs which reflect the degree of uncertainty around the assumed flight height distribution.

6. Next Steps

As outlined, this joint SNCB position reflects the obligation on SNCBs to amend their advice as the best available evidence continues to evolve. Consequently, this SNCB position statement will be subject to review as more empirical data become available (e.g. ORJIP study). Further to this, we advise that:

1. A review of this position statement will be undertaken by the SNCBs once ongoing work to quantify error and uncertainty in flight height distributions and collision risk modelling reports are completed. A NERC funded project, undertaken by Dr Liz Masden[3] , is expected to address some of these outstanding questions by spring 2015.

2. A strategic data collection programme should be drawn-up and agreed between all interested parties to supplement data collected under ORJIP. This should be aimed at gathering additional species-specific avoidance behaviour data (particularly for gannets and kittiwakes) to allow derivation of more refined avoidance rates than those recommended in the MSS report. Implementation of the programme should be overseen by regulatory bodies in recognition of their key role in the consenting process and formulation of licence conditions.

[3] Environmental Research Institute, University of Highlands and Islands, Thurso.